WORKING PAPER NO. TSRA-87-016E
TIME SERIES RESEARCH & ANALYSIS DIVISION
METHODOLOGY BRANCH.

A REVIEW OF THE SEASONAL ADJUSTMENT METHODOLOGY USED IN INTERNATIONAL TRADE SERIES

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RÉSUMÉ

La Division de Commerce international désaisonalise 63 séries d'importations et 64 séries d'exportations de biens et de prix ainsi que 12 séries de regroupements de pays et quatre séries reliées aux produits de l'automobile (séries de la Banque du Canada).

Un re-examen exhaustif de la méthodologie de désaisonnalisation des séries de commerce international sus-mentionnées a été fait en collaboration avec la Division de la recherche et de l'analyse des chroniques.

Dans chaque cas on a essayé toutes les options de la méthode de désaisonnalisation X-11-ARMMI. De nouvelles options ont été choisies sur la base de tests statistiques de signification et de mesure d'évaluation de qualité.

1. Introduction

International Trade Division seasonally adjusts value and price data for 63 import and 64 export commodity series; as well as 12 other series by major country groups and four series related to automotive products (Bank of Canada series).

An exhausitive review of the seasonal adjustment methodology of the above-mentioned international trade series has been conducted in collaboration with the Time Series Research and Analysis Division.

For every series all possible options of the X-II-ARIMA seasonal adjustment procedure have been reviewed and newly available options have been selected on the basis of the significance of statistical tests, quality assessment measures and other indicators.

The actual procedure was updated for such factors as the Easter effect, Trading-day variation, and some distorting effects, like August-wedge adjustment were removed.

Emphasis was on the improvement of the quality of the seasonal adjustment of several individual series (e.g.: Meat and meat prep., Coal, Aircraft, ... etc.) and also that of the composite series.

After a comprehensive study a new starting point was established at 1980. This seemed to be appropriate because in most industry groups the economic trend had significantly changed since the beginning of the eighties.

This phenomenon can be observed also in other economic time series. For instance, the G.N.P. analysts have found similar trend changes in numerous components other than imports and exports and, as a result they have established also 1980 as the starting point for these series.

In section 2 we examine in detail the current seasonal adjustment procedure, the use of ARIMA extrapolation, the selection of moving averages, the treatment of Trading-day variation, Easter effect, and a comparison between the forecast seasonal factors actually used versus the concurrent adjustment.

Section 3 concludes the study by summarizing the recommendations based on the detailed analysis in Section 2.

2. Analysis of the Proposed Seasonal Adjustment Methodology of the International Trade Series

The international trade series are adjusted using the X-II-ARIMA program with ARIMA forecasts produced by a model automatically selected by the program, 3x5 and 3x9 seasonal moving averages; a fixed 13-term Henderson moving average was applied for some series to obtain an improved estimate of the trend-cycle; prior trading-day weights were estimated and will be kept fixed for a year.

The monthly seasonally adjusted estimates will continue to be obtained in the same way as before, that is: the data will be processed through the seasonal adjustment program twice a year, seasonal factor forecasts (and trading-day factor forecasts, if the series contains trading-day variation) will be produced and divided into the unadjusted data each month of the following year as the data becomes available.

In this review of the seasonal adjustment, the following three decomposition models were used for the estimation of the time series components. They are:

Multiplicative: $$Z_{ij} = C_{ij} \times S_{ij} \times I_{ij} \times TD_{ij}$$

Log-additive: $$\log Z_{ij} = \log C_{ij} + \log S_{ij} + \log I_{ij} + \log TD_{ij}$$

Additive: $$Z_{ij} = C_{ij} + S_{ij} + I_{ij} + TD_{ij}$$

In these equations, Z denotes the observed unadjusted series; C the trend-cycle; S the seasonal variation, I the irregular component and TD the trading-day variation.

The subscript i indicates the year and j the month.

In the multiplicative and log-additive models the seasonal factors and the irregulars are expressed as percentages.

For the series to be decomposed multiplicatively or log-additively, all the observations must be greater than zero.

On the other hand, in the additive model the seasonal estimates give the seasonal effects of the month for the observed values in actual units.

For series with negative values or zeroes, the additive model is the only one applicable.

From the point of view of seasonal adjustment, it is preferable to choose the decomposition model that yields the most "stable" seasonal factors. Tests have been developed to determine the preferred model.

If a series does not show any significant "stable" seasonality, we do not seasonally adjust the series, consequently it is included in the totals as raw data.

2.1 The ARIMA Extrapolation Option

It has been proved by Estela Bee Dagum of Time Series Research and Analysis Division (see reference at the end) that extending the raw series with one year of forecasted values obtained using ARIMA models improves the reliability of the current seasonally adjusted estimate.

The X-II-ARIMA program offers eight ARIMA extrapolation options, four for backcasting and forecasting and four for forecasting only.

The option applied in the present seasonal adjustment of international trade series allows for forecasting only, using an ARIMA model that is automatically selected by the program.

The program has four built-in ARIMA models in the case of multiplicative and log-additive decomposition:

$$\left.\begin{array}{l}(0,1,1)\ (0,1,1)\ \log \\ (0,1,2)\ (0,1,1)\ \log \\ (0,2,2)\ (0,1,1)\ \log \\ (2,1,0)\ (0,1,1)\ \log\end{array}\right\}\quad *$$

* For more details see Appendix C

In case of additive decomposition these same models apply but without log.

If the automatic model selection option is chosen, the program fits the four models to the series and uses the best one to produce forecasts (as long as it satisfies certain criteria on forecast error and goodness-of-fit).

These built-in criteria are:

1. The average forecast error must be less than 15%.
2. The chi-squared probability must be greater than 5%.

Due to the rigid nature of these built-in criteria it is quite possible that a model that passes the guidelines in one month does not meet the criteria later with new data added to the series.

In this case either a new model is chosen or possibly no acceptable model can be found. Either way, unwanted fluctuations in the seasonally adjusted estimates will be introduced.

It is much better, from the point of view of stability, to retain the same model for at least a year even if it fails to meet the built-in criteria in some months of the year.

The X-II-ARIMA program allows the user to provide his own model selected through a proper model identification technique. Alternatively, the user may select the best of the four automatic models (regardless of the built-in criteria) provided as user supplied model for a year.

As a result of this analysis, it is recommended that the series be adjusted using a fixed pre-established model whenever applicable.

(The list of appropriate models is given in Appendix B.)

2.2 Seasonal Moving Average Option

One of the many features built into the X-II-ARIMA program is the availability of five different seasonal moving averages to suit various seasonal patterns, ranging from very flexible rapidly changing seasonality to almost rigid stable seasonal behaviour.

In order to get a reliable estimate of the year-to-year movement in the seasonal component, it is important that the movement in the seasonal component not be obscured by the movement in the irregular component.

From the point of view of seasonal adjustment, it is important to know the proportion of the irregular contribution to the variance of the series relative to the seasonal contribution. If the irregular variation is too high compared to the variation in the seasonal component, the two components cannot be separated successfully.

The X-II-ARIMA program calculates a statistics called the $\overline{I}/\overline{S}$ ratio. This ratio measures the average absolute year-to-year movement in the seasonal component.

If the $\overline{I/S}$ ratio is low (i.e.: $\overline{I/S} < 1.5$) it indicates that the seasonal pattern is changing significantly and the irregular component is small and consequently a short moving average would be appropriate.

High $\overline{I/S}$ values (i.e.: $\overline{I/S} > 6.5$), on the other hand, would indicate little movement in the seasonal component and hence it is more appropriate to use a long seasonal moving average to estimate it.

Since the $\overline{I/S}$ ratios for the international trade series range approximately between 2.60 and 7.34 and are rather high, the following options were used to obtain the best results:

$\overline{I/S}$ RANGE	MOVING AVERAGE SELECTED
2.60 - 5.00	3x3 moving average for the 1st estimate of the seasonals in each iteration and 3x5 in the final estimate
5.01 - 6.50	3x5 moving average in all iterations
6.51 and up	3x9 moving average in all iterations

2.3 Moving Average for Variable Trend-Cycle

The Henderson moving averages (9-, 13- and 23-term) are applied to obtain an improved estimate of the trend-cycle.

The statistical indicator measuring the relationship between the irregular component and the trend-cycle is the $\overline{I}/\overline{C}$ ratio. This $\overline{I}/\overline{C}$ ratio can be found at the top of Table D12 and in Table F2. H.

If this ratio exceeds 3, the amount of irregular movement is considered high.

The $\overline{I}/\overline{C}$ ratios for most of the international trade series was higher than 3. In some cases the 13-term Henderson was applied even though the $\overline{I}/\overline{C}$ ratio was higher than 3.5 (in the remaining cases the variable trend-cycle routine was applied).

2.4 The Treatment of Easter

The Easter effect is calculated using the final irregulars identified by the X-II-ARIMA program (Table D13).

The difference between the April and March values is averaged over years when Easter fell in March and then again when it fell in April.

The program tests if these averages are significantly different from each other given the variability among the irregulars.

In technical terms, a one-way analysis of variance test is carried out.

If the F-value calculated is too small, the series does not have a significant Easter effect. Testing is done at the 10% significance level.

The effect estimated is the difference between the March-Easter and April-Easter averages divided by 2.

$$\text{Easter effect:}\quad \hat{E} = \tfrac{1}{2}\left[\frac{\sum_{i_M=1}^{n_M}(A_{iM} - M_{iM})}{n_M} - \frac{\sum_{i_A=1}^{n_A}(A_{iA} - M_{iA})}{n_A}\right]$$

or:

$$\hat{E} = \tfrac{1}{2}\left[\overline{Diff_M} - \overline{Diff_A}\right]$$

March factor: $1-\hat{E}$ in case of Multiplicative and log-additive decomposition

March factor: $-\hat{E}$ in case of additive decomposition

April factor: $1+\hat{E}$ in case of multiplicative and log-additive decomposition

April factor: $\hat{E}$ in case of additive decomposition

$$F = \frac{(\overline{Diff}_M - \overline{Diff})^2 + (\overline{Diff}_A - \overline{Diff})^2}{\dfrac{\sum_{i=1}^{n_T} (Diff_i - \overline{Diff})^2 - \left[(\overline{Diff}_M - \overline{Diff})^2 + (\overline{Diff}_A - \overline{Diff})^2\right]}{n_T - 2}}$$

Notations:

n_M = number of years Easter fell in March

n_A = number of years Easter fell in April

n_T = total number of years

A_{i_M} = April irregular in year i_M (March Easter)

M_{i_M} = March irregular in year i_M (March Easter)

A_{i_A} = April irregular in year i_A (April Easter)

M_{i_A} = March irregular in year i_A (April Easter)

2.5 The Treatment of Trading Day Variation

The X-II-ARIMA seasonal adjustment program permits two ways to adjust for trading-day variation:

1) The user may enter prior trading-day weights which will be used in making the trading-day adjustment.

2) The user may apply an option of the X-II-ARIMA program to have a trading-day regression estimated.

In contrast to X-II, the X-II-ARIMA program requires that the trading-day variation be removed from the series prior to fitting the ARIMA model to the data.

The present suggestion is to let the X-II-ARIMA program estimate the trading-day weights once a year and use these fixed weights as prior daily weights to remove trading-day variation in successive runs of the program.

Table C15 gives the final trading-day regression. One-way analysis of variance test is also incorporated with the F-statistic indicating the presence or absence of a residual trading-day variation.

2.6 The Aggregation Problem

The X-II-ARIMA method is basically a linear smoothing technique, however, it contains certain non-linearities, such as the identification of extremes, the multiplicative decomposition and automatic changing of the trend-cycle moving averages.

Because of the non-linear features of the program, the seasonally adjusted components are not expected to add up to the seasonally adjusted total, making it sometimes difficult to explain the movement in the total through what was happening in the component series.

One way around this problem is to define the seasonally adjusted total as the sum of the seasonally adjusted component series (indirect adjustment).

The adjusted series thus formed has practically identical spectral properties with the directly adjusted total. Either approach is therefore acceptable.

Table I presents the month-to-month movements for the years 1984 to 1986 from the total of Imports (by commodity groups), adjusted directly and indirectly using data up to December 1986.

TABLE I. Comparison of the month-to-month movements in the Import totals (by commodity groups) adjusted directly and by the proposed indirect procedure :

	J	F	M	A	M	J	J	A	S	O	N	D
1984												
Direct	1.3	3.1	4.4	-1.7	4.3	-1.9	2.6	8.0	-9.2	0.7	-0.7	2.9
Indirect	1.8	1.3	5.9	-5.1	6.1	-2.6	3.2	7.9	-8.7	2.8	-3.2	4.9
Difference	-0.5	1.8	-1.5	3.4	-1.8	0.7	-0.6	-0.1	-0.5	-2.1	2.5	-2.0
1985												
Direct	0.4	1.0	1.6	3.0	1.3	3.6	-1.8	2.2	2.0	-4.0	7.1	-1.1
Indirect	2.0	-3.6*	4.2	0.2	2.8	3.0	-0.1	0.4	3.1	-1.8	3.8	0.0*
Difference	-1.6	4.6	-2.6	2.8	-1.5	-0.6	-1.7	-1.8	-1.1	-2.2	3.3	-1.1
1986												
Direct	3.8	4.3	-12.5	1.3	1.8	2.2	5.4	-4.6	-0.2	1.3	0.9	-0.2
Indirect	5.9	-0.2*	-10.7	0.8	1.2	2.6	6.4	-7.7	3.6*	2.8	-1.9*	2.3*
Difference	-2.1	4.5	-1.8	0.5	0.6	-0.4	-1.0	3.1	-3.8	-1.5	2.7	-2.5

* Reversal of direction

In this series the percentage change, especially in the last three years indicates that the indirect seasonally adjusted composite is smoother than the direct seasonally adjusted composite.

While indirect adjustment solves the problem of consistency among the individual commodity movements and the total movements, if the total is calculated by summing up the imports and exports by major country grouping discrepancies and reversals in the movement between the two sets of seasonally adjusted totals can still occur.

It is expected that they will be reduced as well by using the proposed options.

2.7 Seasonal Factor Forecasts Versus Concurrent Adjustment

The seasonal factor forecasts will be obtained when the March data is available. This data will be processed through the seasonal adjustment program.

Seasonal factor forecasts (and trading-day factor forecasts, if the series contains trading-day variation) will be produced and divided into the unadjusted data each month of the following year as the data becomes available.

At the present time, for series which were seasonally adjusted, the results of the D16A table were used (combined seasonal and trading-day factors 12-months ahead) as projected seasonal factors.

In the near future it will be necessary to include into the X-II ARIMA program a new table which will take care of combined seasonal, trading-day and Easter factors 12 months ahead.

The shortcomings of these projected factors is that they are calculated ahead of the actual time and they do not take into account the most recent information incorporated into the series.

On the other hand, the use of a concurrent seasonal factor to produce a current seasonally adjusted datum implies the use of all the data in the series up to and including the current month's observation.

The main reason for using concurrent instead of seasonal factor forecasts is that the former are subject to smaller revisions as new observations are added to the series.

This important result has been confirmed in several empirical studies.

3. Conclusions

The present seasonal adjustment procedure of the international trade series has been reviewed in detail.

Based on the analysis presented in Section 2, the following changes are recommended:

1. Use of fixed ARIMA model (as given in Appendix B) for a year.

   At the time of the annual revision these models can be reviewed to determine if they are still describing adequately the structure of the series and changed if necessary.

2. Use of these ARIMA models for forecasting an additional year.

3. To fix the recommended seasonal moving averages and the Henderson moving averages for a year.

APPENDIX A

Results: January 1980 - March 1987

APPENDIX B

ARIMA Models Used:

I. Imports by Commodities ('B2 MM')

Series Ident. M	Description	ARIMA Model
201	Meat and meat prep.	(011) (011)
202	Fish	(011) (011) log
203	Fresh fruits	(011) (011) log
205	Fresh vegetables	(011) (011) log
206	Other vegetables prep.	(210) (011) log
208	Dairy products	(011) (011) log
213	Beverages	(011) (011) log
304	Crude anmal prod.	(011) (011) log
305	Crude vegetables prod.	(210) (011)
306	Crude wood material	(011) (011) log
309	Other crude materials	(210) (011) log
401	Wood fabricated materials	(011) (011) log
402	Textiles	(011) (011) log
403	Organic chemicals	(011) (011) log
404	Plastics	(011) (011) log
405	Other chemicals	(011) (011) log
407	Rolling mill prod.	(012) (011) log
410	Other non-ferrous metals	(011) (011) log
411	Metal fabricated basic prod.	(011) (011) log
412	Rubber fabr. materials	(011) (011) log
414	Non-metallic minerals	(011) (011) log
415	Other fabricated materials	(011) (011) log

I. Imports by Commodities ('82 MM') - Concluded

Series Ident. M	Description	ARIMA Model
501	Engines	(011) (011) log
505	Other machinery	(011) (011) log
506	Agricultural machinery	(011) (011) log
508	Trucks and other motor vehicles	(011) (011) log
509	Motor vehicle parts	(210) (011) log
510	TV, radios	(011) (011) log
511	Other telecomm. equip.	(022) (011) log
513	Electronic apparatus	(011) (011) log
515	Other transp. equip.	(011) (011) log
516	Apparel and apparel access.	(011) (011) log
517	Footwear	(011) (011) log
518	Printed matter	(011) (011) log
519	Watches, sporting goods	(011) (011) log
520	Household furnishing	(011) (011) log
521	Photographic goods	(012) (011) log
522	Other end products	(011) (011) log

II. Exports by Commodities ('B2 XX')

Series Ident. X	Description	ARIMA Model
201	Fish	(011) (011) log
206	Other cereal prep.	(011) (011) log
208	Alcoholic beverages	(011) (011) log
209	Other Section II	(011) (011) log
311	Asbestos unmanufactured	(210) (011) log
315	Other Section III	(011) (011) log
401	Lumber	(011) (011) log
402	Other wood fabricated materials	(011) (011)
404	Newsprint	(011) (011) log
405	Other paper	(011) (011) log
413	Rolling mill prod.	(011) (011) log
414	Other iron and steel	(011) (011) log
417	Nickel	(012) (011) log
421	Metal fabricated basic prod.	(011) (011) log
423	Textiles	(011) (011) log
501	Industrial machinery	(011) (011) log
502	Agricultural machinery	(011) (011) log
503	Passenger automobiles	(011) (011) log
505	Motor vehicle parts	(011) (011) log
506	TV, telecomm.	(011) (011) log
507	Aircraft	(011) (011) log
509	Office machines and equip.	(011) (011) log
510	Other equip. and tools	(011) (011) log
511	Other consumer goods	(011) (011) log

III. Imports by Major Country Groups

Series Ident. M	Description	ARIMA Model
0001	U.S.A.	(011) (011) log
0003	E.E.C. less U.K.	(011) (011) log
0004	Japan	(011) (011) log

IV. Exports by Major Country Groups

Series Ident. X	Description	ARIMA Model
0001	U.S.A.	(011) (011) log
0002	U.K.	(011) (011) log
0003	E.E.C. less U.K.	(011) (011) log
0004	Japan	(011) (011) log
0008	Other countries	(011) (011) log

APPENDIX C

ARIMA (Autoregressive Integrated Moving Average) models can be used to model numerous time series.

The general mutiplicative ARIMA model for a series with seasonality is expressed as $(p, d, q)\ (P, D, Q)_s$

Where: d is the order of the ordinary difference

D is the order of the seasonal difference applied to the original series in order to make it stationary

p and P indicate the ordinary and the seasonal autoregressive order parameters respectively.

If p=1 the dependent variable Z_t is lagged once, i.e. Z_{t-1}.

If P=1 Z_t is also lagged once but in the seasonal periodicity, i.e.: Z_{t-s}.

q and Q are the moving averages order parameters and indicate the number of periods that the observed residuals are lagged.

If q=1, then the residuals a_t are lagged once; i.e., a_{t-1}

If Q=1 the residuals a_t are also lagged once but in the seasonal periodicity, i.e. a_{t-s}.

s is the length of the seasonal cycle, for monthly data, the value of s is 12.

Thus in ARIMA models, the dependent variable Z_t is a function of independent variables which are lagged dependent variables and lagged residuals.

REFERENCE

Dagum, E.B. (1975): "Seasonal Factor Forecasts from ARIMA Models", Proceedings of the International Institute of Statistics, 40th Session, Contributed Papers, Vol. 3, Warsaw, pp. 206-219.

IMPORTS JANUARY 1980 - MARCH 1987

M	Seas Adj. Meth.	Fseas. (Stable)	F T/D	Easter Adj.		M_7	Q	Arima Model	Av.% Forecast error last 3 years
				F-test	Signif.(%)				
101	RAW	5.71	NOT SIGN.	23.53	0.5	1.14	1.48*	-	-
201	ADDITIVE	8.33	SIGN.	0.44	53.6	0.77	1.16	YES	22.07
202	MULT.	37.14	SIGN.	0.14	71.9	0.33	0.63	YES	16.12
203	MULT.	46.15	SIGN.	5.33	6.9	0.44	0.73	YES	6.99
204	MULT.	4.54	SIGN.	1.41	28.8	0.91	1.58	NO	-
205	MULT.	144.22	SIGN.	4.28	9.3	0.16	0.39	YES	14.21
206	MULT.	16.75	SIGN.	8.84	3.1	0.59	0.98	YES	13.66
207	RAW	5.30	SIGN.	3.19	13.4	1.19	1.48*	-	-
208	MULT.	26.38	SIGN.	8.59	3.3	0.49	0.77	YES	9.25
209	LOGR.	5.05	NOT SIGN.	8.11	3.6	0.97	1.23	NO	-
210	MULT.	16.06	SIGN.	1.89	22.8	0.56	0.98	NO	-
211	LOGR.	7.64	NOT SIGN.	0.11	75.9	0.81	1.70	NO	-
212	RAW	3.23	SIGN.	4.44	8.9	1.14	1.48*	-	-
213	MULT.	37.91	SIGN.	3.15	13.6	0.36	0.93	YES	12.05
214	RAW	1.40	NOT SIGN.	0.04	85.8	1.92	2.06*	-	-
301	MULT.	5.19	NOT SIGN.	0.57	48.2	1.22	1.76	-	-
302	ADDITIVE	57.95	SIGN.	2.29	19.0	0.29	0.53	NO	-
303	RAW	1.59	NOT SIGN.	0.14	72.8	2.13	2.06*	-	-
304	MULT.	142.85	SIGN.	0.24	64.1	0.16	0.42	YES	14.92
305	ADDITIVE	4.19	SIGN.	2.05	21.2	1.09	1.65	YES	17.86
306	LOGR.	34.14	NOT SIGN.	0.02	88.6	0.47	0.65	YES	16.94
307	RAW	2.30	NOT SIGN.	16.55	1.0	2.45	1.80*	-	-
308	MULT.	8.76	SIGN.	1.88	22.9	0.68	1.49	NO	-
309	MULT.	5.75	SIGN.	0.01	91.1	0.81	1.53	YES	11.40

M	Seas Adj. Meth.	Fseas. (Stable)	F T/D	Easter Adj.		M_7	Q	Arima Model	Av.% Forecast error last 3 years
				F-test	Signif.(%)				
401	MULT.	14.27	SIGN.	6.11	5.6	0.71	0.67	YES	12.77
402	MULT.	18.66	SIGN.	8.06	3.6	0.50	0.55	YES	7.21
403	MULT.	21.01	SIGN.	5.75	6.2	0.50	0.72	YES	7.76
404	MULT.	12.25	SIGN.	4.45	8.9	0.65	0.81	YES	5.10
405	MULT.	50.99	SIGN.	7.79	3.8	0.30	0.57	YES	6.67
406	RAW	2.10	NOT SIGN.	0.00	98.5	1.67	1.87*	-	-
407	MULT.	12.81	SIGN.	7.26	4.3	0.55	0.67	YES	13.75
408	RAW	3.07	SIGN.	2.73	15.9	1.61	1.33*	-	-
409	RAW	1.36	NOT SIGN.	8.80	3.1	1.92	1.89*	-	-
410	MULT.	9.26	SIGN.	36.98	0.2	0.69	0.87	YES	9.74
411	LOGR.	5.47	SIGN.	5.82	6.1	1.06	1.26	YES	8.23
412	MULT.	12.03	SIGN.	7.93	3.7	0.61	0.83	YES	6.78
413	MULT.	4.95	SIGN.	1.22	31.9	0.96	1.55	NO	-
414	MULT.	12.67	SIGN.	14.79	1.2	0.75	0.76	YES	9.74
415	MULT.	23.15	SIGN.	43.09	0.1	0.49	0.47	YES	5.70
501	MULT.	4.91	NOT SIGN.	2.58	16.9	1.13	1.62	YES	12.45
502	RAW	2.92	SIGN.	5.38	6.8	1.34	1.44*	-	-
503	LOGR.	6.79	SIGN.	2.08	20.9	0.91	1.06	NO	-
504	RAW	2.38	SIGN.	3.52	11.9	1.50	1.36*	-	-
505	MULT.	14.84	SIGN.	19.20	0.7	0.56	0.57	YES	11.29
506	MULT.	49.20	SIGN.	2.10	20.7	0.30	0.48	YES	15.26
507	MULT.	32.86	SIGN.	1.36	29.6	0.41	0.55	NO	-
508	MULT.	20.23	SIGN.	19.66	0.7	0.54	0.71	YES	8.95
509	LOGR.	9.59	NOT SIGN.	0.06	81.1	0.80	1.10	YES	12.40
510	MULT.	23.03	SIGN.	0.44	53.5	0.47	0.69	YES	10.86
511	MULT.	15.31	SIGN.	3.93	10.4	0.61	0.65	YES	13.16
512	MULT.	9.20	SIGN.	34.49	0.2	0.71	0.80	NO	-
513	MULT.	30.51	SIGN.	9.85	2.6	0.43	0.48	YES	3.59
514	ADDITIVE	6.18	SIGN.	0.38	56.4	0.98	1.54	NO	-

M	Seas Adj. Meth.	Fseas. (Stable)	F I/D	Easter Adj. F-test	Easter Adj. Signif.(%)	M_7	Q	Arima Model	Av.% Forecast error last 3 years
515	LOGR.	4.64	SIGN.	0.65	45.7	1.03	1.68	YES	11.98
516	MULT.	62.84	SIGN.	4.36	9.1	0.29	0.47	YES	10.97
517	MULT.	84.87	SIGN.	0.83	40.5	0.26	0.43	YES	11.70
518	MULT.	16.55	SIGN.	22.58	0.5	0.52	0.83	YES	5.54
519	MULT.	35.13	SIGN.	1.66	25.4	0.38	0.59	YES	8.71
520	MULT.	16.19	SIGN.	9.75	2.6	0.52	0.67	YES	7.35
521	MULT.	20.34	SIGN.	4.69	8.3	0.58	0.72	YES	7.56
522	MULT.	12.28	SIGN.	9.16	2.9	0.64	0.74	YES	6.10
601	MULT.	5.10	SIGN.	5.93	5.9	0.98	1.28	NO	-
701	RAW (Add.)	3.07	SIGN.	0.04	85.1	1.58	1.24*	-	-

* Identifiable seasonality is not present.
When the combined test after the D8 table fails it means there is no identifiable seasonality present in the series.

X	Seas Adj. Meth.	Fseas. (Stable)	F T/D	Easter Adj.		M_7	Q	Arima Model	Av.% Forecast error last 3 years
				F-test	Signif.(%)				
101	RAW	1.76	SIGN.	0.77	42.0	1.57	1.53*	-	-
201	MULT.	47.27	SIGN.	0.34	58.4	0.33	0.42	YES	10.57
202	LOGR.	4.65	SIGN.	0.74	42.9	0.99	0.99	NO	-
203	LOGR.	29.32	SIGN.	1.10	34.2	0.41	0.86	NO	-
204	RAW	1.24	NOT SIGN.	2.53	17.3	2.09	2.16*	-	-
205	MULT.	19.81	NOT SIGN.	0.01	96.0	0.53	0.77	NO	-
206	MULT.	4.57	NOT SIGN.	0.09	77.4	0.99	1.69	YES	10.71
207	LOGR.	4.21	NOT SIGN.	5.04	7.5	1.21	1.25	NO	-
208	LOGR.	20.85	SIGN.	0.00	98.1	0.54	1.14	YES	11.22
209	LOGR.	8.73	SIGN.	0.01	92.3	0.77	1.17	YES	11.12
301	RAW	1.38	NOT SIGN.	0.11	75.1	2.37	2.07*	-	-
302	LOGR.	10.79	SIGN.	1.38	29.2	0.61	1.42	NO	-
303	MULT.	11.29	SIGN.	1.00	36.4	0.63	1.52	NO	-
304	RAW	1.16	NOT SIGN.	5.73	6.2	1.88	2.08*	-	-
305	RAW	1.26	NOT SIGN.	12.67	1.6	2.31	1.81*	-	-
306	ADDITIVE	6.31	SIGN.	0.04	85.3	0.95	1.73	NO	-
307	RAW	3.18	NOT SIGN.	0.14	72.1	1.17	1.70*	-	-
308	RAW	2.72	NOT SIGN.	0.48	51.6	1.36	1.28*	-	-
309	MULT.	58.29	NOT SIGN.	5.86	6.0	0.28	0.39	NO	-
310	RAW	2.48	NOT SIGN.	0.25	63.6	1.55	1.99*	-	-
311	LOGR.	5.40	SIGN.	1.47	28.0	0.97	1.54	YES	19.37
312	MULT.	61.79	SIGN.	1.45	28.2	0.40	0.67	NO	-
313	MULT.	3.61	SIGN.	0.73	43.3	1.00	1.75	NO	-
314	RAW	1.53	SIGN.	1.11	33.9	1.86	2.12*	-	-
315	MULT.	3.75	SIGN.	0.87	39.3	1.32	1.64	YES	8.99

X	Seas Adj. Meth.	Fseas. (Stable)	F T/D	Easter Adj. F-test	Easter Adj. Signif.(%)	M_7	Q	Arima Model	Av.% Forecast error last 3 years
401	LOGR.	10.68	SIGN.	2.90	14.9	0.75	1.02	YES	9.27
402	ADDITIVE	11.09	SIGN.	4.90	7.8	0.79	0.89	YES	7.30
403	MULT.	4.31	SIGN.	0.07	79.5	1.01	1.09	NO	-
404	MULT.	4.22	SIGN.	2.42	18.1	1.10	1.11	YES	10.57
405	LOGR.	10.56	SIGN.	6.92	4.6	0.61	0.98	YES	9.23
406	RAW	1.55	NOT SIGN.	0.02	90.2	2.59	2.19*	-	-
407	RAW	1.61	SIGN.	0.50	50.9	1.58	1.91*	-	-
408	LOGR.	8.02	NOT SIGN.	0.53	50.0	0.93	1.09	NO	-
409	RAW	4.26	SIGN.	6.84	4.7	1.29	1.46*	-	-
410	RAW	1.46	NOT SIGN.	0.07	80.7	2.55	2.14*	-	-
411	RAW	3.60	NOT SIGN.	1.05	35.2	1.52	1.76*	-	-
412	RAW	2.88	NOT SIGN.	0.02	88.6	1.34	1.68*	-	-
413	LOGR.	7.40	SIGN.	0.57	48.6	0.78	0.81	YES	18.95
414	MULT.	13.95	NOT SIGN.	0.02	91.5	0.55	0.66	YES	8.01
415	RAW	2.21	SIGN.	1.50	27.5	1.40	1.66*	-	-
416	RAW	2.08	NOT SIGN.	0.95	37.5	1.78	1.93*	-	-
417	MULT.	10.47	SIGN.	0.34	58.7	0.76	0.96	YES	19.62
418	RAW	1.17	NOT SIGN.	0.36	57.2	2.25	2.16*	-	-
419	ADDITIVE	4.14	NOT SIGN.	1.49	27.7	1.00	1.52	NO	-
420	RAW	1.87	NOT SIGN.	0.41	54.8	2.01	1.90*	-	-
421	LOGR.	18.59	SIGN.	0.11	75.5	0.51	0.71	YES	9.38
422	MULT.	3.32	NOT SIGN.	0.34	56.7	1.38	1.39	NO	-
423	LOGR.	9.03	SIGN.	21.35	0.6	0.71	0.97	YES	8.25
424	MULT.	17.38	SIGN.	0.60	47.3	0.58	0.83	NO	-
425	MULT.	5.69	SIGN.	0.01	92.3	0.94	1.27	NO	-

EXPORTS JANUARY 1980 - MARCH 1987

X	Seas Adj. Meth.	Fseas. (Stable)	F T/D	Easter Adj. F-test	Easter Adj. Signif.(%)	M_7	Q	Arima Model	Av.% Forecast error last 3 years
501	LOGR.	6.21	SIGN.	2.40	18.2	0.84	1.24	YES	8.64
502	MULT.	17.75	SIGN.	0.59	47.6	0.52	0.71	YES	11.25
503	MULT.	15.96	NOT SIGN.	1.13	33.7	0.63	0.91	YES	11.50
504	LOGR.	15.04	SIGN.	0.81	40.8	0.62	0.76	NO	-
505	MULT.	17.19	SIGN.	0.60	47.2	0.67	0.65	YES	4.99
506	MULT.	8.26	SIGN.	0.06	81.3	0.70	1.01	YES	15.36
507	MULT.	4.23	NOT SIGN.	0.02	89.4	1.32	1.62	YES	17.85
508	RAW	1.39	NOT SIGN.	2.28	19.2	1.89	1.66*	-	-
509	MULT.	12.47	SIGN.	0.14	71.9	0.68	0.91	YES	13.35
510	MULT.	14.47	SIGN.	0.64	46.0	0.70	0.90	YES	5.31
511	MULT.	45.23	SIGN.	11.78	1.9	0.32	0.52	YES	6.44
512	RAW	1.65	SIGN.	2.12	20.5	2.07	1.91*	-	-
601	RAW	1.89	NOT SIGN.	0.18	69.0	1.55	1.39*	-	-
701	RAW (Add.)	3.63	SIGN.	21.73	0.6	2.33	1.80*	-	-

* Identifiable seasonality is not present.
When the combined test after the D8 table fails it means there is no identifiable seasonality present in the series.

M	Seas Adj. Meth.	Fseas. (Stable)	F T/D	Easter Adj. F-test	Easter Adj. Signif.(%)	M_7	Q	Arima Model	Av.% Forecast error last 3 years
Imports									
0001	MULT.	41.67	SIGN.	4.61	8.4	0.39	0.42	YES	3.49
0002	RAW	1.12	NOT SIGN.	0.02	88.1	1.86	1.78*	-	-
0003	LOGR.	8.24	SIGN.	0.10	76.4	0.69	0.84	YES	7.62
0004	LOGR.	6.59	SIGN.	5.36	6.9	0.92	1.09	YES	8.68
0006	RAW	1.99	SIGN.	1.66	25.3	1.61	1.93*	-	-
0008	RAW	2.94	NOT SIGN.	1.16	33.1	1.35	1.63*	-	-
Exports									
0001	MULT.	34.36	SIGN.	3.75	11.1	0.41	0.47	YES	6.81
0002	MULT.	5.13	SIGN.	5.62	6.4	0.87	1.25	YES	13.32
0003	MULT.	3.71	SIGN.	1.12	33.9	1.16	1.31	YES	10.74
0004	MULT.	4.42	SIGN.	0.59	47.9	0.90	1.63	YES	14.52
0006	RAW	3.00	NOT SIGN.	0.10	76.2	1.68	1.81*	-	-
0008	LOGR.	27.84	SIGN.	0.10	76.2	0.39	0.92	YES	12.66

* Identifiable seasonality is not present.