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Relational Patterns between Total Unemployment and Unemployment Insurance Beneficiaries in Canada

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ABSTRACT

This study purports to assess whether there are temporal relationships between Unemployment Insurance Beneficiaries, Total Unemployment, Job Losers and Job Leavers in Canada using univariate and multivariate time series methods. The results indicate that during 1975-82 the Unemployment Insurance Beneficiaries series leads: (1) Total Unemployment by one month and (2) Job Leavers by two months. On the other hand, there are evidence of a feedback relationship between Unemployment Insurance Beneficiaries and Job Losers.

KEY WORDS: Job losers; Job leavers; ARIMA; VARMA; Multivariate time series.

1. INTRODUCTION

Unemployment Insurance (UI) plays a key role in helping the national labour markets adjust to trade and demand-induced changes in production and employment patterns. The main function of UI as part of labour market policy is to provide adequate financial protection during temporary unemployment, to facilitate adjustments. By removing the immediate threat from unemployment, UI relieves job seekers of the need to yield to economic pressures by accepting jobs unsuited to their skills or abilities. It permits a more systematic or wide-ranging job search contributing to the efficient reallocation of human resources. Furthermore, when there are temporary plant layoffs, the objective of UI is met by providing income protection to laid-off workers, so the employer keeps an experienced labour force intact. This saves him/her the cost of recruiting and training new employees after a layoff. It also saves the employee from going through extreme dislocation to prevent financial hardship.

In any situation, UI must have enough flexibility to take into account prevailing economic circumstances which may limit the availability of other jobs and extended jobseekers' unemployment. In the Canadian UI program, this flexibility is provided as longer benefit durations are triggered by rising regional unemployment rates.

The gap between overall unemployment and the UI series tends to narrow in recession and widen in recovery periods. Where business conditions worsen and layoffs occur, job losers become a greater proportion of Total Unemployment. As the most Unemployment Insurance claimants are in fact job losers, this increases the proportion of Unemployment Insurance Beneficiaries related to Total Unemployment.

This study purports to assess whether there is a temporal relationship between the Unemployment Insurance Beneficiaries and Total Unemployment in Canada. The analysis is extended to Job Losers (JLo) and Job Leavers (JLe) who can claim for benefits and are the two major groups of Total Unemployment. The existence of strong relationships among these variables can be useful to explain labour markets behaviour. Furthermore, they may lead to other types of similar relationships useful to estimate unemployment in small areas

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where the sample size of the current labour force survey is inadequate. Section 2 introduces the definition of each of the four series discussed and analyzes the main characteristics from their spectra. Section 3 estimates the residual cross-correlation values, for several time lags, of the whitened series to assess whether or not there are pairwise relationships and their direction, if present. The residuals are computed from ARIMA models fitted to each series. Section 4 extends the previous analyses by identifying and estimating two multivariate time series models in order to understand the joint dynamic relationships of: (1) UIB and TU; and (2) UIB, JLo and JLe. Finally, Section 5 gives the main conclusions of this study.

2. THE MAIN CHARACTERISTICS OF THE ANALYZED SERIES

To understand the type of relationship between UIB and TU and its major components, JLo and JLe, we first introduce the definitions and analyze the main characteristics looking at their spectra.

2.1 Total Unemployment (TU)

The Labour Force Survey (LFS) Division of Statistics Canada obtains monthly information through a sample of 56,000 representative households across the country. Although developed since 1952, substantial revisions were introduced to the LFS from 1976.

Estimates of employment, unemployment and non-labour force activity refer to the specific week covered by the survey each month, normally the week containing the 15^{th} day. The sample is designed to represent all persons in the population 15 years of age and over, residing in Canada, with some minor expections.

The Labour Force is composed to people who, during the reference week, were employed or unemployed. The employed includes persons who:

- did any work at all;
- had a job but were not at work due to illness or disability, bad weather, labour dispute, vacation, personal or family responsibilities.

The unemployed includes persons who:

- were without work, but actively looked for work in the past four weeks and were available for work;
- had not actively looked for work in the past four weeks but had been on layoff for 26 weeks or less, and were available for work;
- had not actively looked for work in the past four weeks but had a new job to start in four weeks or less, and were available for work.

Total unemployment is composed of the sum of job losers (JLo), job leavers (JLe), new entrants to the labour market, re-entrants after one year or less, re-entrants after more than one year (Statistics Canada 1976). Of these five components, the first two are the most important for our study since they can claim benefits and represent about 70% of TU.

Data on the flows into unemployment are not available prior to 1975. Thus, all the series were observed for the period January 1975 to December 1982, thus including the most recent data available at the time.

Figure 1 shows the original Total Unemployment series which is characterized by a peak in the winter months and a trough in the summer. Figure 2 shows the spectrum of the Total Unemployment series. High power is observed at the frequency 0.05 cycle/month associated with the business-cycle (0.05 corresponds to a 20-months cycle). Similarly, relatively high power is observed at the fundamental seasonal frequency 0.083 cycle/month and neighbouring frequencies, but less at the harmonics of the fundamental seasonal. Finally, the contribution of the irregular fluctuations to the total variance is small, relative to the other two components.

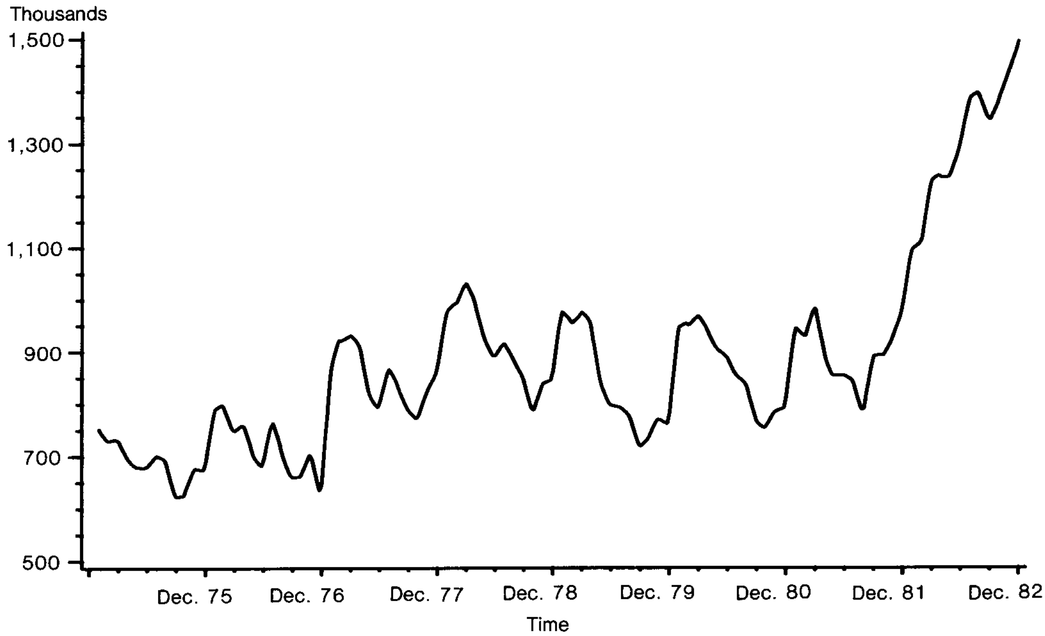


Figure 1. Total Unemployment Series

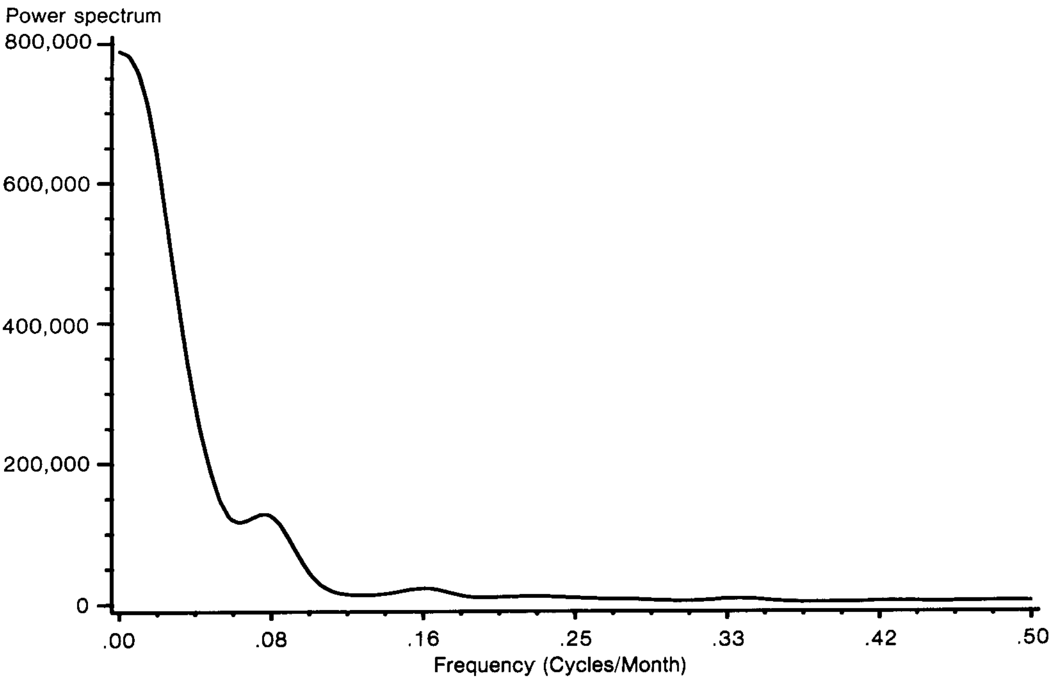


Figure 2. Spectrum of Total Unemployment

Figure 3 shows the original Job Losers series and Figure 4 displays its corresponding spectrum. Similar to TU, high power is shown at the business-cycle frequencies, but now most of the seasonal power is at the fundamental seasonal band and very little is left at the harmonic bands. The contribution of the irregular variations is smaller than that of TU.

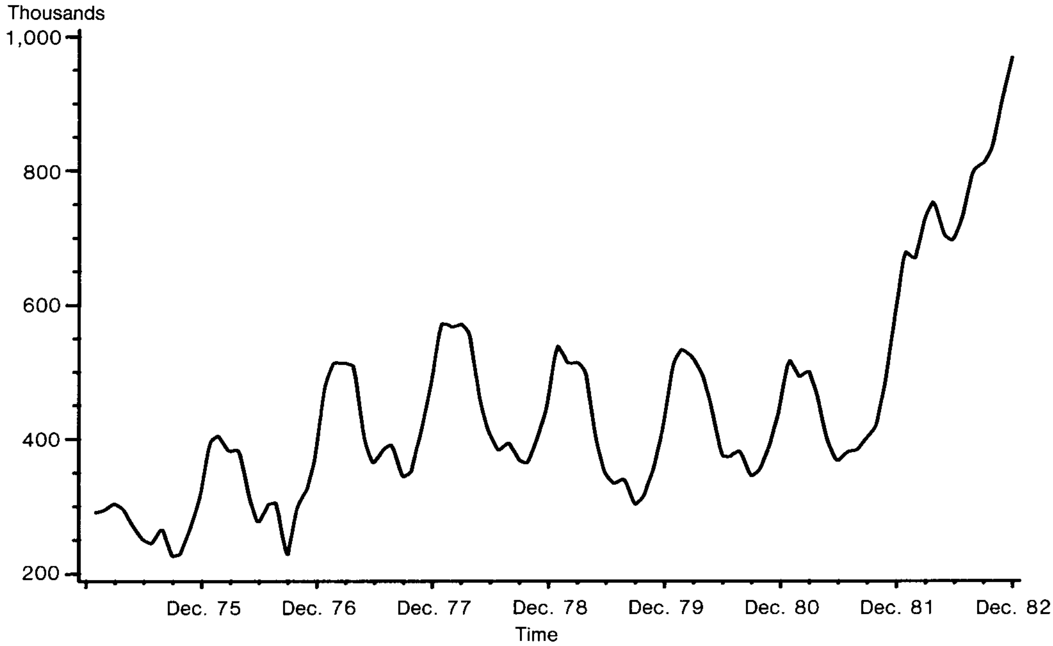


Figure 3. Job Losers Series

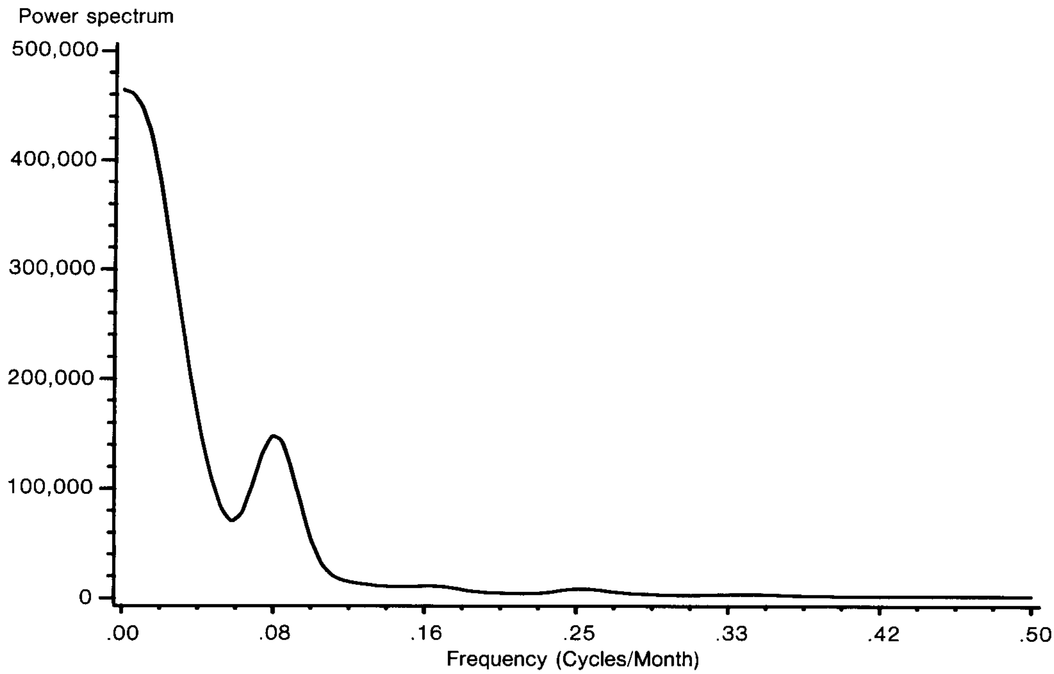


Figure 4. Spectrum of Job Losers

Figure 5 shows the Job Leavers series, characterized by two troughs, one in the winter months and the other during the summer. Its spectrum is given in Figure 6. This series has more cyclical variations than trend as indicated by the high peak at 0.022 cycle/month which corresponds to a 45 months-cycle. Furthermore, the seasonal variations are highly concentrated around the first harmonic band, supporting the fact that this series has two seasonal troughs. Finally, the contribution of the irregular to the total variance is larger than that observed for the two previous series.

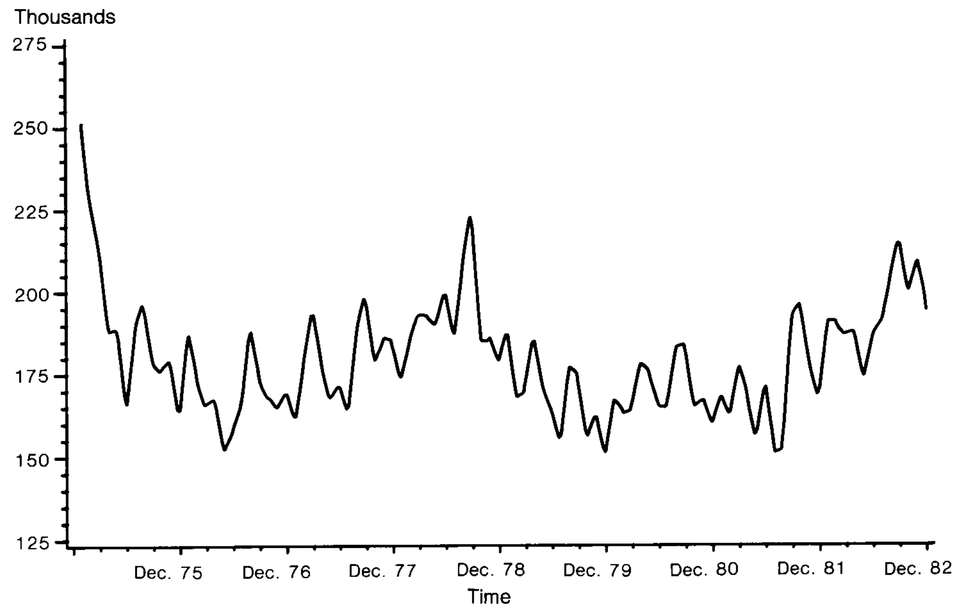


Figure 5. Job Leavers Series

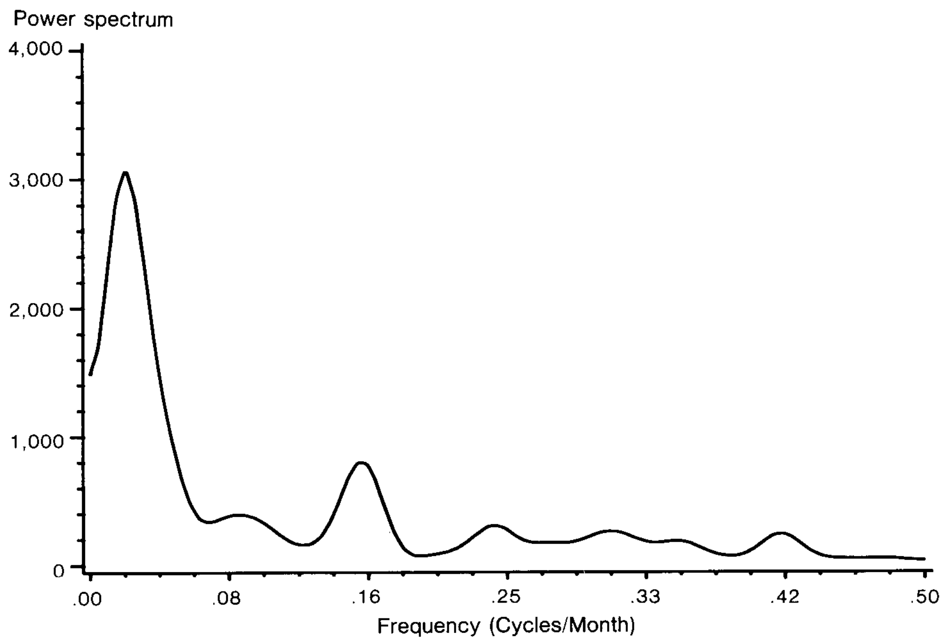


Figure 6. Spectum of Job Leavers

2.2 The Unemployment Insurance Beneficiaries (UIB)

The monthly data for Unemployment Insurance Beneficiaries cover all persons drawing benefits for a specific week, namely the week of the LFS. This is not a sample since it includes the total population of beneficiaries. The UI covers virtually all paid workers in the labour force and members of Armed Forces. The main exceptions are:

- People 65 years of age and over;
- People working fewer than 15 hours weekly;
- People earning less than 20% of the maximum weekly insurable earnings (in 1982, it was $70).

In order to qualify for benefits, a claimant must be available for and capable of work, unable to find suitable employment and have the necessary qualifying requirements. Previously eight weeks of work was the minimum required to qualify for benefits but as of December 1977 this number varied between 10 and 14 weeks according to the rate of unemployment prevailing in the region of residence of the claimant. Benefits are paid after a two-week period has been served.

Claimants who qualify for benefits can receive up to 25 percent of their benefits in earnings and continue to receive UI. However, the LFS considers these individuals to be employed. In order to assess the relationship between UI beneficiaries and unemployment, it is thus more accurate to use the series of UI beneficiaries *without* earnings. This subset of UI beneficiaries is a fairly consistent and significant proportion of the total LFS count of the unemployed. We must note, however, that because of differences in definition, the following groups are counted as unemployed in the LFS but are not included in the UI records, namely, entrants and re-entrants; all individuals who have worked but not long enough to qualify for benefits; and those unemployed persons who were previously self-employed. On the other hand, persons insured under the UI program can receive benefits even though, under the LFS definition they would not be classified as unemployed, examples include self-employed fishermen during the off-season, women on maternity leave and employees away from work due to sickness or disability.

The UI beneficiaries (without earnings) series is a sensitive indicator of labour market economic conditions. It is reflective of the insured labour force with recent work experience.

The original Unemployment Insurance Beneficiaries series, as shown in Figure 7, displays large seasonal fluctuations with a peak during the winter months, when bad weather curtails outdoor work in such industries such as fishing, construction and lumber, bringing a sharp rise in claims filed by affected workers.

Figure 8 shows the spectrum of the UIB series. Very high power is shown at the frequency 0.0167 cycle/month, which corresponds to a 60 months-cycle, and at those frequencies associated with the fundamental seasonal band. The contribution of seasonal variations to the total variance of the series is much larger than that observed in TU and its two major components. Finally, there is little irregularity relative to the trend-cycle and the seasonal components.

3. PAIRWISE RELATIONSHIPS BETWEEN UNEMPLOYMENT INSURANCE BENEFICIARIES, TOTAL UNEMPLOYMENT, JOB LOSERS AND JOB LEAVERS

Several early Canadian studies (e.g., Grubel *et al.* 1975; Green and Cousineau 1976; Jump and Rea 1975; and Siedule *et al.* 1976) support the general conclusion that unemployment has tended to shift upward with the increased availability of unemployment insurance in 1971. Lazar (1978) shows that the 1971 changes increased the unemployment duration and induced higher rates of job leaving, especially of young persons and adult women. These studies

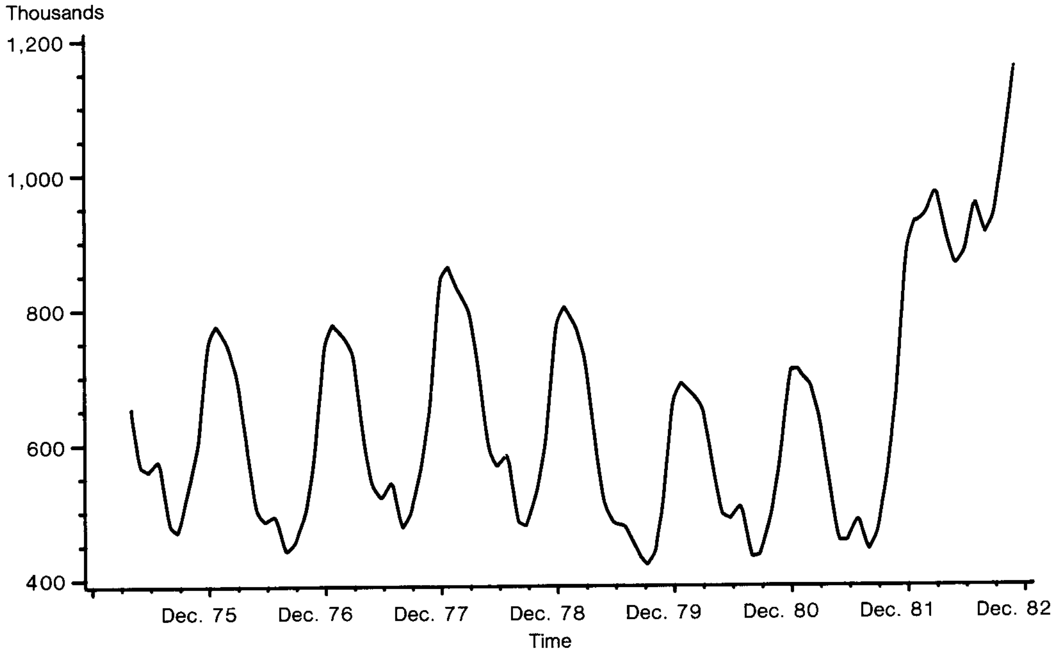


Figure 7. Unemployment Insurance Beneficiaries Series

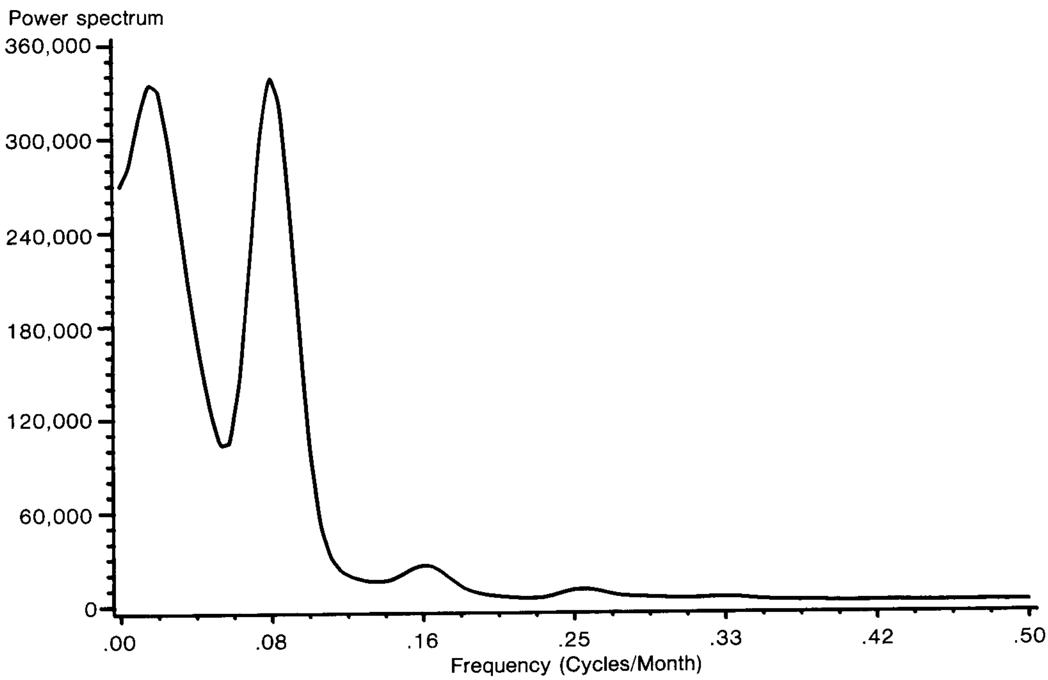


Figure 8. Spectrum of Unemployment Insurance Beneficiaries

were made before the changes of 1975 that aimed at strengthening work incentives. It was expected that the changes introduced after 1975 would reverse the effects of the program on total unemployment.

In this section, we carry out an exploratory analysis by searching for pairwise temporal relationships between Total Unemployment, Unemployment Insurance Beneficiaries, Job Losers and Job Leavers. The existence of these relationships will be useful to build a multivariate time series model to explain the joint dynamic behaviour of the above variables.

The pairwise relationships between TU, UIB, JLo and JLe are calculated using the cross-correlations of the residuals or *innovations* from ARIMA models (Box and Jenkins 1970) that fitted well the data. It has been rightly argued by several authors (e.g., Pierce and Haugh 1977) that the cross-correlations between white noise residuals obtained with different filters are biased to accepting the nul hypothesis of independence when it does not exist. Pierce and Haugh (1977) suggest to use dynamic regression models. This, however, implies that we have to make a judgement on which variable is the *cause* and which is the *effect*. At this stage, we are simply interested in determining whether there is a temporal relationship in each pair of variables analyzed. Table 1 shows the ARIMA models fitted to each series, their parameter values estimated with unconditional least squares, the results of the portmanteau test (Ljung and Box 1978) and the residual variance.

The Q statistics values accept the null hypothesis of randomness of the residuals in each case. However, since this test is applied to a set of autocorrelations of residuls for various lags, it is possible to have significant autocorrelation for some particular time lag k that will not be detected by this test. Therefore, we also tested whether there was autocorrelation of the residuals for each time lag. We used a more accurate approximation for small samples than $1/N$ to test the variance of the autocorrelation, that is, $(N - |k|)N^{-2}$ as given by Haugh (1976).

Having obtained satisfactory results from the above models we calculated the cross-correlation $\hat{r}_{xy}(k)$ between the series analyzed. The S^*_M statistic (Haugh 1976) is applied to test the independence between the series. Under the assumption that the residuals are normally distributed and that $E[\hat{r}_{xy}(k)] = 0$ and Var $[\hat{r}_{xy}(k)] = (N - |k|)N^{-2}$, the statistic

$$S^*_M = N^2 \sum_{k=-M}^{M} (N - |k|)^{-1} \hat{r}_{xy}(k)^2$$

follows a X^2 distribution with $2M + 1$ degrees of freedom. In order to determine the direction of the pairwise relationships, we modified the S^*_M statistics which is calculated for positive or negative k only, excluding zero.

Table 2 presents the estimates of the cross-correlation between Unemployment Insurance Beneficiaries (UIB) and Total Unemployment (TU) and its two major subcomponents Job Losers (JLo) and Job Leavers (JLe). We indicate with (a) and (b) those values significant at a 5% and 1% confidence level. In the case of UIB and JLo we calculated S^*_M for positive and negative values of k from ± 1 to ± 6 and from ± 1 to ± 2 to determine whether there is a dominant unidirectional relationship. The results indicated that there is no dominant direction between the two variables but a feedback process.

We can summarize the results from Table 2 as follows:

(1) There is indication of a unidirectional relationship between UIB and TU such that UIB would lead TU by one month;

(2) There is a feedback between UIB and JLo with a strong instantaneous relationship. Taking into consideration the time lag between the two variables, the feedback process seems to be initiated by JLo at lag 2.

Table 1

Univariate ARIMA Models

Series	ARIMA Models	Q(24)	$\hat{\sigma}_a^2$
Unemployment Insurance Beneficiaries (UIB)	$(1 - 0.68B)\Delta\Delta^{12} \log_{10} UIB_t = (1 - 0.80B^{12})a_t$	11.55	0.000140
Total Unemployment (TU)	$(1 - 0.25B^3)\Delta\Delta^{12} \log_{10} TU_t = (1 - 0.84B^{12})a_t$	9.13	0.000395
Job Losers (JLo)	$(1 - 0.31B^3)\Delta\Delta^{12} \log_{10} JLo_t = (1 - 0.67B^{12})a_t$	15.78	0.000604
Job Leavers (JLe)	$(1 - 0.37B^3)\Delta\Delta^{12} \log_{10} JLe_t = (1 - 0.40B - 0.25B^2)(1 - 0.87B^{12})a_t$	14.58	0.000627

Table 2

Cross-Correlation Between Unemployment Insurance Beneficiaries and Total Unemployment and Its Two Major Components, Job Losers and Job Leavers

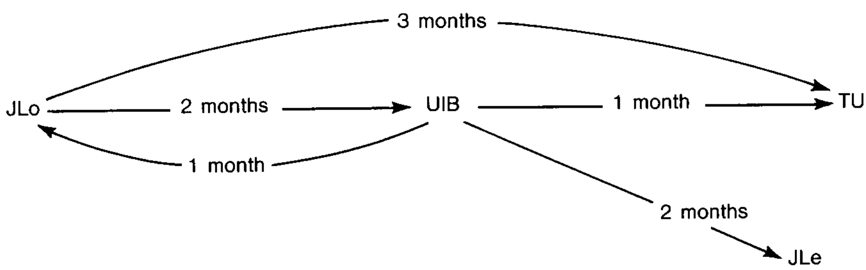
LAGS k	$UIB_{(t-k)} - TU_t$ $\hat{r}(k)$	$UIB_{(t-k)} - JLo_t$ $\hat{r}(k)$	$UIB_{(t-k)} - JLe_t$ $\hat{r}(k)$	$JLo_{(t-k)} - TU_t$ $\hat{r}(k)$
−6	−0.07	0.01	0.27[a]	0.15
−5	0.05	−0.04	−0.09	−0.04
−4	−0.09	0.03	−0.08	−0.01
−3	0.01	0.01	−0.11	−0.06
−2	0.14	0.28[a]	0.14	−0.01
−1	0.14	0.08	−0.01	0.21
0	0.16	0.32[b]	0.06	0.39[b]
1	0.22[a]	0.29[a]	0.04	0.14
2	0.12	0.12	0.26[a]	−0.16
3	−0.07	0.00	0.19	0.42[b]
4	0.12	−0.05	0.01	−0.05
5	−0.06	0.09	0.11	−0.04
6	0.13	0.00	0.08	0.05

[a] 5% significance level.
[b] 1% significance level.

(3) There is a unidirectional relationship between UIB and JLe such that UIB would lead JLe by 2 months. We observe, however, the effect of a delayed feedback at lag 6 which arises from the fact that the JLe series have a strong secondary peak in summer as shown in Figure 6.
(4) Finally, there is a strong instantaneous and undirectional relationship between JLo and TU such that JLo would lead TU by 3 months.

The above observations lead to the following Diagram 1 which will be useful for the identification of a more complex multivariate time series model that also takes into account the partial associations among the variables.

Diagram 1



4. BUILDING A MULTIVARIATE TIME SERIES MODEL FOR UNEMPLOYMENT INSURANCE BENEFICIARIES, TOTAL UNEMPLOYMENT, JOB LOSERS AND JOB LEAVERS

In the previous section we concluded that there are pairwise relationships among the four variables in the sense defined by Granger (1969) and Pierce and Haugh (1977). Taking into consideration those preliminary relationships, we here identify and estimate two multivariate time series models following the methodology developed by Tiao and Box (1981) and Tiao and Tsay (1983). These models will explain the joint dynamic behaviour of the variables involved.

A vector ARMA model for seasonal series takes the form

$$\underline{\phi}(B)\underline{\Phi}(B^s)\underline{Z}_t = \underline{\theta}(B)\underline{\Theta}(B^s)\underline{a}_t \tag{4.1}$$

where

$$\underline{\phi}(B) = \underline{I} - \underline{\phi}_1 B - \dots - \underline{\phi}_p B^p \tag{4.2}$$

$$\underline{\Phi}(B^s) = \underline{I} - \underline{\Phi}_1 B^s - \dots - \underline{\Phi}_P B^{sP} \tag{4.3}$$

$$\underline{\theta}(B) = \underline{I} - \underline{\theta}_1 B - \dots - \underline{\theta}_q B^q \tag{4.4}$$

$$\underline{\Theta}(B^s) = \underline{I} - \underline{\Theta}_1 B^s - \dots - \underline{\Theta}_Q B^{sQ} \tag{4.5}$$

are matrix polynomials in B (the back shift operator which is defined by $B^m Z_t = Z_{t-m}$), the $\underline{\phi}$'s, $\underline{\Phi}$s, $\underline{\theta}$'s and $\underline{\Theta}$'s are $k \times k$ matrices, s is the seasonal periodicity and a_t is a sequence of random shock vectors $IID\ N(\underline{0}, \underline{\Sigma})$ and $\underline{Z}_t$ is a vector of stationary time series.

In order to avoid a problem of multicollinearity between TU and JLo, two VARMA models were specified, a VARMA $(1,2)(0,1)_{12}$ that relates Unemployment Insurance Beneficiaries with total Unemployment, and a VARMA $(2,6)(0,1)_{12}$ that relates UIB with Job Losers and Job Leavers. These models were identified and estimated using the exact maximum likelihood method in the Scientific Computing Associates program (Liu and Hudak 1983). The models are fitted respectively to the original data transformed as follows:

$$\begin{pmatrix} uib_t \\ tu_t \end{pmatrix} = (1 - B)(1 - B^{12}) \log_{10} \begin{pmatrix} UIB_t \\ TU_t \end{pmatrix} \tag{4.6}$$

and,

$$\begin{pmatrix} uib_t \\ jlo_t \\ jle_t \end{pmatrix} = (1 - B)(1 - B^{12}) \log_{10} \begin{pmatrix} UIB_t \\ JLo_t \\ JLe_t \end{pmatrix} \tag{4.7}$$

Table 3 shows the parameter values of the VARMA (1,2)(0,1) model and the standard errors of estimates given in parenthesis. (The estimated parameter values and the variance-covariance matrix of the residuals shown in Table 3 cannot be compared with the one of the univariate models (Table 1) because the former result from the fit of the model to the standardized transformed data instead of the non-standardized as it was the case with the univariate models.) Examination of the pattern of the cross-correlations of the residuals in Table 4 suggests that the model is adequate. A plus (minus) sign is used when the estimate is greater (less) than twice its standard error and a dot for a non-significant value based on the above criterion.

Thus, the VARMA model for UIB and TU becomes,

$$uib_t = 0.669 uib_{t-1} + \hat{a}_{1t} - 0.794\, \hat{a}_{1(t-12)} \tag{4.8}$$

$$\begin{aligned} tu_t &= 0.475 uib_{t-1} - 0.347 tu_{t-1} + \hat{a}_{2(t)} - 0.308 \hat{a}_{2(t-2)} \\ &\quad - 0.705 \hat{a}_{2(t-12)} + 0.217 \hat{a}_{2(t-14)} \end{aligned} \tag{4.9}$$

Table 3

Estimated Parameters for the Transformed UIB and TU Variables

$\hat{\underline{\Phi}}_1$		$\hat{\underline{\theta}}_2$		$\hat{\underline{\Theta}}_{12}$	
0.669 (0.089)	-	-	-	0.794 (0.090)	-
0.475 (0.098)	−0.347 (0.115)	-	0.308 (0.116)	-	0.705 (0.086)

$\underline{\Sigma}$		$\hat{\underline{\theta}}_1$
0.429249	-	$\underline{0}$
0.131532	0.544389	

Table 4

Cross-Correlation Matrices of the Residuals in Terms of +, −, and ·

LAGS 1 THROUGH 6					
..	..	..	..	..	..
..	..	..	..	..	..
LAGS 7 THROUGH 12					
..	..	..	..	..	..
..	..	..	..	..	..
LAGS 13 THROUGH 18					
..	..	..	..	..	..
..	..	..	..	..	..
LAGS 19 THROUGH 24					
..	..	..	..	..	..
..	..	..	..	..	..

Equations (4.8) and (4.9) indicate that Unemployment Beneficiaries leads the Total Unemployment series by one month. In fact, when analyzing the relationship between UIB and TU we must keep in mind that an increase in JLo and thus an increase in UIB may lead other members of the family to look for work in order to compensate for the loss of income. These are the new entrants and re-entrants who do not qualify for insurance benefits but contribute to an increase in TU. Furthermore, we should note that it is possible to have an increase in Total Unemployment without an increase in the normal gross flow of labour markets, simply because an increase in UIB occurs during recessionary periods where the availability of jobs is significantly reduced and thus flows into the unemployment state will increase.

The results of this model are in agreement with the preliminary results obtained from the pairwise cross-correlations of the previous section as shown in Diagram 1. The model, however, provides us with a more complete information on the dynamic behaviour of these two phenomena. We observe that the Unemployment Insurance Beneficiaries series is positively related to its previous-month level whereas the Total Unemployment is positively related to the previous-month level of UIB and negatively related to its previous-month level. In both equations, the effect of seasonality is reflected in their moving average part with a high parameter value for the random shock at lag 12.

Table 5 shows the VARMA $(2,6)(0,1)_{12}$ model applied to the transformed UIB, JLo and JLe variables as given in System (4.7).

Table 6 indicates no recognizable patterns in the estimated cross-correlation matrices of the residuals and, therefore, this model is considered adequate.

The final vector ARMA $(2,6))0,1)_{12}$ model for the three variables is,

$$uib_t = 0.617 uib_{t-1} + 0.268 jlo_{t-2} + \hat{a}_{1(t)} + 0.221 \hat{a}_{3(t-6)} - 0.831 \hat{a}_{1(t-12)} - 0.176 \hat{a}_{3(t-18)} \tag{4.10}$$

$$jlo_t = 0.577 uib_{t-1} - 0.285 jlo_{t-1} + \hat{a}_{2(t)} + 0.386 \hat{a}_{3(t-6)} - 0.525 \hat{a}_{2(t-12)} - 0.308 \hat{a}_{3(t-18)} \tag{4.11}$$

$$jle_t = 0.303 uib_{t-2} - 0.411 jle_{t-1} - 0.403 jle_{t-2} + \hat{a}_{3(t)} - 0.797 \hat{a}_{3(t-12)}. \tag{4.12}$$

Table 5

Estimated Parameters for the Transformed UIB, JLo and JLe Variables

$\hat{\underline{\Phi}}_1$

0.617 (0.086)	-	-
0.577 (0.099)	−0.285 (0.096)	-
-	-	−0.411 (0.088)

$\hat{\underline{\Phi}}_2$

-	0.268 (0.080)	-
-	-	-
0.303 (0.083)	-	−0.403 (0.084)

$\hat{\underline{\theta}}_6$

-	-	−0.221 (0.087)
-	-	−0.386 (0.108)
-	-	-

$\hat{\underline{\Theta}}_{12}$

0.831 (0.094)	-	-
-	0.525 (0.096)	-
-	-	0.797 (0.077)

$\underline{\Sigma}$

0.339	-	-
0.117	0.483	-
0.014	0.153	0.428

$\hat{\underline{\theta}}_t, t = 1,2,\ldots,5$

$\underline{0}$

Table 6

Cross-Correlation Matrices Terms of +, −, and ·

LAGS 1 THROUGH 6					
...	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...
LAGS 7 THROUGH 12					
..+	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...
LAGS 13 THROUGH 18					
..−	...	...	...	−..	...
...	...	...	...	...	...
...	...	...	...	...	...
LAGS 19 THROUGH 24					
...	...	...	...	...	...
...	...	...	...	...	...
...	...	...	...	...	...

Equation (4.10) and (4.11) shows the existence of feedback between Job Losers and Unemployment Insurance Beneficiaries similar to the relationship found in section 3. The JLo series leads UIB by two months (equation 4.10) and the one month lagged UIB strongly affects the current value of JLo (equation 4.11). Furthermore, each of the two endogeneous variables UIB and JLo are affected by their previous-month levels, positively in the case of UIB and negatively in the case of JLo. The relationship between both series due to seasonality is reflected by the parameter values of a_{t-6} and a_{t-12}. The need for a moving average term at lag 6 arises from the fact that the JLe series have a strong secondary peak in summer as shown in figure 6.

These empirical results are not in contradiction with economic theory. It has been argued, with good reason, that causality cannot be detected only from empirical evidences but must be supported by economic theory (see e.g. Zellner 1979). It is easy to accept that an increase in Job Losers which is associated with an economic recession will lead to an increase in Unemployment Insurance Beneficiaries. In turn, an increase in Unemployment Insurance Beneficiaries will lead to an increase in Job Losers because in reaction to a severe economic recession, most firms make temporary layoffs to be able to have their employees back when economic conditions improve.

Equation (4.12) raises an interesting question when showing that Unemployment Insurance Beneficiaries leads the Job Leavers by two months. It is not so evident why this should be the case.

Plausible explanations can be found in the analysis of the shortrun dynamics of the Canadian labour markets and a thorough investigation would require longitudinal data. We can, however, entertain the hypothesis among others that an increase in JLo and thus an increase in UIB may lead other members of the family to look for work in order to compensate for the loss of income. These persons are the new entrants and re-entrants. During a recession when JLo is increasing it is very difficult for new entrants and re-entrants to find a job. These new entrants and re-entrants are mainly young people and women over 25 who are willing to accept any job, at first, as long as it means extra income for the family. They might work for the length of time necessary for them to qualify for benefits. Then, once they qualify for benefits, they would become JLe in order to be more selective in the kind of job they will accept.

5. CONCLUSIONS

The main purpose of this study has been to assess whether there are temporal relationships between Unemployment Insurance Beneficiaries (UIB) and Total Unemployment (TU), Job Losers (JLo) and Job Leavers (JLe) by building dynamic multivariate time series models.

We have first carried out an exploratory analysis by searching for pairwise temporal relationships between TU, UIB, JLo and JLe in the sense defined by Granger (1969) and Pierce and Haugh (1977). Our results indicated the existence of relationships among the four variables involved.

We have then identified and estimated two multivariate time series models following the methodology developed by Tiao and Box (1981) and Tiao and Tsay (1983). The results of the vector ARMA models agree with the preliminary results obtained from the pairwise cross-correlations of the residuals of the univariate ARIMA models.

The first vector ARMA model shows that the UIB series leads TU by one month. UIB is also positively related to its previous-month level whereas TU is negatively related.

The second vector ARMA model shows that JLo leads UIB by two months with the existence of a one-month feedback from UIB to JLo. Furthermore, UIB is posivitely affected by its previous-month level while JLo is negatively related. It also shows that UIB leads JLe by two months.

These empirical results based on data for 1975-82 are not in contradiction with economic theory. Furthermore, they conform to those of earlier Canadian studies, based on data prior to 1975, which supported the general conclusions that the increased availability of unemployment insurance induced higher rates of job leaving, especially of young persons and adult women and led to increased levels of unemployment. Hence, it seems that the UIC regulation change in 1977 had little effect, if any, in this regard.

It would have been very interesting to assess the effect of the high recession that started in July 1981 but given the series length, elimination of this recessionary period would have made the series too short for any sound statistical modelling.

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