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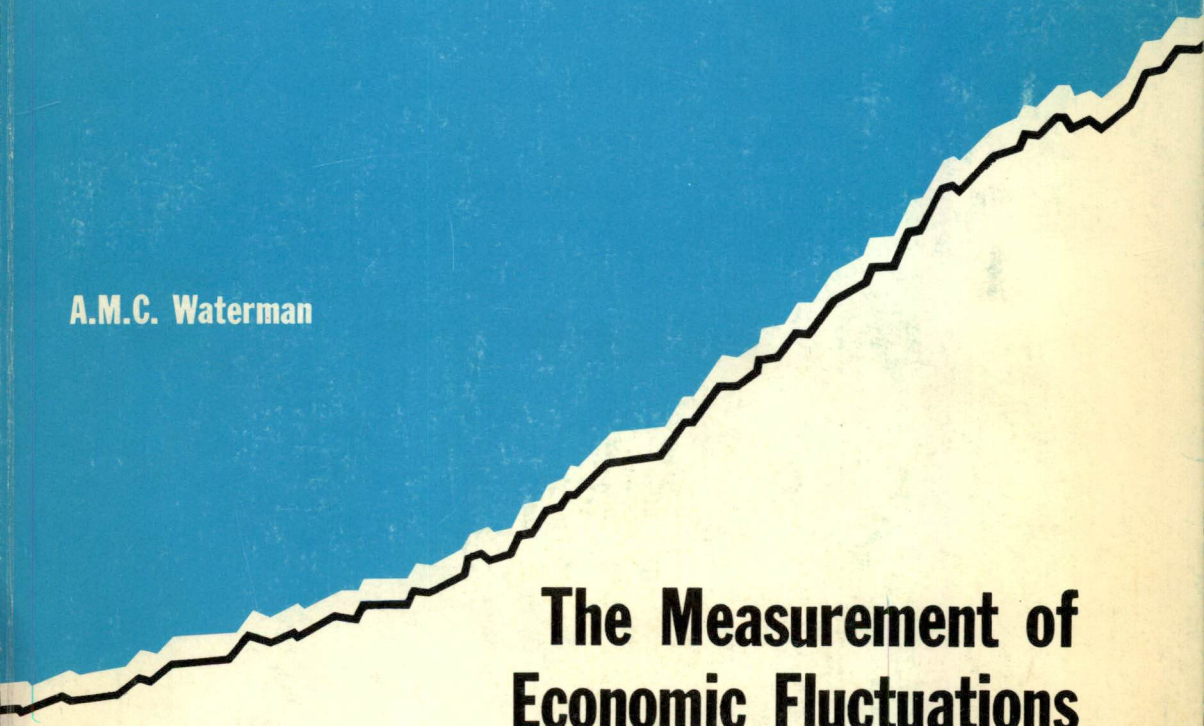

A.M.C. Waterman

# The Measurement of Economic Fluctuations in Canada, January 1947 to December 1969

# the measurement of economic fluctuations in Canada,

## january 1947 to december 1969

by

A. M. C. WATERMAN

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# PREFACE

This study of economic fluctuations in Canada was undertaken at St John's College, Winnipeg, during the summers of 1970 and 1971. It formed part of a larger investigation of post-War economic policy which I made for the Prices and Incomes Commission. I am greatly indebted to that body for generous financial support; and to several members of its staff, in particular its Director of Research, Dr. J.G. Cragg, for encouragement, criticism and advice. Neither he nor the Commission, however, is to be held responsible for any error or inadequacy which may remain in this report.

This is not the first account of the Canadian business cycle to appear since the War. In 1967 the Economic Council of Canada published a Staff Study by D.A. White, Business Cycles in Canada, which lists the results of previous investigations by E.J. Chambers (Canadian Journal of Economics and Political Science, 1958 and 1964) and K.A.J. Hay (Canadian Journal of Economics and Political Science, 1966). Somewhat earlier, there were studies made by W.A. Beckett (in Moore G.H., ed., Business Cycle Indicators, Princeton University Press, 1961) and G. Rosenbluth (Canadian Journal of Economics and Political Science, 1957 and 1958) of the relation of Canadian fluctuations to those in the U.S.A.

It is in no way to disparage the work of these authors to say that apart from the estimates of reference cycle peaks and troughs summarised by Mr. White, no other use was made of their results. This is partly because their inquiries, for the most part, refer to periods which came to an end by about 1960, but chiefly because the approach to business cycle measurement followed in this study is very different from anything previously attempted in Canada.

In effect, the present work is a replication with Canadian data of a method I developed in 1966 for measurement of the Australian business cycle. An explanation of the principles upon which that method is based, together with reference to published accounts of its application to Australia, are contained in chapter one.

Much of the actual work was done by my research assistant, Asher Drory. To him belongs most of the credit, and none of the blame, for what follows herein.

A.M.C. Waterman,
October 1971.

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Anyone who takes the statistical approach to business cycles develops a longing to assemble all the pertinent series and analyse them afresh upon some consistent plan, which shall incorporate the best ideas of his predecessors with improvements of his own.

Wesley C. Mitchell

chapter one

# THE MEASUREMENT OF FLUCTUATIONS IN A GROWING ECONOMY

The "business cycle" is traditionally described by the succession of "peaks" and "troughs" observed in the general level of activity. But in a strongly growing economy, this is unsatisfactory for two reasons. First, the cyclical component of activity will reach a maximum before and a minimum after the peaks and troughs of the "trend-cycle". Secondly, when fluctuations in the growth-rate are small in relation to the average rate of growth (such that the minimum rate of growth is still positive), the conventional peaks and troughs will disappear altogether. Fluctuations of the same amplitude in the growth-rate will yield a "business cycle" when the growth-trend is shallow, but not when it is steep.

If "cyclical component" and "growth-rate" (the latter meaning the first logarithmic time derivative of the level of activity) are seen merely as statistical abstractions, this does not matter much. If the relation between levels at different points in time is what is important for the purpose of explaining the process of fluctuation, then peaks and troughs have a significance denied to any of the other turning points which might be extracted from the data. Such

was generally held to be the case when Mitchell pioneered the measurement of business cycles between the two World Wars.

During the past three decades, however, the theory of economic fluctuations has come to depend upon other measures of the cycle for its account of the decision-making process. Broadly speaking, and at some risk of injustice to the authors named, modern explanations may be divided into two broad classes: the "Hicksian" and the "Harrodian" respectively.

According to the former view, first set out by J. R. Hicks in A Contribution to the Theory of the Trade Cycle (Oxford, 1950), the public make savings and investment decisions in the light of income levels in relation to an exogenously growing trend. The Hicksian approach frankly accepts the assumption of a causal independence of "trend" and "cyclical" components in the general level of activity, thereby implying that empirical attention ought to be paid to "trend-free" maxima and minima. Given the independence of trend and cycle, moreover, it may be important to know whether the cyclical component stands above or below its trend level, and therefore, the dates at which the two are equal. Not only ought we to determine business cycle peaks and troughs, that is. Quite as importantly, perhaps more so, we must date four other points, here described by names which are suggested merely for mnemonic purposes:

| | |
|---|---|
| "Boom Point" | (B) - trend-free maximum |
| "Slump Point" | (S) - trend-free minimum |
| "Inflation Point" | (I) - up-cross of trend-cycle on trend |
| "Deflation Point" | (D) - down-cross of trend-cycle on trend |

Somewhat earlier, though more radical, is that view of business fluctuations associated with R. F. Harrod, first advanced in the Essay on the Trade Cycle (Macmillan, 1936), and developed more fully in "An Essay in Dynamic Theory" (Economic Journal, 1939) and Towards a Dynamic Economics (Macmillan, 1948). Here the rate of growth plays the crucial

role. Entrepreneurs' reactions to discrepancies between the actual and "warranted" growth-rate, together with cyclical variability of the saving ratio and the optimum capital-output ratio, provide a complete explanation of a growth-rate cycle. If at any stage of the latter the growth-rate becomes negative, then a peak will appear in the observed time-series. But if the average rate of growth is high and the amplitude of its fluctuation small, the traditional, NBER-type "business cycle" will no longer appear - notwithstanding the existence of what might be considerable unevenness in the progress of the economy.

It follows from this approach that we ought to be interested not so much in fluctuations in levels as in fluctuations in the rate of growth of these levels. Instead of regarding the "growth-rate" as a statistical artifact derived from the causally meaningful time-series of "levels", the reverse will be nearer the case. Primary business cycle data now become the maxima and minima of the growth-rate curve, here referred to as:

| | |
|---|---|
| "Contraction Point" | (C) - growth-rate maximum |
| "Expansion Point" | (E) - growth-rate minimum |

Peaks (P) and troughs (T) are merely byproducts, so to speak, to which little or no analytical interest attaches.

Rather than commit oneself to one or the other of these theories (or even to either), it seems better to collect information bearing upon both. The method of Mitchell and the NBER can easily be extended to provide estimates of the dates not only of peaks and troughs, but also of the B, S, I, D, C, and E points. Detailed accounts of an earlier inquiry along these lines using Australian data are contained in two previous publications of the author: "The Timing of Economic Fluctuations in Australia: January 1948 to December 1964" (Australian Economic Papers, 1967) and Economic Fluctuations in Australia, 1948 to 1964 (A.N.U. Press, 1971), chapter I.

As with all other business cycle studies, those fluctuations which form the subject of the present investigation are oscillations in the general level of activity, or its growth-rate, having an average frequency intermediate between annual, seasonal cycles and "long swings". Occasional use of the time-honoured word "cycle" is not intended to

imply any strictly or even approximately periodic function of time. The "general level of activity" might best be represented by a perfect, monthly index of real GNP.

If any such fluctuations have occurred in recent Canadian history, we might reasonably expect to discover some outline of their time-shape in many, if not all, of the economic time-series extant for the period. Assuming each series to be the product of four casually independent components, trend ($\alpha$), cycle ($\beta$), seasonal ($\gamma$) and irregular ($\delta$), isolation of the $\beta$-component would allow us to study the course of the "cyclical" fluctuations as revealed in that particular indicator. It is difficult, however, to define these components without some element of circularity. The usual practice is to assume that the $\gamma$ and $\delta$ components are what, in fact, are removed by the deseasonalising and smoothing techniques, and then to focus attention on the residual "trend-cycle:, $Y=\alpha.\beta$. The customary procedure will be followed here. The point of departure consists of exposing the anatomy of the trend-cycle to a more minute examination than has hitherto been attempted.

Writing $\ell n\ Y$ (for any indicator) as $f(t)$, and employing the usual notation for derivatives, we may define specific cycle <u>peaks</u> (P) and <u>troughs</u> (T) as:

$$\begin{aligned} &P \text{ when } f'(t) = 0,\ f''(t) < 0; \\ &T \text{ when } f'(t) = 0,\ f''(t) > 0. \end{aligned}$$

The first derivative of the logarithmic trend-cycle is a time-series of the proportionate growth-rate of the indicator. Any peak of this curve is a point of <u>contraction</u> (C); any trough a point of <u>expansion</u> (E). These correspond, of course, with points of inflexion on the trend-cycle, and may be defined as:

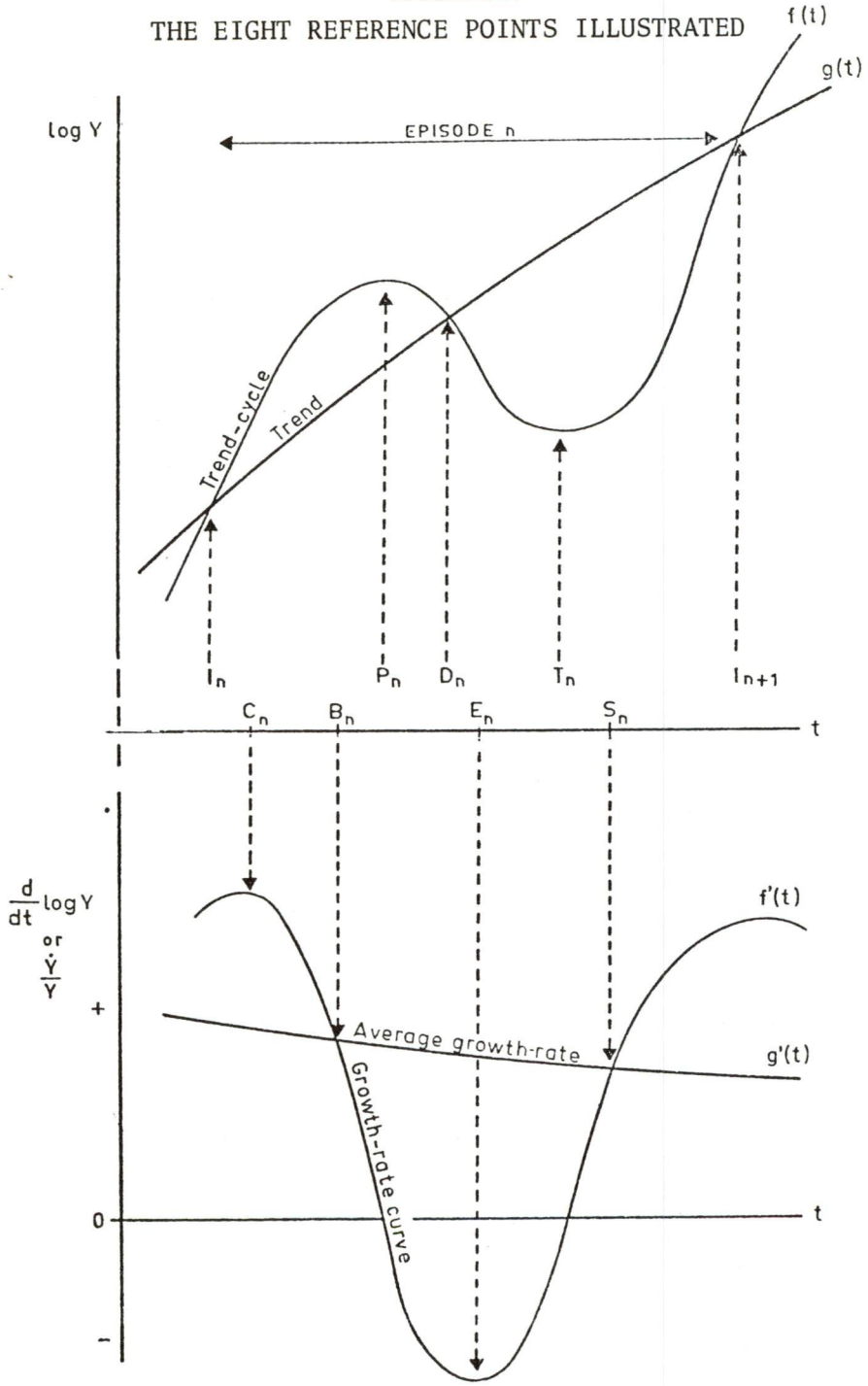
$$\begin{aligned} &C \text{ when } f''(t) = 0,\ f'''(t) < 0; \\ &E \text{ when } f''(t) = 0,\ f'''(t) > 0. \end{aligned}$$

Writing $\ell n\alpha = g(t)$, we may define <u>boom</u> point (B) and <u>slump</u> point (S) as:

$$\begin{aligned} &B \text{ when } f'(t) - g'(t) = 0,\ f(t) - g(t) > 0,\ f''(t) < 0; \\ &S \text{ when } f'(t) - g'(t) = 0,\ f(t) - g(t) < 0,\ f''(t) > 0. \end{aligned}$$

FIGURE 1

THE EIGHT REFERENCE POINTS ILLUSTRATED



Finally, the up and down-cross of trend-cycle on trend may be defined as:

$$\text{I when } f(t) - g(t) = 0,\ f'(t) - g'(t) \geq 0;$$
$$\text{D when } f(t) - g(t) = 0,\ f'(t) - g'(t) < 0.$$

Fluctuations in the course of each indicator (and, by assumption, in the level of activity as a whole) may be charted in terms of the history of these eight "reference points". Let us replace the word "cycle" with a more general term, episode, borrowed from musical theory in order to bring out the analogy between the quasi-periodic process of economic growth and fugal development. Writing a subscript to denote the particular episode we have in mind, we may describe the chronology of the nth by the dates corresponding with $I_n$, $C_n$, $B_n$, $D_n$, $E_n$, $T_n$, $S_n$, and $I_{n+1}$. An illustration of this sequence is provided in Figure 1. Note that the points I and D may occur before, after, or at the same time as the points C and E. The point B will precede P, and the point S follow T, when the trend is positive; and vice versa when it is negative. B and S will coincide with P and T when there is no trend.

The eight reference points, when identified, allow an estimate to be made not only of the period between peaks and troughs, but also of the length of each phase of the episode, and of the relation between turning points on the trend-cycle and its derived growth-rate curve. The extraction of a trend in order to determine I, B, D and S points, however, also makes possible as a by-product some study of the amplitude of fluctuations appropriate to an economy in which the average level of activity is steadily growing.

Let the amplitude of fluctuation of the jth indicator, $Y_j = \ln^{-1} f_j(t)$, be defined as the logarithm of the proportionate deviation from trend at a specified time. Writing this as $a_j$, with a second subscript for time, $a_{ji} = f_j(t) - g_j(t)$, $(t = i)$. By means of similar notation, the amplitude of fluctuation in the general level of activity, A, can be written:

$$A_i = f_A(t) - g_A(t), \quad (t = i).$$

If it may now be assumed that the elasticity of response of any indicator, $\frac{d\beta_j}{d\beta_A} \cdot \frac{\beta_A}{\beta_j}$ remains stable over the range of

t, the amplitude of the indicator, $a_j$, can be written as a linear function of A, having the elasticity of response as its slope. Since there is no ground to question the reasonableness of that assumption for periods in which no sudden institutional or structural change occurs, the amplitude of fluctuation of an indicator may be used as evidence of the amplitude of fluctuation in the general level of activity.

The evidence of chronology afforded by various indicators can be compared and combined without further manipulation. For example, an inference about the date at which a peak of activity occurred might be drawn from the distribution of dates at which each indicator reached its specific peak. A similar inference concerning the amplitude of a boom could not be made from the distribution of specific amplitudes, however, because of the wide range assumed by the elasticity of response in any useful sample of indicators.

In order to render the amplitude evidence of one indicator comparable with that of another, therefore, specific cycle amplitudes (already measured as proportionate deviations) must be further "relativised". One way of doing this is to express amplitudes as ratios to amplitude at base date or to some other measure specific to the indicator, such as its average amplitude of deviation. Suppose, for example, that for the jth indicator the amplitude at $B_i$ was +5 per cent, whereas for the (j+1)th indicator it was +30 per cent. If the average amplitude of deviation for indicator j were ±2.5 per cent and for that of indicator (j+1), ±15 per cent then in each case the amplitude at $B_i$ would be twice the average deviation from trend during the period of the investigation, and the evidence of the two indicators equivalent.

In this study, the relative amplitude of deviations from trend at time i of the jth indicator will be defined as $\frac{a_{ji}}{\alpha(a_j)}$, where $\alpha\ (a_j)$ is the standard deviation of $f_j(t)$ from $g_j(t)$ during the period for which the indicator is available.

Assuming that $\gamma$ and $\delta$ have been perfectly eliminated, the value of $\frac{a_{ji}}{\alpha(a_j)}$ as an estimator of $\frac{A_i}{\alpha(A)}$ depends only upon the assumption of a constant elasticity of response and the non-existence of lags. The latter condition can to some extend be satisfied by measuring amplitudes only at

specific peaks and troughs of the cyclical components (specific cycle B and S points) assuming for each indicator a variable lag, u, equal to the period between specific B and S points and those established for the reference cycle. In the notation so far used, $\frac{a_j(i+u)}{\alpha(a_j)}$ is an estimator of $\frac{A_i}{\alpha(A)}$. Such has been the practice in this study.

It must be emphasized that the resulting measures of relative amplitude at reference cycle B and S points are of strictly limited applicability. They can be used, for example, to determine whether the Canadian boom in the first half of 1966 was greater or less (relatively speaking) than the Canadian boom of the second half of 1956: provided that all the series used extended over the same period which included each of these years. But they could not be used to make any comparison between, say, the seriousness of the Canadian and Australian recessions of 1961. According to Canadian data from January 1947 to December 1969, Canadian reference cycle $S_5$ occurred in January 1961 with a relative amplitude of -1.63 standard deviations; whereas with Australian data from January 1948 to December 1964, Australian reference cycle $S_4$ occurred in September 1961 with a relative amplitude of -1.09 standard deviations. The seriousness of each recession as so measured is relative to that of other fluctuations which occurred in that country during the specified period of study, hence the two estimates of amplitude are in no way comparable.

chapter two

# METHOD

## Data

Since the object of the research was to establish a fine chronology, monthly indicators only were examined. All series were taken from the Canadian Statistical Review. In effect, the outcome of this study is a presentation of that view of post-War Canadian fluctuations which would emerge from a diligent reading of that publication.

It is well known that some series such as exports, for example, which play an obvious initiating role in the Canadian economy, may tend to lead the average movement of most other indicators. Others, such as imports, which reflect the business cycle more as effect than as cause, will tend to lag. There seemed no satisfactory way of avoiding any possible bias which might result from this, short of examining as many indicators as possible. A total of 95 was inspected, but for various reasons, chiefly because of breaks in continuity, only 54 of these were actually used, compared with the 36 used in the author's study of Australian fluctuations. A list of the monthly time-series examined is set out in Table I. Wherever possible, observations extend from January 1947 to December 1969.

TABLE I

MONTHLY TIME-SERIES USED TO DETERMINE REFERENCE POINTS FOR THE CANADIAN BUSINESS CYCLE FROM 1947-1969

---

1 Volume Index of Production - Mining
2 " " " " - Food and Beverages
3 " " " " - Textile Industries
4 " " " " - Paper and Allied Industries
5 " " " " - Chemical and Chemical Products
9 " " " " - Transportation Equipment
10 " " " " - Electrical Products Industries - Total
11 " " " " - Electrical Power, Gas and Water Utilities - Total

12 Labor Force - Total
13 Employed - Total
14 Unemployed - Total
15 Not in the Labor Force - Total
18 Claimants for Unemployment Insurance
19 Time Lost in Work Stoppages - Total
30 Average Hourly Earnings - Manufacturing - Total
31 Wholesale Price Index - Principal Components - Total
32 " " " - Canadian Farm Products - Total

36 Manufacturing - Total Shipments
37 " - Unfilled orders
38 " - Total Inventories
39 New Motor Vehicles - Commercial Production
40 " " " - New Passenger - Production
41 " " " - " " - Sales
42 " " " - Commercial - Sales
44 Net Domestic Production - Crude Oil and Gas
48 Dwelling Units - Completed - Canada total

50 Exports of Grain - Wheat
54 Merchandise Exports - All Countries
55 " " - United States
56 " Imports - All Countries
57 " " - United States

TABLE I (continued)

58 Merchandise Exports - Index of Prices
59 " Imports - " " "

60 Railway Revenue Freight Loadings - Total
61 " " Ton Miles
62 " " Passenger - Miles
64 Chartered Banks - General Loans
65 " " - Total Loans
66 Government of Canada - Chartered Bank Deposits
67 Personal Savings
68 Demand - Chartered Bank Deposits
69 Currency and Chartered Bank Deposits - Total
70 Cheques Cashed in Clearing Centers - Canada
75 Toronto Stock Exchange - Combined Volume
76 Commercial Failures - Total
81 Federal Government Budgetary Expenditures - Defence
82 " " " " - Total
84 Official Holdings of Gold and United States Dollars - Total
85 Total Industrial Production - Volume Index
91 Consumer Price Index - Total
92 Index of Employment - Industrial Composite
93 Average Weekly Wages and Salaries - Industrial Composite
94 Securities Prices Index - Total Industrials
95 Consumer Price Index - Total Excluding Food

It is inappropriate to pretend that this set is a random sample drawn from the parent population of all available monthly indicators. In the first place, even if it actually were, the population of available indicators, depending as it does upon a variety of accidental, administrative and historical circumstances for its composition, may be but a biased guide to the general level of activity. And in the second, it is unprofitable to deny that the judgment of an experienced investigator may often afford a clearer insight into the working of the economy than the nicest statistical techniques. As a result, however, few of the measurements reported in this study are subject to any test of their statistical significance.

The basic assumptions in all that follows are four:

(1) The general level of activity during a period may, in principle, be described by a single measure:

Gross National Product at constant prices being the nearest approximation to this.

(2) For any reference point between $I_1$ and $I_9$ inclusive, the arithmetic mean of the distribution of specific cycle dates for the indicators listed in Table I provides an estimate of the date at which a perfect monthly index of the general level of activity would have generated that reference point.

(3) The reliability of this estimate varies positively with the number of indications and negatively with their dispersion.

(4) Similar conclusions may be drawn about the relative amplitude of fluctuation of a perfect index of activity from the distribution of specific, standardized relative amplitudes.

Assumptions of this kind appear to underlie most attempts to construct any "reference cycle" intended not merely to classify indicators but also to date fluctuations in the general level of activity. The method is inelegant and fallible, and its results depend for their validity upon consistency with annual and quarterly series of real GNP, and agreement with the judgment of other investigators. In the last and most important of these respects, however, it differs only in degree from all other attempts at quantitative analysis in the social sciences.

## Trend Extraction

Given the decision to examine a logarithmic transformation of the basic data, it was necessary to decide whether to fit a log-linear or log-curvilinear trend for purposes of extracting the "cyclical component".

The most useful log-curvilinear trend is the log-quadratic. In the first place, it can be regarded as a general case of the log-linear. If the coefficient of $t^2$ in the fitted log-quadratic is negligible, we can assume that there is little average curvature in the logarithmic data and hence that a linear trend would be justified. Secondly,

in cases where there is any marked curvilinearity, the first derivative of the log-quadratic can be interpreted as the average growth-rate of the series and the second derivative as the acceleration or deceleration of that average growth-rate over the period of the study.

In the author's Australian study both log-linear and log-quadratic trends were used, and the results compared. The average dates of the derived I, B, D and S points were found to be unaffected by the choice of trend, but the dispersion of observations about their means was greater when the log-linear trend was used. It was concluded from this that indiscriminate use of a log-linear trend failed to expose the $\beta$-component adequately, thus leading to some displacement of apparent values of specific cycle I, B, D and S points. The log-quadratic trend was therefore preferred as a better approximation to the $\alpha$-component. This decision was consistent with quite obvious acceleration or deceleration in certain series for reasons which were well understood.

Visual inspection of the graphed Canadian series confirmed that here too there were considerable departures from apparent log-linearity in many series, and that these could usually be explained by reasons distinct from cyclical fluctuations in the economy. It was therefore decided to use the log-quadratic alone, and thus to assume that the $\alpha$-component of Canadian time-series was subject to steady acceleration or deceleration (zero in the boundary case) during the period studied.

Unfortunately, only 30 of the indicators were available from January 1947 to December 1969. The remainder begin in 1953. The shape of the log-quadratic trend is quite sensitive to changes in the length of the series. Two trends were therefore computed, and the results for I, B, D and S points with each compared. For those series beginning in 1947 a "long trend" was fitted from January of that year to December 1969. For all series a "short trend" was fitted from January 1953 to December 1969. There are therefore alternative estimates of the four reference points affected by choice of trend from 1953-1969.

Two examples of series having marked curvilinear trends are displayed in Figures 2 and 3.

## Specific "Trend-Cycles" and "Cycles"

In order to extract the information discussed in chapter one, a considerable amount of processing was necessary for each time-series. Seasonal variation, if any, had to be estimated and removed, erratic variation minimised, trends estimated and fitted, deviations of trend-cycle from trend computed, and growth-rate curve derived.

A simple deseasonalizing procedure, based upon the ratio-to-moving-average method, was found to be satisfactory for those series which represent single monthly observations or the average of a number of observations in each month (e.g., employment series). In cases where monthly data represented an accumulation of observations during each month (e.g., production series) some correction for the number of working days (or hours) in the month was required in principle. Whenever available, seasonally-adjusted series provided by Statistics Canada were used. Where not, rough adjustments for the probable length of the working month were made by guess-work.

It was found by trial and error with Australian data that an iterated three-month moving average provided a fit to the seasonally-adjusted data that was on the one hand reasonably smooth and on the other sufficiently flexible to minimise distortion of turning points. Discreet approximations to $\frac{Y}{Y}$ were made with the formula $\left(\frac{\Delta Y}{Y}\right)_t = \frac{\frac{1}{2}(Y_{t+1} - Y_{t-1})}{Y_t}$, multiplied by 1200 to appear in average, annual percentage form. A simple five-month moving average was found to provide a satisfactory fit to the series $\frac{\Delta Y}{Y}$.

A computer program was prepared for transforming each of the time-series listed in Table I by the following operations.

(1) Seasonal-adjustment routine.

(2) Quadratic trend fitted by least-squares to logarithmns of original observations.

(3) Monthly values of log-quadratic trend interpolated on the regression line.

## FIGURE 2

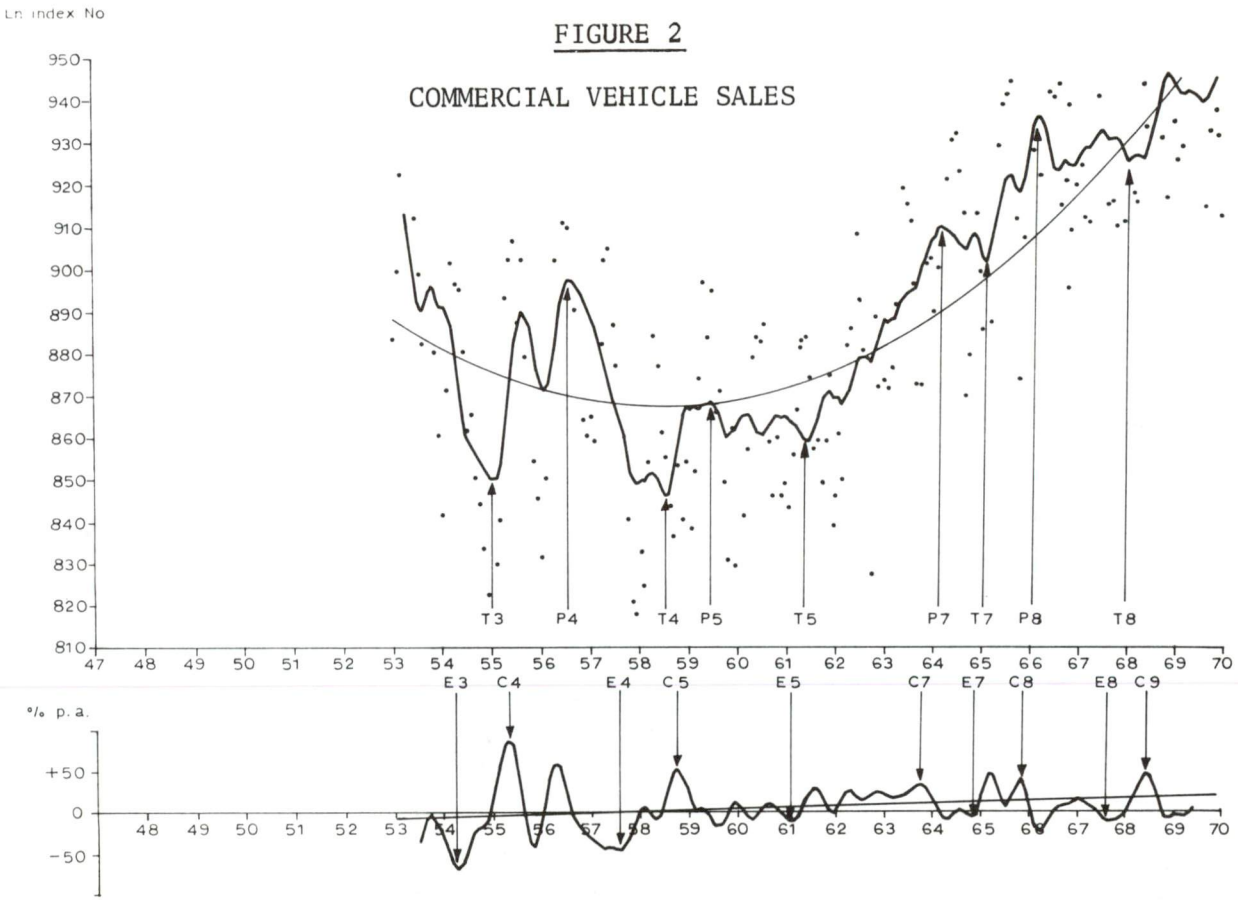
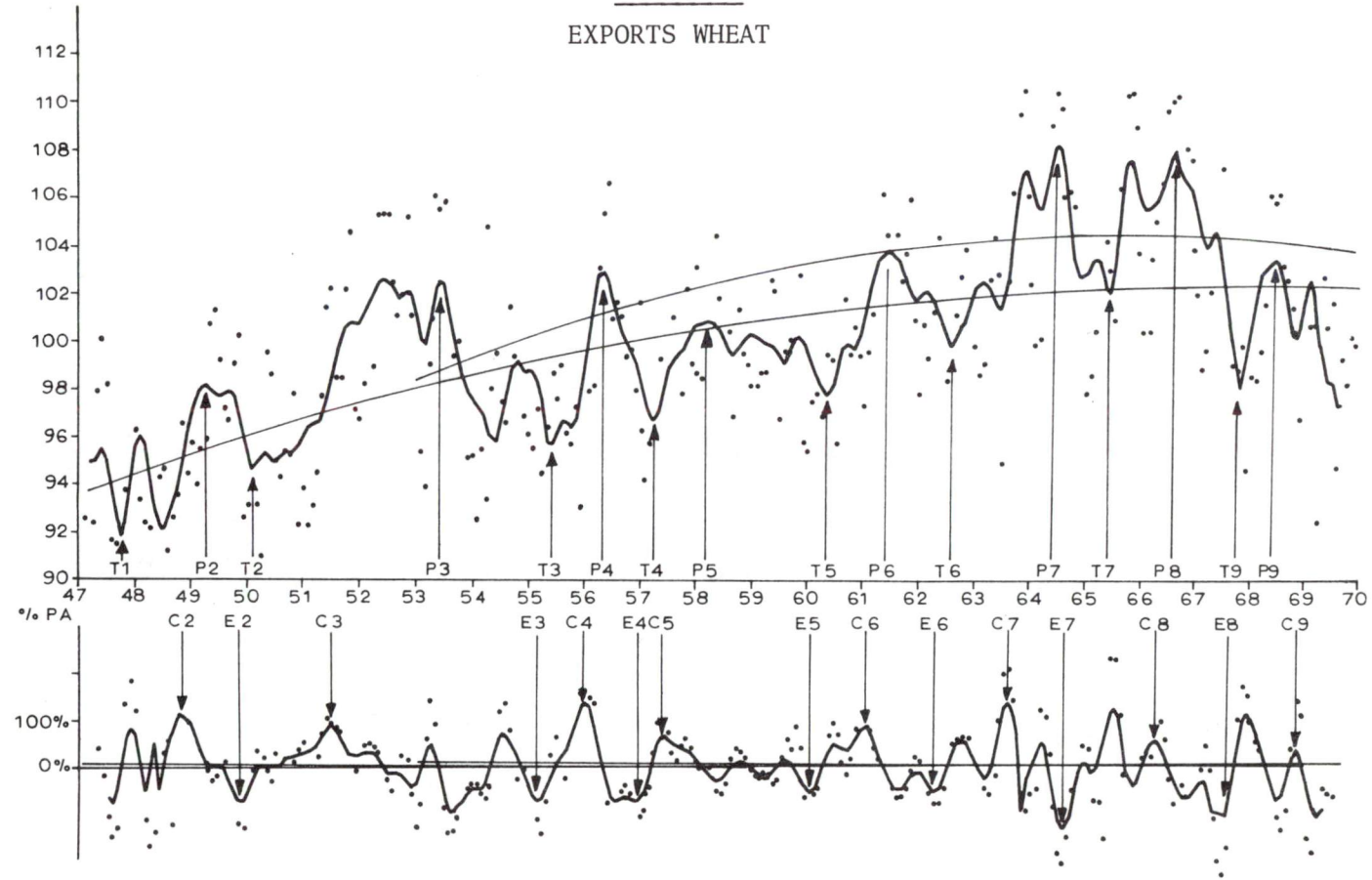

COMMERCIAL VEHICLE SALES
Ln index No
950
940
930
920
910
900
890
880
870
860
850
840
830
820
810
T3
P4
T4
P5
T5
P7
T7
P8
T8
47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70
E3
C4
E4
C5
E5
C7
E7
C8
E8
C9
% p.a.
+50
0
-50
48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70

FIGURE 3

EXPORTS WHEAT



(4) Monthly values computed of first derivatives of log-quadratic curve, expressed as growth-rates in per cent per annum.

(5) Seasonally-adjusted data smoothed by a once-iterated, three-month moving average.

(6) Proportionate deviations computed of smoothed, seasonally-adjusted data from the log-quadratic trend expressed in standard deviation units.

(7) Proportionate first difference computed of smoothed, seasonally-adjusted data, expressed as growth-rates in per cent per annum.

(8) Five-month moving average fitted to the series of proportionate first differences.

Output from the program was plotted in a set of graphs taking the form illustrated in Figure 1,of which Figures 2 and 3 are examples. Specific cycle reference points from $I_1$ to $P_9$ were then determined by inspection of each graph. Because two log-quadratic trends were fitted, one from January 1947, the other from January 1953, two sets of I, B, D and S points were generated for each episode after 1952.

To provide a check of the smoothing procedures, original observations and unsmoothed growth-rates were plotted as separate points in addition to their fitted curves. Where turning points of smoothed and unsmoothed series differed, and in other cases where subjective appraisal was called for, the following principles were used to ensure reasonable consistency.

(1) When a reference point on the trend-cycle differed from that implied by the value of the growth-rate curve, the evidence of the former was preferred.

(2) When a turning point on the trend-cycle differed from that indicated by the plot of the original data by less than three months, the discrepancy was taken to result from seasonal variation and the evidence of the trend-cycle preferred.

(3) When the difference exceeded two months, some distortion was presumed. If the unsmoothed series rose or fell sharply, its evidence was preferred to that of the trend-cycle; if there was no sharp up or down-turn, the mid-point between the two indications was selected.

(4) When the up and down-cross of trend-cycle on trend was uncertain or repeated, the point I was selected at the last month before trend-cycle rose unambiguously above trend; the point D at the first month after trend-cycle ceased to run unambiguously above trend.

(5) When more than one indication for B or S was obtained in any one phase (by the cross of growth-rate on average growth-rate) the maximum or minimum deviation of trend-cycle from trend was ascertained from the output of the computer program.

(6) When the growth-rate curve exhibited more than one maximum or minimum in any one phase of the trend-cycle, the point C was usually taken as the last growth-rate peak before the occurrence of P or B on the trend-cycle; the point E as the last growth-rate trough before the occurrence of T or S on the trend-cycle.

(7) One or two series, connected with foreign trade, are noticeably out of phase with the remainder. It was assumed that these series lead the domestic indicators, and their reference points have been numbered accordingly.

(8) Total numbers "Unemployed", "Claimants for Unemployment Insurance", and total numbers "Not in the Labor Force" were assumed to oscillate reciprocally to the remaining time series. Reference points were identified for those series, therefore, from inverse turning points and crosses. $P_4$, for example, was selected at the date at which the trend-cycle of the "Unemployed" series reached a minimum value in 1956; $I_4$ at which the trend-cycle made a down-cross on trend in 1955; and so forth.

(9) No attempt has been made to nominate a complete set of 68 ($I_1$ - $P_9$) reference points for each series under the 1947 trend, or 52 ($I_3$ - $P_9$) under the 1953 trend. Where there was any doubt, the evidence was rejected. No indicator yielded a complete set of points using either trend.

## Reference Cycle Chronology

Months were numbered serially from January 1947 and the date of each specific cycle reference point converted into a number between one and 276. The distribution of indications for each reference point was then examined. Medians, means and standard deviations were calculated, and frequency distributions prepared for each set of observations. The purpose of these operations was to obtain estimates of the reference cycle reference points from the evidence of the specific trend-cycles and growth-rate curves; and also to throw light on the usefulness for economic history of the conventional peaks and troughs compared with that of the other six reference points.

Where the median and mean of the distribution differed by no more than two months, and where no bimodality was observed in the frequency distributions, the mean was automatically taken as the numerical date of the reference cycle reference point. In the very few cases where these criteria were not satisfied, the exercise of further "judgment" was called for.

Some reference points are evidently more strongly vouched for than others. Most series yield indications in the fourth and fifth episodes, for example, but only a few in the first, sixth and seventh episodes. Moreover, the frequency distributions for some reference points are markedly less dispersed than those for some others. In accordance with the third assumption listed in the first section of this chapter, an index of "reliability of evidence", W, was defined in order to appraise the evidence for each reference point.

An index of coverage, p, was defined as the proportion of the available series which provide evidence of the

reference point. For example, all available indicators show a trend-free peak in the fourth episode, hence the value of p for $B_4$ is 1.00. Only half the available indicators make a down-cross of trend-cycle on trend in the third episode, hence the value of p for $D_3$ is 0.500.

An index of concentration is the complement of the index of relative dispersion. The standard deviation of each reference point indication is a measure of absolute dispersion. Comparison of $\alpha$ with the period which has elapsed since the previous occurrence of that reference point gives us the relative dispersion, which may be defined as:

$$v_i = \frac{\alpha_i}{\bar{R}_i - \bar{R}_{i-1}}$$

where $\bar{R}_i$ and $\bar{R}_{i-1}$ are the means of the reference point distributions in the current and previous episodes. (For the standard deviations in the first episode, there were, of course, no divisors. The arithmetic mean of $\bar{R}_i - \bar{R}_{i-1}$ was used, therefore.) A perfectly concentrated distribution would have a zero value of v, and a perfectly dispersed distribution a unitary value. The complement, (1-v) is thus an index of concentration having a range, like that of p, from zero to one.

The product of these two indexes, $W = p(1-v)$, is therefore an index of the reliability of evidence for any reference point upon the assumption that coverage and concentration have equal weight in determining the "reliability" of evidence. If all available indicators yielded a particular reference point in the same month, the evidence would be perfect according to these criteria, and the value of W unitary. If either coverage or concentration were zero, there would be no evidence and W would be zero.

## Reference Cycle Amplitude of Fluctuation

Stage (6) of the computer program described in the third section above yielded for each indicator a monthly series of proportionate deviations of trend-cycle from trend, expressed in standard deviation units. Specific cycle relative amplitudes were recorded for each series by reading off the deviations at the specific cycle B and S points previously determined from the graphs. For each B and S point

there was thus obtained a distribution of observations from which references could be drawn about the relative amplitudes of B and S points in the general level of activity, in a manner closely analogous to that used to estimate the reference cycle chronology.

The reliability of evidence was appraised by the construction of an index similar to W. The index of coverage, p, was identical, of course, with that determined for the dates of B and S points. An index of concentration, c, was computed as the complement of the relative deviation, defined as the standard deviation divided by the (absolute value of) the mean relative amplitude of the distribution, $\overline{A}$. Then the index of reliability is:

$$p\left(1-\frac{\alpha}{|\overline{A}|}\right)$$

which, like W, has a range from zero to unity.

chapter three

# RESULTS

Estimates of specific cycle I, C, B, P, D, E, T and S points, made in accordance with the principles set out in the third section of chapter two, are listed in Tables II to XIII inclusive. Alternative estimates are shown for I, B, D and S points, depending upon whether the "long" or the "short" trend was used.

Frequency distributions of reference point indications are shown in Table XIV. For each reference point, three five-month classes are defined on either side of the central five-month class (which contains observations lying no more than two months from the mean). Two further, open-ended classes are also used, in order to contain all observations lying more than 18 months either side of the mean. In each frequency distribution, the number lying in the modal class is underlined with a solid line. Where there is bimodality, the secondary peak is underlined with a dotted line.

A summary of the reference cycle chronology is shown in Tables XV to XXIII inclusive. Median, mean, standard deviation, and indexes of concentration, coverages, and "reliability of evidence" are shown for each reference point in each of the first eight episodes, and for I, C, B, and P in the ninth episode. Alternative estimates of these data

are shown for the four reference points affected by choice of trend. The dates nominated as reference points of the "general level of activity" are also listed in Tables XV to XXIII.

Tables XXIV and XXV contain the relative amplitudes of each indicator at its specific cycle B and S points. Table XXVI summarizes the amplitude data in much the same way as Tables XV to XXIII summarize the chronology.

TABLE II

SPECIFIC CYCLE I-POINTS

USING THE LONG TREND

| Indicator No. | $I_1$ | $I_2$ | $I_3$ | $I_4$ | $I_5$ | $I_6$ | $I_7$ | $I_8$ | $I_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | -- | -- | -- | May 55 | -- | -- | Dec 63 | Jul 65 | Oct 66 |
| 2 | -- | Dec 50 | -- | Dec 55 | Jan 58 | Aug 61 | -- | -- | -- |
| 3 | -- | Nov 49 | Aug 52 | Jan 55 | -- | Oct 61 | -- | -- | Jan 69 |
| 4 | -- | Jan 50 | Jan 53 | -- | Aug 59 | -- | Aug 64 | Oct 65 | -- |
| 5 | -- | Dec 50 | Jan 53 | -- | -- | -- | Jun 64 | -- | -- |
| 9 | -- | Aug 50 | -- | -- | -- | -- | Oct. 63 | Jan 65 | -- |
| 11 | -- | Sep 50 | -- | Mar 56 | -- | -- | -- | Oct 65 | -- |
| 18 | -- | Dec 50 | -- | Aug 55 | -- | -- | May 63 | -- | -- |
| 19 | -- | Jun 50 | May 51 | Jun 55 | Jan 57 | Sep 61 | Oct 64 | Dec 65 | -- |
| 39 | -- | May 50 | -- | Jan 56 | Oct 58 | -- | -- | Sep 65 | -- |

TABLE II (continued)

| Indicator No. | $I_1$ | $I_2$ | $I_3$ | $I_4$ | $I_5$ | $I_6$ | $I_7$ | $I_8$ | $I_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 40 | -- | May 50 | Apr 52 | Nov 54 | -- | -- | -- | -- | -- |
| 44 | -- | Mar 51 | -- | -- | -- | -- | -- | -- | -- |
| 48 | Nov 48 | Feb 50 | Mar 53 | -- | Nov 57 | -- | Dec 63 | Dec 65 | May 68 |
| 50 | -- | Nov 48 | May 51 | Jan 56 | Nov 57 | Jan 61 | Jul 63 | -- | -- |
| 54 | Aug 48 | -- | Nov 50 | Oct 54 | -- | -- | Mar 64 | Jan 66 | -- |
| 55 | Jul 48 | Oct 49 | -- | -- | -- | -- | -- | Aug 66 | -- |
| 56 | -- | Jul 50 | -- | Dec 54 | Mar 59 | -- | -- | Sep 65 | -- |
| 57 | -- | Sept 50 | -- | -- | -- | -- | -- | Sep 65 | -- |
| 60 | -- | Jul 50 | -- | Dec 54 | May 59 | -- | Oct 63 | -- | -- |
| 61 | -- | Dec 50 | -- | Feb 55 | -- | -- | Sep 63 | -- | -- |
| 62 | -- | -- | Jun 51 | -- | Nov 58 | -- | Nov 63 | -- | Oct 66 |
| 64 | -- | Sep 50 | Jul 52 | Jun 55 | May 59 | -- | -- | Apr 65 | -- |
| 65 | -- | Oct 50 | -- | -- | May 59 | -- | -- | -- | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 67 | -- | -- | Dec 52 | May 54 | -- | -- | -- | -- | Nov 67 |
| 68 | -- | Jan 50 | -- | -- | May 58 | -- | -- | -- | Aug 66 |
| 69 | -- | Nov 48 | Apr 52 | -- | Jan 58 | -- | -- | -- | Apr 67 |
| 70 | -- | Apr 50 | -- | Oct 55 | Apr 58 | -- | Aug 64 | -- | Jan 69 |
| 75 | -- | Feb 50 | Jun 51 | Jun 54 | May 58 | -- | Dec 63 | Sep 65 | Apr 68 |
| 76 | -- | Apr 49 | -- | -- | -- | Jan 62 | -- | -- | -- |
| 85 | -- | Aug 50 | Feb 52 | Feb 55 | -- | -- | Nov 63 | -- | Sep 68 |
| 94 | -- | Aug 50 | -- | Oct 54 | Oct 58 | Mar 61 | -- | Mar 64 | -- |

TABLE III

SPECIFIC CYCLE I-POINTS

USING THE SHORT TREND

| Indicator No. | $I_3$ | $I_4$ | $I_5$ | $I_6$ | $I_7$ | $I_8$ | $I_9$ |
|---|---|---|---|---|---|---|---|
| 1 | -- | Jun 55 | -- | -- | Jan 64 | Aug 65 | Oct 66 |
| 2 | -- | Nov 55 | -- | Feb 62 | -- | -- | -- |
| 3 | -- | Nov 54 | -- | Nov 61 | -- | -- | Feb 69 |
| 4 | -- | Jul 55 | Apr 59 | -- | Jan 64 | Jul 65 | -- |
| 5 | -- | Jul 55 | -- | -- | Jun 64 | -- | -- |
| 9 | -- | Feb 55 | -- | -- | Aug 62 | -- | -- |
| 10 | -- | Jun 55 | -- | Feb 62 | -- | -- | -- |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11 | -- | Mar 56 | -- | -- | -- | Oct 65 | -- |
| 12 | -- | Oct 56 | -- | -- | -- | Aug 66 | -- |
| 13 | -- | Sep 55 | Dec 58 | -- | -- | Dec 64 | Oct 68 |
| 14 | -- | Jul 55 | -- | -- | Jun 63 | -- | -- |
| 15 | -- | Dec 55 | Feb 60 | -- | -- | Dec 65 | Sep 68 |
| 18 | -- | Jun 55 | -- | -- | Aug 63 | -- | -- |
| 19 | -- | May 55 | Jan 57 | Aug 61 | Oct 64 | Dec 65 | -- |
| 36 | -- | Apr 55 | Feb 59 | -- | Oct 63 | -- | -- |
| 37 | -- | May 55 | -- | -- | May 64 | -- | -- |
| 38 | Jun 53 | Mar 56 | -- | -- | -- | Jun 65 | -- |
| 39 | -- | Jan 56 | Aug 58 | -- | -- | Aug 65 | -- |
| 40 | -- | Jan 55 | Nov 59 | Jul 61 | -- | -- | -- |
| 41 | -- | Feb 55 | -- | Dec 61 | -- | -- | -- |
| 42 | -- | May 55 | -- | -- | Sep 62 | -- | -- |
| 44 | -- | Apr 55 | -- | -- | -- | -- | -- |

TABLE III (Continued)

| Indicator No. | $I_3$ | $I_4$ | $I_5$ | $I_6$ | $I_7$ | $I_8$ | $I_9$ |
|---|---|---|---|---|---|---|---|
| 48 | -- | Oct 54 | Dec 57 | -- | Nov 63 | Dec 65 | May 68 |
| 50 | -- | Dec 55 | Oct 57 | Jan 61 | Jul 63 | -- | -- |
| 54 | -- | Dec 54 | Sep 59 | -- | Sep 63 | Sep 65 | -- |
| 55 | -- | May 55 | -- | Sep 61 | -- | Jul 66 | -- |
| 56 | -- | Jun 55 | -- | -- | -- | Jul 65 | -- |
| 57 | -- | May 55 | Sep 58 | -- | -- | Jun 65 | -- |
| 60 | -- | Dec 54 | Dec 58 | -- | Sep 63 | -- | -- |
| 61 | -- | Apr 55 | -- | -- | Sep 63 | -- | -- |
| 62 | -- | Dec 54 | -- | -- | Oct 63 | -- | Oct 66 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 64 | -- | Aug 55 | Mar 59 | Apr 62 | -- | Oct 64 | -- |
| 65 | -- | Aug 55 | Feb 59 | Apr 62 | -- | Apr 65 | -- |
| 67 | -- | Jan 55 | -- | -- | -- | -- | Jan 68 |
| 68 | -- | Nov 54 | May 58 | -- | -- | -- | Jul 66 |
| 69 | -- | Jan 55 | Dec 57 | Oct 61 | -- | -- | Jul 67 |
| 70 | -- | Nov 55 | Apr 58 | -- | Apr 64 | -- | Feb 69 |
| 75 | -- | Aug 54 | May 58 | Sep 61 | Oct 63 | -- | May 68 |
| 76 | May 53 | -- | -- | Jan 62 | -- | -- | -- |
| 81 | -- | -- | -- | -- | -- | -- | -- |
| 82 | -- | May 56 | Aug 58 | -- | Dec 63 | -- | -- |
| 85 | -- | Apr 55 | -- | -- | Oct 63 | -- | -- |
| 92 | -- | Sep 55 | -- | -- | -- | Dec 64 | -- |
| 94 | -- | Sep 54 | Sep 58 | Mar 61 | -- | Mar 64 | -- |

TABLE IV

SPECIFIC CYCLE C-POINTS

| Indicator No. | $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | $C_7$ | $C_8$ | $C_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Apr 48 | May 51 | Feb 53 | Jul 55 | Jan 59 | -- | Oct 63 | Oct 65 | Nov 68 |
| 2 | Nov 47 | Nov 50 | Feb 52 | Jan 56 | May 59 | Jun 61 | Oct 64 | Dec 67 | Nov 68 |
| 3 | Apr 48 | Jul 50 | Aug 52 | Jan 55 | Jun 58 | May 61 | Feb 64 | Jun 65 | Feb 69 |
| 4 | Dec 48 | Jun 50 | Mar 53 | Oct 55 | Oct 59 | Jul 62 | Sep 64 | Dec 65 | Nov 68 |
| 5 | -- | Oct 50 | Nov 53 | Sep 57 | Sep 59 | Feb 62 | Aug 64 | Sep 65 | Oct 69 |
| 9 | -- | Jul 50 | Jun 52 | Mar 56 | Jan 60 | -- | Sep 63 | May 67 | May 68 |
| 10 | Nov 48 | Jun 50 | Feb 53 | Jun 56 | Jan 60 | Sep 61 | -- | Mar 66 | Feb 69 |
| 11 | -- | Sep 50 | -- | May 56 | Sep 59 | Feb 62 | Sep 63 | Sep 65 | Nov 68 |
| 12 | -- | -- | -- | Dec 56 | -- | -- | Aug 63 | Jan 66 | Jan 69 |
| 13 | -- | -- | -- | Oct 56 | Jan 59 | Nov 61 | Jul 63 | Mar 67 | Nov 68 |
| 14 | -- | -- | -- | May 56 | Jan 59 | Sep 61 | Aug 65 | -- | Nov 68 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15 | -- | -- | -- | Jan 56 | Jan 60 | Feb 62 | Feb 65 | Mar 67 | Feb 69 |
| 18 | Jun 48 | Oct 50 | Aug 52 | Apr 56 | Feb 59 | Aug 61 | -- | Mar 66 | Oct 68 |
| 19 | -- | -- | -- | Aug 55 | -- | Oct 61 | Oct 64 | Jan 68 | -- |
| 36 | -- | Nov 50 | Oct 52 | Apr 56 | Feb 59 | Apr 62 | Nov 63 | Oct 65 | Jun 68 |
| 37 | -- | -- | Dec 53 | Oct 56 | Jul 59 | Dec 61 | Oct 63 | Mar 66 | -- |
| 38 | -- | -- | -- | Mar 56 | Feb 60 | Dec 61 | -- | Jul 66 | -- |
| 39 | -- | May 50 | Aug 52 | Feb 56 | Dec 59 | Sep 62 | Oct 65 | Jun 68 | -- |
| 40 | -- | Jun 50 | May 52 | Dec 54 | Oct 58 | Aug 61 | -- | Jun 67 | Jun 69 |
| 41 | -- | -- | -- | Mar 55 | Oct 58 | Jun 61 | Nov 62 | Mar 65 | Jun 68 |
| 42 | -- | -- | -- | May 55 | Oct 58 | -- | Oct 63 | Nov 65 | Jun 68 |
| 44 | Dec 48 | May 51 | Apr 53 | Aug 56 | Nov 58 | Apr 61 | -- | May 67 | -- |
| 48 | Dec 48 | May 50 | Sep 52 | Mar 56 | Dec 57 | -- | -- | -- | -- |
| 50 | -- | Nov 48 | Jul 51 | Jan 56 | Jun 57 | Feb 61 | Sep 63 | May 66 | Dec 68 |
| 54 | -- | Aug 48 | Mar 51 | Feb 56 | Oct 59 | Jul 61 | Oct 63 | Sep 65 | Oct 68 |

TABLE IV (continued)

| Indicator No. | $C_1$ | $C_2$ | $C_3$ | $C_4$ | $C_5$ | $C_6$ | $C_7$ | $C_8$ | $C_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 55 | Jul 48 | Oct 49 | Nov 52 | Mar 57 | Mar 59 | Jul 61 | Jan 64 | Oct 66 | Oct 68 |
| 56 | Oct 48 | Oct 50 | Apr 53 | Jul 55 | Mar 59 | Aug 61 | Jan 64 | Aug 66 | Sep 68 |
| 57 | -- | Dec 50 | Sep 52 | Feb 56 | Mar 59 | Aug 61 | Jan 64 | Sep 66 | Sep 68 |
| 58 | Sep 48 | Feb 51 | -- | Feb 55 | Nov 58 | Feb 62 | Aug 64 | Jun 66 | Feb 69 |
| 60 | Aug 48 | Dec 51 | -- | Mar 56 | Jul 59 | -- | Oct 63 | Aug 65 | Dec 68 |
| 61 | Aug 48 | Dec 51 | -- | Jan 56 | Jul 59 | -- | Oct 63 | Sep 66 | Dec 68 |
| 62 | -- | Sep 51 | -- | Mar 57 | Jan 60 | May 62 | Nov 63 | Jan 66 | Jun 68 |
| 64 | -- | Dec 50 | May 53 | Nov 55 | Feb 59 | Mar 62 | May 65 | Aug 67 | Dec 68 |
| 65 | Sep 48 | Dec 50 | Jun 53 | Oct 55 | Mar 59 | Apr 62 | Apr 65 | -- | Dec 68 |
| 67 | Apr 49 | Nov 52 | May 54 | Oct 56 | Jul 58 | Oct 60 | -- | Oct 65 | May 68 |
| 68 | -- | Oct 50 | Dec 52 | Jan 58 | Jun 58 | Aug 61 | -- | Dec 66 | Jul 68 |
| 69 | Oct 48 | Sep 50 | -- | May 54 | Jul 58 | Sep 61 | Sep 61 | May 65 | Jul 68 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 70 | -- | -- | Dec 52 | Mar 56 | Apr 58 | Aug 61 | Nov 64 | Sep 66 | Mar 69 |
| 75 | -- | Mar 50 | Dec 52 | Aug 54 | Jun 58 | Oct 61 | Feb 64 | Oct 65 | Jun 68 |
| 76 | Aug 49 | Jan 52 | Jun 53 | Nov 56 | Aug 59 | Mar 63 | Aug 64 | May 66 | -- |
| 81 | -- | -- | -- | Jun 56 | Nov 58 | Mar 62 | Dec 63 | May 67 | -- |
| 82 | -- | -- | -- | Feb 57 | May 59 | May 61 | Dec 64 | May 67 | -- |
| 85 | -- | Aug 50 | Sep 52 | Feb 55 | Jan 59 | Apr 62 | Nov 63 | Sep 65 | Oct 68 |
| 92 | -- | -- | -- | Dec 55 | Feb 59 | May 61 | Sep 63 | Mar 65 | Nov 68 |
| 94 | Mar 48 | Dec 50 | -- | Jun 55 | Jul 58 | Feb 61 | May 64 | Jan 67 | Jul 68 |

TABLE V

SPECIFIC CYCLE B-POINTS

USING THE LONG TREND

| Indicator No. | $B_1$ | $B_2$ | $B_3$ | $B_4$ | $B_5$ | $B_6$ | $B_7$ | $B_8$ | $B_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Jul 48 | Jun 51 | -- | May 57 | Oct 59 | -- | -- | Jan 66 | Feb 69 |
| 2 | Jan 48 | -- | Jun 52 | Mar 56 | Aug 59 | Jun 62 | Dec 64 | Dec 65 | -- |
| 3 | -- | Apr 51 | Apr 53 | Jan 57 | -- | Jul 62 | Apr 64 | Aug 65 | Apr 69 |
| 4 | -- | Jun 51 | Jul 53 | Jul 56 | Dec 59 | -- | Nov 64 | May 66 | -- |
| 5 | -- | Feb 51 | Jan 54 | Nov 57 | -- | May 62 | Oct 64 | Feb 66 | -- |
| 9 | -- | Mar 51 | May 53 | Dec 56 | -- | -- | Jul 64 | Feb 66 | -- |
| 11 | -- | Dec 50 | Nov 51 | Sep 56 | Nov 59 | Mar 62 | -- | Apr 67 | -- |
| 18 | -- | Apr 51 | -- | Oct 56 | -- | Jun 62 | -- | Oct 65 | -- |
| 19 | -- | Aug 50 | Jun 52 | Dec 55 | Oct 58 | Apr 62 | Dec 64 | Aug 66 | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 39 | -- | Jan 52 | Oct 52 | Oct 56 | May 59 | -- | -- | Jul 66 | -- |
| 40 | -- | Nov 50 | Aug 53 | Dec 56 | -- | -- | Dec 63 | Feb 66 | -- |
| 44 | -- | Jul 50 | Dec 53 | Oct 56 | -- | -- | -- | -- | -- |
| 48 | Jun 49 | Jan 51 | Nov 53 | May 56 | May 59 | -- | Mar 64 | Jun 66 | Jun 69 |
| 50 | -- | Apr 49 | Jun 52 | May 56 | Jan 58 | Jun 61 | Jun 64 | Aug 66 | -- |
| 54 | Nov 48 | -- | Mar 52 | Aug 56 | -- | -- | Jun 64 | Jan 67 | -- |
| 55 | Sep 48 | Apr 51 | May 53 | -- | -- | -- | -- | -- | -- |
| 56 | -- | Apr 51 | Jul 53 | May 56 | May 59 | -- | -- | Dec 66 | -- |
| 57 | -- | Apr 51 | May 53 | Apr 56 | -- | -- | -- | -- | -- |
| 60 | -- | Jun 51 | Feb 52 | Aug 56 | Oct 59 | -- | Jul 64 | Dec 65 | Mar 69 |
| 61 | -- | Jun 51 | Feb 52 | Aug 56 | -- | -- | Jan 64 | Nov 66 | Mar 69 |
| 62 | -- | -- | Dec 51 | May 57 | -- | -- | Sep 64 | Mar 66 | Aug 67 |
| 64 | -- | Apr 51 | Sep 53 | May 56 | Aug 59 | -- | -- | Nov 65 | -- |
| 65 | -- | May 51 | Jan 54 | Jun 56 | Aug 59 | -- | -- | -- | -- |
| 67 | -- | -- | Aug 53 | Jan 57 | Feb 59 | -- | -- | -- | -- |

TABLE V (continued)

| Indicator No. | $B_1$ | $B_2$ | $B_3$ | $B_4$ | $B_5$ | $B_6$ | $B_7$ | $B_8$ | $B_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 68 | -- | Nov 50 | Apr 53 | Aug 55 | Oct 58 | -- | -- | -- | Apr 67 |
| 69 | -- | Sept 49 | May 53 | Sep 55 | Oct 58 | -- | -- | -- | Mar 69 |
| 70 | -- | Nov 50 | Jan 53 | May 56 | Oct 58 | -- | Feb 65 | Jan 67 | -- |
| 75 | -- | Jun 50 | Feb 53 | Jul 55 | Sep 58 | Nov 61 | May 64 | Jan 66 | Dec 68 |
| 76 | -- | Dec 49 | Feb 54 | Jan 57 | Sep 60 | -- | Dec 63 | Aug 66 | -- |
| 85 | -- | Apr 51 | Mar 53 | Oct 56 | -- | -- | -- | Feb 66 | Feb 69 |
| 94 | -- | Oct 51 | -- | Mar 56 | Feb 59 | Sep 61 | -- | Mar 65 | -- |

TABLE VI

SPECIFIC CYCLE B-POINTS

USING THE SHORT TREND

| Indicator No. | $B_3$ | $B_4$ | $B_5$ | $B_6$ | $B_7$ | $B_8$ | $B_9$ |
|---|---|---|---|---|---|---|---|
| 1 | -- | Jun 57 | Oct 59 | -- | -- | Jan 66 | Feb 69 |
| 2 | -- | Mar 56 | Aug 59 | Jun 62 | Jan 65 | Dec 65 | Feb 69 |
| 3 | -- | Jan 57 | -- | Jul 62 | Apr 64 | Aug 65 | Apr 69 |
| 4 | -- | Jul 56 | Dec 59 | -- | Nov 64 | Apr 66 | -- |
| 5 | Feb 54 | Nov 57 | -- | May 62 | Oct 64 | Feb 66 | -- |
| 9 | -- | Dec 56 | -- | -- | Dec 63 | -- | -- |
| 10 | Dec 53 | Sep 56 | -- | Sep 62 | -- | Oct 66 | -- |
| 11 | -- | Aug 56 | Nov 59 | Mar 62 | -- | Apr 67 | Jan 69 |
| 12 | -- | Oct 57 | Oct 60 | -- | -- | Jun 67 | Apr 69 |

TABLE VI (continued)

| Indicator No. | $B_3$ | $B_4$ | $B_5$ | $B_6$ | $B_7$ | $B_8$ | $B_9$ |
|---|---|---|---|---|---|---|---|
| 13 | -- | Jan 57 | Aug 59 | -- | -- | Mar 66 | Mar 69 |
| 14 | -- | Oct 56 | -- | -- | -- | Oct 65 | -- |
| 15 | -- | Nov 56 | Dec 60 | -- | -- | Jul 67 | Apr 69 |
| 18 | -- | Oct 56 | -- | -- | -- | Oct 65 | -- |
| 19 | -- | Dec 55 | Oct 58 | Apr 62 | Dec 64 | Aug 66 | -- |
| 36 | -- | Jan 57 | May 59 | -- | Feb 64 | Jan 66 | -- |
| 37 | -- | Feb 57 | -- | -- | -- | Aug 66 | -- |
| 38 | Oct 53 | Aug 57 | -- | -- | -- | Dec 66 | -- |
| 39 | -- | Oct 56 | May 59 | -- | -- | Jul 66 | -- |
| 40 | Sep 53 | Dec 56 | Feb 60 | -- | Dec 63 | Feb 66 | -- |
| 41 | -- | Jun 56 | -- | May 62 | Dec 63 | Nov 65 | -- |
| 42 | -- | Jul 56 | -- | -- | Jan 64 | Jan 66 | -- |
| 44 | -- | Nov 56 | -- | -- | -- | -- | -- |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 48 | -- | May 56 | May 59 | Oct 62 | Mar 64 | Jun 66 | Jun 69 |
| 50 | -- | May 56 | Jan 58 | Jun 61 | Jun 64 | Aug 66 | -- |
| 54 | -- | Aug 56 | Dec 59 | Sep 61 | Jun 64 | Jan 67 | -- |
| 55 | -- | Aug 56 | Jun 59 | Jan 62 | -- | Mar 68 | -- |
| 56 | -- | Feb 57 | May 59 | -- | -- | Oct 66 | -- |
| 57 | -- | Feb 57 | Jun 59 | -- | -- | Dec 66 | -- |
| 60 | -- | Aug 56 | Oct 59 | -- | Jul 64 | Dec 65 | Feb 69 |
| 61 | -- | Aug 56 | -- | -- | Jan 64 | Apr 66 | Mar 69 |
| 62 | -- | Jun 57 | -- | -- | Sep 64 | Mar 66 | Aug 67 |
| 64 | -- | Jun 56 | Aug 59 | Aug 62 | -- | Oct 65 | -- |
| 65 | -- | Jun 56 | Aug 59 | Aug 62 | -- | Oct 65 | -- |
| 67 | -- | Jan 57 | Mar 59 | -- | -- | -- | -- |
| 68 | -- | Aug 55 | Oct 58 | -- | -- | -- | Mar 67 |
| 69 | -- | Sep 55 | Oct 58 | May 62 | -- | -- | Feb 69 |
| 70 | -- | Jun 56 | Oct 58 | -- | Feb 65 | Dec 66 | -- |

TABLE VI (continued)

| Indicator No. | $B_3$ | $B_4$ | $B_5$ | $B_6$ | $B_7$ | $B_8$ | $B_9$ |
|---|---|---|---|---|---|---|---|
| 75 | -- | Mar 56 | Nov 58 | Nov 61 | May 64 | Jan 66 | Dec 68 |
| 76 | Mar 54 | Jan 57 | Sep 60 | -- | Dec 63 | Aug 66 | -- |
| 81 | Mar 54 | Sep 56 | -- | May 62 | Mar 64 | -- | -- |
| 82 | -- | Apr 57 | Jul 59 | Nov 61 | Mar 64 | Mar 65 | -- |
| 85 | -- | Oct 56 | Oct 59 | -- | -- | Feb 66 | -- |
| 92 | -- | Jan 57 | -- | -- | -- | Jun 66 | -- |
| 94 | -- | Mar 56 | Feb 59 | Sep 61 | -- | Mar 65 | -- |

TABLE VII

SPECIFIC CYCLE P-POINTS

| Indicator No. | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ | $P_6$ | $P_7$ | $P_8$ | $P_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | -- | Jul 51 | Jul 53 | Jan 58 | Nov 59 | -- | -- | Mar 66 | Feb 69 |
| 2 | Jan 48 | Mar 51 | Dec 52 | Jul 57 | Aug 59 | Jul 62 | -- | Mar 68 | Mar 69 |
| 3 | -- | Apr 51 | Apr 53 | Feb 57 | Mar 60 | -- | -- | Feb 66 | Apr 69 |
| 4 | -- | Jun 51 | -- | Mar 57 | Jul 60 | Sep 62 | Dec 64 | Jan 67 | -- |
| 5 | -- | -- | Feb 54 | Dec 58 | Feb 60 | Jun 62 | -- | Apr 66 | -- |
| 9 | -- | -- | May 53 | Dec 56 | -- | -- | Jul 64 | -- | -- |
| 10 | Dec 47 | Apr 51 | Dec 53 | Sep 56 | Mar 60 | -- | -- | Nov 66 | -- |
| 11 | Aug 47 | -- | -- | Oct 56 | -- | Jul 62 | -- | -- | -- |
| 12 | -- | -- | -- | -- | -- | -- | -- | -- | May 69 |
| 13 | -- | -- | -- | Sep 57 | Mar 60 | Jul 62 | -- | Aug 67 | May 69 |

TABLE VII (continued)

| Indicator No. | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ | $P_6$ | $P_7$ | $P_8$ | $P_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 14 | -- | -- | -- | Sep 56 | Sep 59 | May 62 | Oct 65 | -- | Mar 69 |
| 15 | -- | -- | -- | -- | -- | -- | Sep 63 | -- | -- |
| 18 | -- | Apr 51 | -- | Jul 56 | Jun 59 | Jun 62 | -- | May 66 | Feb 69 |
| 19 | -- | Jun 52 | -- | Jan 56 | Oct 58 | Apr 62 | Dec 64 | Mar 68 | -- |
| 36 | -- | Jun 51 | Apr 53 | Apr 57 | Oct 60 | -- | -- | -- | -- |
| 37 | -- | -- | -- | Jan 57 | Nov 59 | Jul 62 | -- | Feb 67 | -- |
| 38 | -- | -- | Nov 53 | Sep 57 | Jun 60 | -- | -- | Aug 67 | -- |
| 39 | -- | -- | Oct 52 | Oct 56 | Feb 60 | -- | -- | -- | -- |
| 40 | -- | Nov 50 | Jan 54 | Dec 56 | -- | -- | Dec 63 | Feb 66 | -- |
| 41 | -- | -- | -- | Jun 56 | -- | -- | -- | Dec 65 | -- |
| 42 | -- | -- | -- | Jul 56 | Jun 59 | -- | Feb 64 | Jan 66 | -- |
| 44 | -- | Aug 51 | Jan 54 | May 57 | -- | -- | -- | -- | -- |
| 48 | -- | Feb 51 | Nov 53 | May 56 | Oct 58 | -- | -- | Jun 66 | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 50 | -- | Apr 49 | Jun 53 | May 56 | Mar 58 | Jun 61 | Jun 64 | Aug 66 | Jun 68 |
| 54 | -- | Nov 48 | Mar 52 | -- | Jan 60 | -- | Aug 64 | Jan 67 | -- |
| 55 | Oct 48 | -- | May 53 | Aug 57 | Dec 59 | -- | -- | -- | -- |
| 56 | Jan 49 | Apr 51 | Jun 53 | Feb 57 | Jun 59 | Jul 62 | Apr 64 | Jul 67 | -- |
| 57 | -- | Apr 51 | Jun 53 | Feb 57 | Jun 59 | Jul 62 | Apr 64 | Jan 67 | -- |
| 58 | Jan 49 | Nov 51 | -- | Dec 56 | -- | -- | Nov 64 | Jan 67 | -- |
| 60 | Nov 48 | Feb 52 | -- | Aug 56 | Oct 59 | -- | Jul 64 | Dec 65 | Feb 69 |
| 62 | -- | Dec 51 | -- | May 57 | -- | Jul 62 | -- | Mar 66 | Aug 67 |
| 64 | -- | Aug 51 | Feb 54 | Jan 57 | Sep 59 | -- | -- | -- | -- |
| 65 | -- | Jul 51 | Feb 54 | Jun 57 | Sep 59 | Sep 62 | -- | -- | -- |
| 67 | -- | -- | -- | -- | Aug 59 | -- | -- | -- | -- |
| 68 | -- | Nov 50 | Jun 53 | Sep 55 | Nov 58 | Dec 61 | -- | -- | -- |
| 69 | -- | Jan 51 | -- | Jun 56 | Jul 59 | May 62 | -- | -- | -- |
| 70 | -- | -- | Feb 53 | -- | -- | -- | -- | Apr 67 | -- |
| 75 | -- | Jun 50 | Feb 53 | Jul 55 | Nov 58 | Nov 61 | May 64 | Jan 66 | Dec 68 |

TABLE VII, (continued)

| Indicator No. | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ | $P_6$ | $P_7$ | $P_8$ | P9 |
|---|---|---|---|---|---|---|---|---|---|
| 76 | Dec 49 | May 52 | Mar 54 | Jan 57 | Sep 60 | Dec 63 | -- | Aug 66 | -- |
| 81 | -- | -- | -- | Sep 56 | Jul 59 | May 62 | Mar 64 | Aug 67 | -- |
| 82 | -- | -- | -- | Apr 57 | -- | Nov 61 | -- | -- | -- |
| 85 | -- | May 51 | Apr 53 | Mar 57 | Feb 60 | Sep 62 | -- | -- | Mar 69 |
| 92 | -- | -- | -- | Feb 57 | May 59 | -- | -- | May 67 | -- |

TABLE VIII

SPECIFIC CYCLE D-POINTS

USING THE LONG TREND

| Indicator No. | $D_1$ | $D_2$ | $D_3$ | $D_4$ | $D_5$ | $D_6$ | $D_7$ | $D_8$ | $D_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Feb 49 | Aug 51 | -- | -- | May 60 | -- | -- | May 66 | -- |
| 2 | Dec 48 | -- | May 54 | Sep 57 | Jun 60 | -- | -- | Apr 68 | -- |
| 3 | -- | Oct 51 | Aug 53 | May 57 | -- | -- | -- | Nov 66 | -- |
| 4 | -- | Apr 52 | -- | Aug 57 | Jul 60 | -- | Jan 65 | Mar 67 | -- |
| 5 | Aug 48 | Aug 51 | -- | Dec 58 | -- | -- | -- | Jun 67 | -- |
| 9 | -- | -- | Jul 54 | Dec 57 | -- | -- | -- | -- | -- |
| 11 | Aug 48 | -- | Oct 52 | -- | -- | Aug 62 | -- | -- | -- |
| 18 | Nov 48 | Jul 57 | -- | Apr 57 | -- | -- | -- | Feb 67 | -- |
| 19 | -- | Oct 50 | Nov 52 | -- | Oct 59 | Jun 62 | Aug 65 | Sep 68 | -- |

TABLE VIII (continued)

| Indicator No. | $D_1$ | $D_2$ | $D_3$ | $D_4$ | $D_5$ | $D_6$ | $D_7$ | $D_8$ | $D_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 39 | -- | -- | Apr 54 | Nov 57 | -- | -- | -- | -- | -- |
| 40 | -- | Jun 51 | May 54 | Jan 58 | -- | -- | -- | -- | -- |
| 44 | -- | -- | -- | Oct 57 | -- | -- | -- | -- | -- |
| 48 | Oct 49 | Jun 51 | -- | Feb 57 | Apr 60 | -- | May 65 | Aug 66 | -- |
| 50 | -- | Nov 49 | Oct 53 | Oct 56 | May 58 | Mar 62 | Apr 65 | Jul 67 | -- |
| 54 | Dec 48 | -- | Jan 54 | May 58 | -- | -- | Aug 64 | Jun 67 | -- |
| 55 | Dec 48 | -- | -- | Jan 58 | Dec 59 | -- | -- | -- | -- |
| 56 | -- | -- | Feb 54 | Dec 57 | Jul 59 | -- | -- | -- | -- |
| 57 | -- | -- | -- | Nov 57 | -- | -- | -- | -- | -- |
| 60 | Mar 49 | -- | Jul 53 | Jan 58 | Jan 60 | -- | -- | -- | -- |
| 61 | Jan 49 | -- | Sep 53 | Dec 57 | -- | -- | -- | Sep 67 | -- |
| 62 | -- | -- | -- | -- | Apr 60 | -- | -- | Jun 66 | -- |
| 64 | -- | Mar 52 | Oct 54 | Dec 57 | Sep 59 | -- | -- | -- | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 65 | -- | -- | -- | Feb 58 | Oct 59 | -- | -- | -- | -- |
| 67 | -- | -- | Oct 53 | -- | Feb 60 | -- | -- | -- | -- |
| 68 | -- | -- | -- | Oct 56 | Apr 59 | -- | -- | -- | -- |
| 69 | -- | Jun 51 | -- | May 57 | Sep 59 | -- | -- | -- | -- |
| 70 | -- | -- | Nov 54 | Aug 57 | Apr 60 | -- | -- | Jun 67 | -- |
| 75 | -- | Jan 51 | Dec 53 | Jul 57 | Apr 59 | -- | -- | May 66 | -- |
| 76 | -- | Jul 52 | Jan 55 | -- | -- | -- | -- | -- | -- |
| 85 | -- | Oct 51 | Dec 53 | Sep 57 | -- | -- | -- | Jul 67 | Apr 69 |
| 94 | Aug 48 | -- | Dec 52 | Aug 57 | Apr 59 | Mar 62 | -- | Jun 66 | -- |

TABLE IX

SPECIFIC CYCLE D-POINTS

USING THE SHORT TREND

| Indicator No | $D_3$ | $D_4$ | $D_5$ | $D_6$ | $D_7$ | $D_8$ | $D_9$ |
|---|---|---|---|---|---|---|---|
| 1 | -- | -- | Apr 60 | -- | -- | May 66 | -- |
| 2 | -- | Sep 57 | Jun 60 | -- | -- | Apr 68 | -- |
| 3 | -- | Jul 57 | -- | -- | -- | Oct 66 | -- |
| 4 | -- | Jul 57 | Dec 60 | -- | Mar 65 | Mar 67 | -- |
| 5 | Apr 54 | Dec 58 | -- | -- | -- | Jun 67 | -- |
| 9 | Mar 54 | Jul 59 | -- | -- | -- | Dec 67 | -- |
| 10 | -- | Jul 57 | -- | -- | -- | -- | -- |
| 11 | -- | Mar 58 | -- | Jul 62 | -- | -- | -- |
| 12 | -- | -- | Aug 61 | -- | -- | -- | -- |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | Jun 53 | Jul 58 | Apr 60 | -- | -- | Dec 67 | -- |
| 14 | Sep 53 | Jul 57 | -- | -- | -- | Sep 67 | -- |
| 15 | Sep 53 | May 58 | Jun 61 | -- | -- | Sep 67 | -- |
| 18 | Aug 53 | May 57 | -- | -- | -- | Feb 67 | -- |
| 19 | -- | -- | Oct 59 | Jun 62 | Sep 65 | Sep 68 | -- |
| 36 | May 53 | Mar 58 | Nov 59 | -- | -- | Dec 67 | -- |
| 37 | -- | Aug 58 | -- | -- | -- | Apr 68 | -- |
| 38 | Jan 54 | -- | Jul 60 | -- | -- | Apr 68 | -- |
| 39 | Mar 54 | Dec 57 | -- | -- | -- | Nov 68 | -- |
| 40 | Mar 54 | Jan 58 | May 60 | -- | -- | Nov 67 | -- |
| 41 | -- | Sep 57 | -- | -- | -- | Sep 67 | -- |
| 42 | Mar 54 | Jun 57 | -- | -- | -- | Sep 67 | -- |
| 44 | -- | Feb 58 | -- | -- | -- | -- | -- |
| 48 | -- | Feb 57 | May 60 | -- | May 65 | Aug 66 | -- |
| 50 | Dec 53 | Nov 56 | May 58 | Mar 62 | Apr 65 | Jul 67 | -- |

TABLE IX (continued)

| Indicator No. | $D_3$ | $D_4$ | $D_5$ | $D_6$ | $D_7$ | $D_8$ | $D_9$ |
|---|---|---|---|---|---|---|---|
| 54 | Aug 53 | Jul 58 | Feb 60 | Dec 61 | Oct 64 | May 67 | -- |
| 55 | -- | -- | Apr 60 | Aug 62 | -- | -- | -- |
| 56 | -- | -- | Mar 60 | -- | -- | -- | -- |
| 57 | -- | Jan 58 | Sep 59 | -- | -- | Apr 68 | -- |
| 60 | May 53 | Feb 58 | Mar 60 | -- | -- | -- | -- |
| 61 | Jun 53 | Jan 58 | -- | -- | -- | -- | -- |
| 62 | -- | -- | May 60 | -- | -- | Jun 66 | -- |
| 64 | Feb 54 | Jan 58 | Jan 60 | Oct 62 | -- | Feb 67 | -- |
| 65 | Feb 54 | Mar 58 | Mar 60 | Oct 62 | -- | -- | -- |
| 67 | -- | -- | -- | -- | -- | -- | -- |
| 68 | May 53 | Oct 56 | Jul 59 | -- | -- | -- | -- |
| 69 | -- | May 57 | Dec 59 | -- | -- | -- | -- |
| 70 | Oct 54 | Oct 57 | Jun 60 | -- | -- | Jun 67 | -- |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 75 | -- | Jul 57 | Apr 59 | -- | -- | May 66 | -- |
| 76 | Jan 55 | -- | -- | -- | -- | -- | -- |
| 81 | -- | May 58 | Sep 59 | Jan 63 | May 64 | -- | -- |
| 82 | -- | Jun 58 | -- | -- | -- | Dec 66 | -- |
| 85 | Aug 53 | Sep 57 | -- | -- | -- | Jul 67 | -- |
| 92 | May 53 | -- | Nov 59 | -- | -- | Jan 68 | -- |
| 94 | -- | Aug 57 | Jun 59 | Mar 62 | -- | Jun 66 | -- |

TABLE X

SPECIFIC CYCLE E-POINTS

| Indicator No. | $E_1$ | $E_2$ | $E_3$ | $E_4$ | $E_5$ | $E_6$ | $E_7$ | $E_8$ |
|---|---|---|---|---|---|---|---|---|
| 1 | Jan 49 | Oct 51 | Aug 53 | Apr 58 | Feb 60 | -- | Jul 64 | May 66 |
| 2 | Apr 48 | Apr 51 | Jan 55 | Sep 57 | Nov 60 | Aug 62 | Mar 65 | May 68 |
| 3 | Sep 49 | Jul 51 | Oct 53 | Nov 57 | May 60 | Sep 62 | Jul 64 | May 66 |
| 4 | May 49 | Mar 52 | Oct 54 | Oct 57 | Nov 60 | Nov 62 | Feb 65 | Apr 67 |
| 5 | Nov 49 | Jul 52 | Apr 54 | Mar 59 | Apr 60 | Aug 62 | Dec 64 | Jun 67 |
| 9 | Jan 50 | May 51 | Jun 54 | Oct 57 | Dec 60 | -- | Sep 64 | Dec 67 |
| 10 | May 49 | Aug 51 | Apr 54 | Jan 57 | Jul 60 | Dec 62 | -- | Mar 67 |
| 11 | Nov 47 | -- | May 53 | Dec 56 | Dec 60 | Sep 62 | Apr 65 | Jun 67 |
| 12 | -- | -- | Nov 54 | Nov 57 | -- | Aug 62 | Apr 64 | Sep 67 |
| 13 | -- | -- | Apr 54 | Nov 57 | Dec 60 | Sep 62 | Apr 64 | Oct 67 |
| 14 | -- | -- | Apr 54 | Aug 57 | Jan 60 | Oct 62 | -- | Apr 68 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 15 | -- | -- | Sep 53 | Jul 58 | Jul 61 | Sep 62 | Aug 65 | Sep 67 |
| 18 | Jul 49 | Jul 51 | May 54 | Mar 58 | Oct 59 | Sep 62 | -- | Apr 68 |
| 19 | -- | -- | -- | Sep 56 | Nov 59 | -- | Nov 66 | Nov 68 |
| 36 | Dec 49 | Jul 51 | Sep 53 | Nov 57 | Dec 60 | Nov 62 | Apr 64 | Dec 67 |
| 37 | -- | -- | Nov 54 | Dec 58 | May 60 | Oct 62 | -- | Mar 68 |
| 38 | -- | -- | Mar 54 | Jan 58 | Nov 60 | Nov 62 | -- | Oct 67 |
| 39 | Nov 49 | Mar 52 | May 54 | Jan 58 | May 60 | -- | Jul 67 | Dec 68 |
| 40 | -- | Apr 51 | Jun 54 | Feb 57 | May 60 | -- | -- | Oct 67 |
| 41 | -- | -- | Apr 54 | Apr 58 | Jan 61 | Jun 62 | Oct 64 | Nov 66 |
| 42 | -- | -- | Apr 54 | Aug 57 | Feb 61 | - -- | Nov 64 | Aug 67 |
| 44 | May 49 | Oct 51 | Feb 54 | Aug 57 | Jul 60 | Jan 63 | -- | Sep 67 |
| 48 | Sep 49 | Nov 51 | Jan 54 | Feb 57 | May 60 | -- | -- | -- |

TABLE X (continued)

| Indicator No. | $E_1$ | $E_2$ | $E_3$ | $E_4$ | $E_5$ | $E_6$ | $E_7$ | $E_8$ |
|---|---|---|---|---|---|---|---|---|
| 50 | -- | Nov 49 | Mar 55 | Jan 57 | Feb 60 | May 62 | Sep 64 | Sep 67 |
| 54 | -- | Jan 49 | Oct 53 | Jul 58 | Mar 60 | Jan 62 | Sep 64 | May 67 |
| 55 | Jan 49 | Aug 51 | Jul 54 | Nov 57 | Mar 60 | Oct 62 | Nov 64 | Mar 67 |
| 56 | May 49 | Aug 51 | Oct 53 | Oct 57 | May 60 | Oct 62 | Jul 64 | Aug 67 |
| 57 | -- | Jul 51 | Oct 53 | Oct 57 | May 60 | Sep 62 | Jul 64 | Aug 67 |
| 58 | Jun 49 | -- | Aug 54 | May 58 | Dec 59 | Aug 63 | Jan 65 | Feb 67 |
| 60 | Apr 49 | -- | Mar 54 | Dec 57 | Oct 60 | -- | Oct 64 | Aug 67 |
| 61 | Nov 49 | -- | Sep 53 | Dec 57 | Nov 60 | -- | Oct 64 | Aug 67 |
| 62 | Oct 49 | -- | Aug 54 | Aug 58 | Nov 61 | Sep 62 | Nov 64 | Jun 66 |
| 64 | Aug 49 | Jan 52 | May 54 | Dec 57 | Nov 59 | Nov 62 | -- | May 68 |
| 65 | Nov 49 | Oct 51 | Jun 54 | Apr 58 | Nov 59 | Nov 62 | -- | -- |
| 67 | Apr 51 | Oct 53 | -- | Aug 57 | Oct 59 | -- | -- | May 66 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 68 | Mar 49 | Jul 51 | Sep 53 | Sep 56 | Mar 59 | Mar 62 | -- | Jan 68 |
| 69 | Nov 49 | Apr 51 | -- | Jun 57 | Sep 59 | Jul 62 | Aug 64 | Jan 66 |
| 70 | Dec 49 | -- | Apr 53 | Nov 57 | Aug 60 | Feb 62 | Sep 65 | Dec 67 |
| 75 | Apr 49 | -- | Jan 54 | Aug 57 | Feb 60 | Jul 63 | May 65 | Dec 66 |
| 76 | Jun 50 | Jul 52 | Dec 54 | Jun 58 | Aug 61 | Feb 64 | Jun 65 | May 68 |
| 81 | -- | -- | Apr 54 | Jun 58 | Feb 60 | Dec 62 | Jun 65 | -- |
| 82 | -- | -- | Jan 51 | May 58 | Oct 59 | Aug 63 | Jan 66 | Nov 67 |
| 85 | Feb 49 | Aug 51 | Apr 54 | Sep 57 | May 60 | Oct 62 | -- | Feb 67 |
| 92 | -- | -- | Apr 54 | Feb 58 | Sep 60 | Aug 62 | Jan 64 | Nov 67 |
| 94 | Feb 49 | Mar 53 | -- | Aug 57 | Jan 60 | May 62 | Jul 66 | Dec 67 |

TABLE XI

SPECIFIC CYCLE T-POINTS

| Indicator No. | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ | $T_8$ | $T_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | -- | Nov 51 | -- | Oct 58 | Oct 60 | -- | -- | -- | -- |
| 2 | Jul 48 | Jun 51 | Feb 55 | Nov 57 | Jan 61 | Oct 62 | -- | Jun 68 | -- |
| 3 | -- | Apr 52 | Feb 54 | Feb 58 | Jul 60 | -- | -- | Jan 67 | -- |
| 4 | -- | Jun 52 | -- | Dec 57 | Mar 61 | Jan 63 | Apr 65 | Jul 67 | -- |
| 5 | -- | -- | Jul 54 | May 59 | Jun 60 | Oct 62 | -- | Aug 67 | -- |
| 9 | -- | -- | Oct 54 | Aug 58 | Mar 61 | -- | Nov 64 | -- | -- |
| 10 | Jul 48 | Dec 51 | Jul 54 | Feb 58 | Nov 60 | -- | -- | Jun 67 | -- |
| 11 | -- | -- | -- | -- | -- | Nov 62 | -- | -- | -- |
| 12 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 13 | -- | -- | Jun 54 | Feb 58 | Feb 61 | Oct 62 | -- | Oct 67 | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 14 | -- | -- | Aug 54 | Jul 58 | Oct 60 | Dec 62 | -- | Jul 68 | -- |
| 15 | -- | -- | -- | -- | -- | May 63 | Nov 65 | Mar 68 | -- |
| 18 | Apr 50 | Aug 52 | Aug 54 | Jun 58 | Sep 60 | Jan 63 | -- | Jul 68 | -- |
| 19 | May 50 | Dec 52 | -- | Dec 56 | Jan 61 | Apr 63 | Nov 65 | Feb 69 | -- |
| 36 | Jun 49 | -- | Aug 54 | Mar 58 | Mar 61 | -- | -- | -- | -- |
| 37 | -- | -- | Feb 55 | Mar 59 | Nov 60 | May 63 | -- | Jul 68 | -- |
| 38 | -- | -- | Jul 55 | Mar 59 | Mar 61 | -- | -- | May 68 | -- |
| 39 | -- | -- | Sep 54 | Apr 58 | Mar 61 | -- | -- | -- | -- |
| 40 | -- | Jan 52 | Sep 54 | Aug 58 | -- | -- | Nov 64 | Aug 66 | -- |
| 41 | -- | -- | Nov 54 | Aug 58 | -- | -- | -- | -- | -- |
| 42 | -- | -- | Jan 55 | Jul 58 | May 61 | -- | Jan 65 | Dec 67 | -- |
| 44 | -- | Jan 52 | Apr 54 | May 58 | -- | -- | -- | -- | -- |
| 48 | -- | May 52 | Apr 54 | May 57 | Mar 61 | -- | -- | Mar 67 | -- |
| 50 | Oct 47 | Feb 50 | Jun 55 | Apr 57 | May 60 | Aug 62 | Jun 65 | Oct 67 | -- |
| 54 | Oct 47 | Mar 50 | Feb 54 | -- | May 60 | -- | Dec 64 | Sep 67 | -- |

TABLE XI (continued)

| Indicator No. | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ | $T_8$ | $T_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 55 | Jul 49 | -- | Sep 54 | Apr 58 | Dec 60 | -- | -- | -- | -- |
| 56 | Aug 49 | Dec 51 | Sep 54 | Jul 58 | Sep 60 | Dec 62 | Jul 64 | Oct 67 | -- |
| 57 | May 48 | Nov 51 | Sep 54 | Jun 58 | Aug 60 | Dec 62 | Jul 64 | Oct 67 | -- |
| 58 | Sep 49 | -- | Oct 54 | Jul 58 | -- | -- | Mar 65 | -- | -- |
| 60 | Jun 49 | -- | Jun 54 | Sep 58 | Jan 61 | -- | Jan 65 | -- | -- |
| 62 | Aug 50 | -- | Nov 54 | Sep 58 | Jan 62 | Mar 63 | -- | Aug 66 | -- |
| 64 | -- | Apr 52 | Aug 54 | Aug 58 | Dec 59 | -- | -- | -- | -- |
| 65 | -- | Feb 52 | Jan 55 | Aug 58 | Jul 60 | Jan 63 | -- | -- | -- |
| 67 | -- | -- | -- | -- | Jan 60 | -- | -- | -- | -- |
| 68 | -- | Sep 51 | Dec 53 | Sep 57 | Dec 59 | Jul 62 | -- | -- | -- |
| 69 | -- | Sep 51 | -- | Aug 57 | Dec 59 | Sep 62 | -- | -- | -- |
| 70 | Feb 50 | -- | Jun 53 | -- | -- | -- | -- | Feb 68 | -- |
| 75 | Apr 49 | Apr 51 | Apr 54 | Mar 58 | May 60 | Sep 63 | Jul 65 | Apr 67 | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 76 | Aug 50 | Jan 53 | Aug 55 | Aug 58 | Nov 61 | -- | -- | Aug 68 | -- |
| 81 | -- | -- | Jun 54 | -- | May 60 | Feb 63 | Mar 66 | -- | -- |
| 82 | -- | -- | Mar 55 | Jul 58 | -- | -- | -- | -- | -- |
| 85 | -- | Nov 51 | Mar 54 | Dec 57 | Jul 60 | Nov 62 | -- | -- | -- |
| 92 | -- | -- | Jul 54 | Jun 58 | Feb 61 | -- | -- | Jul 68 | -- |

TABLE XII

SPECIFIC CYCLE S-POINTS USING THE LONG TREND

| Indicator No. | $S_1$ | $S_2$ | $S_3$ | $S_4$ | $S_5$ | $S_6$ | $S_7$ | $S_8$ | $S_9$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Apr 49 | Feb 52 | Oct 53 | Oct 58 | Apr 61 | Jan 63 | -- | Jul 66 | -- |
| 2 | Aug 50 | -- | Mar 55 | Nov 57 | Jan 61 | -- | -- | Jul 68 | -- |
| 3 | -- | Apr 52 | Feb 54 | Feb 58 | Aug 60 | -- | -- | Jul 67 | -- |
| 4 | -- | Jun 52 | -- | Dec 57 | -- | Feb 63 | May 65 | Dec 67 | -- |
| 5 | Feb 50 | Jan 52 | Jul 54 | Jun 59 | Mar 61 | Nov 62 | -- | Sep 67 | -- |
| 9 | -- | -- | Oct 54 | Nov 59 | Mar 61 | -- | Nov 64 | Mar 68 | -- |
| 11 | Sep 49 | -- | Jan 54 | -- | -- | Apr 63 | Jun 65 | Apr 68 | -- |
| 18 | Nov 49 | Nov 51 | Aug 54 | Jun 58 | Sep 60 | Jan 63 | -- | -- | -- |
| 19 | -- | Mar 51 | Dec 52 | Dec 56 | Jan 61 | Dec 63 | Nov 65 | Feb 69 | -- |
| 39 | -- | -- | Sep 54 | -- | May 61 | -- | -- | -- | -- |
| 40 | -- | Jan 52 | Sep 54 | Aug 58 | Aug 60 | -- | -- | Feb 68 | -- |
| 44 | -- | -- | -- | Sep 58 | Oct 60 | -- | -- | -- | -- |
| 48 | Dec 49 | May 52 | -- | May 57 | Mar 61 | Mar 63 | -- | Mar 67 | -- |
| 50 | -- | Feb 50 | May 55 | Apr 57 | May 60 | Aug 62 | Jun 65 | Oct 67 | -- |
| 54 | -- | Mar 50 | Aug 54 | Jan 59 | Nov 60 | Jun 63 | Jan 65 | Sep 67 | -- |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 55 | Jul 49 | -- | -- | Jan 59 | Dec 60 | Sep 63 | -- | -- | -- |
| 56 | -- | -- | Sep 54 | Jul 58 | Apr 61 | Dec 62 | Oct 64 | -- | -- |
| 57 | -- | -- | -- | -- | May 61 | Dec 62 | -- | -- | -- |
| 60 | Jun 49 | -- | Jun 54 | Sep 58 | Mar 61 | -- | -- | Oct 68 | -- |
| 61 | Jan 50 | -- | May 54 | -- | Jan 61 | Dec 61 | Apr 65 | -- | -- |
| 62 | -- | Aug 50 | -- | Sep 58 | Jan 62 | Apr 63 | -- | Aug 66 | -- |
| 64 | -- | May 52 | Feb 55 | Sep 58 | Jun 61 | Jul 63 | -- | -- | -- |
| 65 | -- | -- | -- | Oct 58 | Jul 61 | Aug 63 | -- | -- | -- |
| 67 | -- | Oct 51 | Jan 54 | -- | Sep 60 | -- | -- | Dec 66 | -- |
| 68 | -- | -- | -- | Sep 57 | Jan 60 | Jul 62 | -- | -- | -- |
| 69 | -- | Oct 51 | -- | Sep 57 | May 61 | Apr 63 | Oct 64 | Jul 66 | -- |
| 70 | Feb 50 | -- | Apr 55 | Feb 58 | Nov 60 | Apr 62 | -- | Apr 68 | -- |
| 75 | Apr 49 | Apr 51 | Apr 54 | Mar 58 | May 60 | May 62 | Jul 65 | Apr 67 | -- |
| 76 | -- | Mar 53 | Aug 55 | May 59 | Nov 61 | -- | -- | Aug 68 | -- |
| 85 | -- | Dec 51 | Sep 54 | Sep 58 | Mar 61 | -- | -- | -- | -- |
| 94 | Jun 49 | -- | Nov 53 | Apr 58 | Jul 60 | -- | -- | Oct 66 | -- |

TABLE XIII

SPECIFIC CYCLE S-POINTS

USING THE SHORT TREND

| Indicator No. | $S_3$ | $S_4$ | $S_5$ | $S_6$ | $S_7$ | $S_8$ | $S_9$ |
|---|---|---|---|---|---|---|---|
| 1 | Oct 53 | Oct 58 | Apr 61 | Jan 63 | -- | Jul 66 | -- |
| 2 | Mar 55 | Nov 57 | Jan 61 | Nov 62 | -- | Jul 68 | -- |
| 3 | Feb 54 | Feb 58 | Aug 60 | -- | -- | Jul 67 | -- |
| 4 | -- | Dec 57 | -- | Feb 63 | May 65 | Dec 67 | -- |
| 5 | Jul 54 | Jun 59 | Mar 61 | Dec 62 | -- | Sep 67 | -- |
| 9 | Sep 54 | Nov 59 | Mar 61 | -- | -- | Mar 68 | -- |
| 10 | Jul 54 | Dec 58 | Dec 60 | -- | -- | Jul 67 | -- |
| 11 | Jan 54 | Aug 58 | -- | Apr 63 | Jun 65 | -- | -- |
| 12 | -- | -- | -- | Apr 63 | Sep 65 | Mar 68 | -- |
| 13 | Jul 54 | Oct 58 | Mar 61 | Mar 63 | -- | Mar 68 | -- |
| 14 | Aug 54 | Jul 58 | Oct 60 | -- | -- | Jul 68 | -- |
| 15 | Jan 55 | Sep 58 | Oct 61 | Apr 63 | Dec 64 | Mar 68 | -- |
| 18 | Aug 54 | Jun 58 | Sep 60 | Jan 63 | -- | -- | -- |
| 19 | -- | Dec 56 | Jan 61 | Dec 63 | Nov 65 | Feb 69 | -- |
| 36 | Sep 54 | Oct 58 | Mar 61 | Jan 63 | -- | Mar 68 | -- |
| 37 | Aug 53 | Mar 59 | Dec 60 | Jun 63 | -- | -- | -- |
| 38 | Aug 55 | -- | Aug 61 | Sep 63 | -- | -- | -- |
| 39 | Sep 54 | Apr 58 | Jul 61 | -- | -- | May 69 | -- |

TABLE XIII (continued)

| Indicator No. | $S_3$ | $S_4$ | $S_5$ | $S_6$ | $S_7$ | $S_8$ | $S_9$ |
|---|---|---|---|---|---|---|---|
| 40 | Oct 54 | Aug 58 | Jul 60 | -- | -- | Feb 68 | -- |
| 41 | -- | Aug 58 | Mar 61 | Sep 62 | -- | Apr 68 | -- |
| 42 | Jan 55 | Jul 58 | Jun 61 | -- | -- | Apr 68 | -- |
| 44 | Mar 54 | Jun 58 | Oct 60 | -- | -- | -- | -- |
| 48 | -- | May 57 | Mar 61 | Mar 63 | -- | Mar 67 | -- |
| 50 | May 55 | Apr 57 | May 60 | Aug 62 | Jun 65 | Oct 67 | -- |
| 54 | Jun 54 | Jan 59 | Nov 60 | Jul 63 | Jun 65 | Sep 67 | -- |
| 55 | Sep 54 | -- | Dec 60 | Nov 64 | -- | -- | -- |
| 56 | Sep 54 | Jul 58 | Apr 61 | Dec 62 | Oct 64 | -- | -- |
| 57 | Sep 54 | Jul 58 | May 61 | Dec 62 | Oct 64 | Jul 68 | -- |
| 60 | Jul 54 | Sep 58 | Jan 61 | -- | -- | Oct 67 | -- |
| 61 | Jun 54 | -- | Jan 61 | Dec 61 | -- | Nov 67 | -- |
| 62 | -- | -- | Jan 62 | Apr 63 | -- | Aug 66 | -- |
| 64 | Feb 55 | Sep 58 | Jun 61 | Aug 63 | -- | Jun 67 | -- |
| 65 | Mar 55 | Oct 58 | Jul 61 | Aug 63 | -- | -- | -- |
| 67 | -- | -- | -- | -- | -- | Dec 66 | -- |
| 68 | Dec 53 | Sep 57 | Jan 60 | Jul 62 | -- | -- | -- |
| 69 | -- | Sep 57 | May 61 | Apr 63 | Nov 64 | Aug 66 | -- |
| 70 | Mar 55 | Feb 58 | Oct 60 | Apr 62 | -- | Mar 68 | -- |
| 75 | Apr 54 | Mar 58 | May 60 | May 62 | -- | Apr 67 | -- |
| 76 | Aug 55 | May 59 | Nov 61 | -- | -- | Aug 68 | -- |

TABLE XIII (continued)

| Indicator No. | $S_3$ | $S_4$ | $S_5$ | $S_6$ | $S_7$ | $S_8$ | $S_9$ |
|---|---|---|---|---|---|---|---|
| 81 | Jun 54 | Aug 58 | May 60 | Mar 63 | Oct 64 | -- | -- |
| 82 | -- | Jul 58 | -- | -- | Jun 64 | Mar 67 | -- |
| 85 | Sep 54 | Sep 58 | Mar 61 | Dec 62 | -- | -- | -- |
| 92 | Aug 54 | -- | Feb 61 | Jun 63 | -- | -- | -- |
| 94 | Nov 53 | Apr 58 | Jul 60 | Aug 62 | -- | Oct 66 | -- |

TABLE XIV

FREQUENCY DISTRIBUTION OF REFERENCE POINT IN RELATION TO THE MEANS OF EACH DISTRIBUTION

| | | -18 AND BEYOND | -13 to -17 | -8 to -12 | -3 to -7 | MEAN -2 to MEAN +2 | +3 to +7 | +8 to +12 | +13 to +17 | +18 AND BEYOND |
|---|---|---|---|---|---|---|---|---|---|---|
| Long Trend | $I_1$ | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| | $I_2$ | 2 | 0 | 1 | 6 | 6 | 11 | 1 | 0 | 0 |
| | $I_3$ | 0 | 1 | 4 | 1 | 3 | 1 | 3 | 1 | 0 |
| | $I_4$ | 0 | 0 | 2 | 6 | 5 | 2 | 4 | 0 | 0 |
| | $I_5$ | 1 | 0 | 2 | 5 | 2 | 2 | 4 | 0 | 0 |
| | $I_6$ | 0 | 0 | 0 | 2 | 2 | 2 | 0 | 0 | 0 |
| | $I_7$ | 0 | 0 | 1 | 4 | 6 | 3 | 1 | 0 | 0 |
| | $I_8$ | 0 | 1 | 0 | 2 | 6 | 3 | 2 | 0 | 0 |
| | $I_9$ | 0 | 3 | 0 | 1 | 1 | 2 | 1 | 2 | 0 |
| TOTAL I LONG TREND | | 3 | 5 | 10 | 27 | 34 | 26 | 16 | 3 | 0 |
| Short Trend | $I_3$ | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| | $I_4$ | 0 | 0 | 6 | 7 | 18 | 7 | 3 | 1 | 0 |
| | $I_5$ | 1 | 0 | 3 | 3 | 4 | 6 | 1 | 2 | 0 |
| | $I_6$ | 0 | 0 | 1 | 2 | 6 | 5 | 0 | 0 | 0 |
| | $I_7$ | 0 | 2 | 0 | 2 | 10 | 4 | 2 | 0 | 0 |
| | $I_8$ | 0 | 1 | 1 | 3 | 8 | 4 | 0 | 1 | 0 |
| | $I_9$ | 0 | 3 | 0 | 1 | 1 | 2 | 2 | 2 | 0 |
| TOTAL I SHORT TREND | | 1 | 6 | 11 | 18 | 49 | 28 | 8 | 6 | 0 |

TABLE XIV (continued)

| | | -18 AND BEYOND | -13 to -17 | -8 to -12 | -3 to -7 | MEAN -2 to MEAN +2 | +3 to +7 | +8 to +12 | +13 to +17 | +18 AND BEYOND |
|---|---|---|---|---|---|---|---|---|---|---|
| | $C_1$ | 0 | 0 | 0 | 3 | 8 | 4 | 3 | 0 | 0 |
| | $C_2$ | 2 | 0 | 1 | 6 | 12 | 4 | 1 | 3 | 1 |
| | $C_3$ | 1 | 1 | 2 | 4 | 8 | 8 | 1 | 1 | 1 |
| | $C_4$ | 1 | 2 | 6 | 5 | 14 | 7 | 5 | 4 | 1 |
| | $C_5$ | 1 | 1 | 4 | 9 | 12 | 8 | 8 | 0 | 0 |
| | $C_6$ | 0 | 0 | 3 | 8 | 14 | 10 | 2 | 1 | 0 |
| | $C_7$ | 0 | 1 | 1 | 16 | 6 | 6 | 3 | 3 | 1 |
| | $C_8$ | 0 | 3 | 9 | 7 | 5 | 6 | 8 | 1 | 3 |
| | $C_9$ | 0 | 0 | 0 | 10 | 20 | 5 | 1 | 0 | 0 |
| TOTAL C POINTS | | 5 | 8 | 26 | 68 | 99 | 58 | 31 | 13 | 7 |
| Long Trend | $B_1$ | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 0 | 0 |
| | $B_2$ | 1 | 2 | 0 | 3 | 7 | 13 | 2 | 0 | 0 |
| | $B_3$ | 0 | 2 | 6 | 1 | 5 | 9 | 5 | 0 | 0 |
| | $B_4$ | 0 | 1 | 3 | 8 | 9 | 5 | 2 | 1 | 0 |
| | $B_5$ | 0 | 1 | 0 | 5 | 5 | 6 | 1 | 1 | 0 |
| | $B_6$ | 0 | 0 | 1 | 2 | 2 | 4 | 0 | 0 | 0 |
| | $B_7$ | 0 | 0 | 0 | 5 | 6 | 5 | 0 | 0 | 0 |
| | $B_8$ | 0 | 1 | 1 | 6 | 7 | 5 | 4 | 0 | 0 |
| | $B_9$ | 0 | 2 | 0 | 0 | 1 | 7 | 0 | 0 | 0 |
| TOTAL B LONG TREND | | 1 | 9 | 12 | 30 | 45 | 54 | 15 | 2 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Short Trend | $B_3$ | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 0 | 0 |
| | $B_4$ | 0 | 1 | 2 | 9 | 15 | 12 | 3 | 2 | 0 |
| | $B_5$ | 0 | 1 | 4 | 3 | 11 | 6 | 1 | 2 | 1 |
| | $B_6$ | 0 | 0 | 1 | 4 | 7 | 6 | 0 | 0 | 0 |
| | $B_7$ | 0 | 0 | 0 | 7 | 8 | 4 | 2 | 0 | 0 |
| | $B_8$ | 0 | 2 | 1 | 14 | 6 | 10 | 2 | 2 | 1 |
| | $B_9$ | 1 | 1 | 0 | 0 | 2 | 10 | 0 | 0 | 0 |
| TOTAL B SHORT TREND | | 1 | 5 | 8 | 39 | 53 | 48 | 8 | 6 | 2 |
| | $P_1$ | 0 | 1 | 2 | 0 | 2 | 2 | 0 | 1 | 0 |
| | $P_2$ | 2 | 0 | 1 | 3 | 10 | 5 | 2 | 2 | 0 |
| | $P_3$ | 0 | 1 | 1 | 6 | 7 | 8 | 1 | 0 | 0 |
| | $P_4$ | 0 | 2 | 1 | 10 | 12 | 8 | 3 | 1 | 1 |
| | $P_5$ | 1 | 0 | 4 | 5 | 10 | 8 | 3 | 1 | 0 |
| | $P_6$ | 0 | 0 | 1 | 3 | 13 | 3 | 0 | 0 | 1 |
| | $P_7$ | 0 | 0 | 1 | 5 | 5 | 3 | 0 | 1 | 0 |
| | $P_8$ | 0 | 0 | 8 | 5 | 5 | 3 | 4 | 2 | 0 |
| | $P_9$ | 0 | 1 | 0 | 1 | 7 | 3 | 0 | 0 | 0 |
| TOTAL PEAKS | | 3 | 5 | 19 | 38 | 71 | 43 | 13 | 8 | 2 |

TABLE XIV (continued)

| | | -18 AND BEYOND | -13 to -17 | -8 to -12 | -3 to -7 | MEAN -2 to MEAN +2 | +3 to +7 | +8 to +12 | +13 to +17 | +18 AND BEYOND |
|---|---|---|---|---|---|---|---|---|---|---|
| Long Trend | $D_1$ | 0 | 0 | 0 | 3 | 6 | 1 | 1 | 0 | 0 |
| | $D_2$ | 1 | 0 | 1 | 1 | 6 | 2 | 3 | 0 | 0 |
| | $D_3$ | 0 | 2 | 1 | 3 | 6 | 4 | 2 | 1 | 0 |
| | $D_4$ | 0 | 0 | 0 | 2 | 4 | 10 | 7 | 1 | 1 |
| | $D_5$ | 1 | 0 | 0 | 4 | 6 | 6 | 1 | 0 | 0 |
| | $D_6$ | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 |
| | $D_7$ | 0 | 0 | 0 | 1 | 3 | 1 | 0 | 0 | 0 |
| | $D_8$ | 0 | 0 | 1 | 4 | 2 | 6 | 1 | 1 | 1 |
| | $D_9$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL LONG TREND | | 2 | 2 | 3 | 18 | 36 | 31 | 15 | 3 | 2 |
| Short Trend | $D_3$ | 0 | 0 | 1 | 8 | 4 | 7 | 1 | 1 | 0 |
| | $D_4$ | 0 | 1 | 2 | 9 | 9 | 8 | 3 | 1 | 1 |
| | $D_5$ | 1 | 0 | 2 | 6 | 9 | 6 | 1 | 1 | 1 |
| | $D_6$ | 0 | 0 | 0 | 3 | 3 | 3 | 0 | 0 | 0 |
| | $D_7$ | 0 | 0 | 1 | 1 | 2 | 2 | 0 | 0 | 0 |
| | $D_8$ | 0 | 3 | 2 | 4 | 9 | 4 | 4 | 2 | 0 |
| TOTAL D SHORT TREND | | 1 | 4 | 8 | 31 | 36 | 30 | 9 | 5 | 2 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $E_1$ | 1 | 1 | 0 | 7 | 9 | 9 | 1 | 0 | 1 |
| $E_2$ | 2 | 0 | 0 | 4 | 13 | 3 | 2 | 0 | 2 |
| $E_3$ | 0 | 0 | 3 | 10 | 18 | 6 | 4 | 0 | 0 |
| $E_4$ | 0 | 2 | 5 | 6 | 17 | 10 | 3 | 2 | 0 |
| $E_5$ | 0 | 1 | 4 | 10 | 12 | 13 | 1 | 3 | 0 |
| $E_6$ | 0 | 0 | 2 | 5 | 23 | 1 | 3 | 1 | 0 |
| $E_7$ | 0 | 1 | 3 | 14 | 5 | 5 | 1 | 1 | 2 |
| $E_8$ | 0 | 4 | 2 | 6 | 14 | 8 | 5 | 2 | 1 |
| TOTAL E POINTS | 3 | 9 | 19 | 62 | 111 | 55 | 20 | 9 | 6 |
| $T_1$ | 2 | 0 | 3 | 0 | 4 | 2 | 3 | 2 | 0 |
| $T_2$ | 2 | 0 | 1 | 3 | 8 | 4 | 2 | 1 | 0 |
| $T_3$ | 0 | 1 | 1 | 9 | 16 | 5 | 3 | 0 | 0 |
| $T_4$ | 0 | 2 | 3 | 6 | 13 | 9 | 3 | 0 | 0 |
| $T_5$ | 0 | 0 | 4 | 8 | 8 | 12 | 0 | 2 | 0 |
| $T_6$ | 0 | 0 | 0 | 6 | 10 | 3 | 1 | 0 | 0 |
| $T_7$ | 0 | 0 | 2 | 3 | 4 | 2 | 3 | 0 | 0 |
| $T_8$ | 0 | 2 | 2 | 4 | 6 | 4 | 5 | 1 | 0 |
| TOTAL T | 4 | 5 | 16 | 39 | 69 | 41 | 20 | 6 | 0 |

TABLE XIV (continued)

| | | -18 AND BEYOND | -13 to -17 | -8 to -12 | -3 to -7 | MEAN -2 to MEAN +2 | +3 to +7 | +8 to +12 | +13 to +17 | +18 AND BEYOND |
|---|---|---|---|---|---|---|---|---|---|---|
| Long Trend | $S_1$ | 0 | 0 | 0 | 5 | 3 | 3 | 1 | 0 | 0 |
| | $S_2$ | 2 | 1 | 0 | 2 | 4 | 6 | 1 | 1 | 0 |
| | $S_3$ | 1 | 0 | 2 | 4 | 9 | 2 | 3 | 1 | 0 |
| | $S_4$ | 1 | 2 | 2 | 4 | 4 | 10 | 2 | 1 | 0 |
| | $S_5$ | 0 | 0 | 3 | 6 | 11 | 7 | 2 | 0 | 0 |
| | $S_6$ | 0 | 1 | 2 | 2 | 7 | 6 | 2 | 0 | 0 |
| | $S_7$ | 0 | 0 | 0 | 4 | 4 | 2 | 0 | 0 | 0 |
| | $S_8$ | 0 | 2 | 2 | 3 | 4 | 5 | 2 | 2 | 0 |
| TOTAL S LONG TREND | | 4 | 6 | 11 | 30 | 46 | 41 | 13 | 5 | 0 |
| Short Trend | $S_3$ | 0 | 0 | 4 | 4 | 18 | 6 | 3 | 0 | 0 |
| | $S_4$ | 1 | 2 | 2 | 5 | 13 | 10 | 3 | 1 | 0 |
| | $S_5$ | 0 | 0 | 4 | 7 | 16 | 9 | 3 | 0 | 0 |
| | $S_6$ | 0 | 1 | 2 | 4 | 12 | 10 | 3 | 0 | 0 |
| | $S_7$ | 0 | 0 | 1 | 4 | 1 | 5 | 1 | 0 | 0 |
| | $S_8$ | 0 | 2 | 3 | 6 | 6 | 9 | 4 | 1 | 1 |
| TOTAL S SHORT TREND | | 1 | 5 | 16 | 30 | 66 | 49 | 17 | 2 | 1 |

| TOTAL ALL POINTS | 29 | 69 | 159 | 430 | 715 | 504 | 185 | 68 | 22 |
|---|---|---|---|---|---|---|---|---|---|
| % | 1.32 | 3.16 | 7.29 | 19.71 | 32.78 | 23.10 | 8.48 | 3.11 | 1.00 |

TABLE XV

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, FIRST EPISODE,

1947-1949, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p (1-v) | |
| $I_1$(S) | -- | -- | -- | -- | -- | -- | -- |
| $I_1$(L) | 20 | 21 | 2.12 | 0.927 | 0.103 | 0.096 | Sep 48 |
| $C_1$ | 21 | 20 | 4.70 | .843 | 0.500 | 0.422 | Aug 48 |
| $B_1$(S) | -- | -- | -- | -- | -- | -- | -- |
| $B_1$(L) | 21 | 21 | 6.18 | 0.794 | 0.172 | 0.137 | Sep 48 |
| $P_1$ | 23 | 21 | 9.07 | 0.741 | 0.276 | 0.205 | Sep 48 |

TABLE XV (contd.)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_1$(S) | -- | -- | -- | -- | -- | -- | -- |
| $D_1$(L) | 24 | 24 | 4.03 | 0.870 | 0.379 | 0.330 | Dec 48 |
| $E_1$ | 31 | 31 | 7.43 | 0.760 | 0.853 | .648 | Jul 49 |
| $T_1$ | 31 | 29 | 11.24 | 0.649 | 0.516 | 0.335 | May 49 |
| $S_1$(S) | -- | -- | -- | -- | -- | -- | -- |
| $S_1$(L) | 34 | 34 | 4.86 | 0.848 | 0.387 | 0.328 | Oct 49 |

TABLE XVI

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, SECOND EPISODE,

1950 - 1952, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_2(S)$ | -- | -- | -- | -- | -- | -- | -- |
| $I_2(L)$ | 43 | 41 | 7.22 | 0.639 | 0.871 | 0.557 | May 50 |
| $C_2$ | 46 | 46 | 10.17 | 0.609 | 0.882 | 0.537 | Oct 50 |
| $B_2(S)$ | -- | -- | -- | -- | -- | -- | -- |
| $B_2(L)$ | 52 | 49 | 7.28 | 0.740 | 0.903 | 0.668 | Jan 51 |
| $P_2$ | 52 | 52 | 9.61 | 0.690 | 0.806 | 0.556 | Apr 51 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_2$(S) | -- | -- | -- | -- | -- | -- | -- |
| $D_2$(L) | 56 | 55 | 7.98 | 0.743 | 0.452 | 0.336 | Jul 51 |
| $E_2$ | 56 | 57 | 10.71 | 0.588 | 0.765 | 0.450 | Sep 51 |
| $T_2$ | 60 | 60 | 8.72 | 0.719 | 0.677 | 0.487 | Dec 51 |
| $S_2$(S) | -- | -- | -- | -- | -- | -- | -- |
| $S_2$(L) | 60 | 58 | 9.89 | 0.588 | 0.548 | 0.322 | Oct 51 |

TABLE XVII

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, THIRD EPISODE, 1952-1954, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_3(S)$ | 78 | 78 | 1.00 | 0.966 | 0.065 | 0.062 | Jun 53 |
| $I_3(L)$ | 63 | 62 | 9.17 | 0.563 | 0.452 | 0.254 | Feb 52 |
| $C_3$ | 71 | 71 | 8.19 | 0.672 | 0.794 | 0.534 | Nov 52 |
| $B_3(S)$ | 85 | 85 | 2.64 | 0.912 | 0.136 | 0.124 | Jan 54 |
| $B_3(L)$ | 77 | 74 | 8.21 | 0.672 | 0.903 | 0.607 | Feb 53 |
| $P_3$ | 78 | 79 | 5.95 | 0.780 | 0.727 | 0.567 | Jul 53 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_3(S)$ | 85 | 83 | 5.78 | 0.825 | 0.500 | 0.413 | Nov 53 |
| $D_3(L)$ | 84 | 84 | 7.73 | 0.733 | 0.613 | 0.449 | Dec 53 |
| $E_3$ | 88 | 88 | 5.55 | 0.821 | 0.911 | 0.748 | Apr 54 |
| $T_3$ | 92 | 93 | 5.34 | 0.838 | 0.814 | 0.682 | Sep 54 |
| $S_3(S)$ | 92 | 92 | 5.79 | 0.819 | 0.795 | 0.651 | Aug 54 |
| $S_3(L)$ | 92 | 91 | 7.26 | 0.780 | 0.710 | 0.554 | Aug 54 |

TABLE XVIII

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, FOURTH EPISODE,

1955-1958, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_4(S)$ | 101 | 102 | 5.84 | 0.757 | 0.955 | 0.723 | Jun 55 |
| $I_4(L)$ | 98 | 100 | 6.35 | 0.833 | 0.613 | 0.511 | Apr 55 |
| $C_4$ | 111 | 109 | 9.04 | 0.762 | 1.000 | 0.762 | Jan 56 |
| $B_4(S)$ | 118 | 117 | 5.86 | 0.817 | 1.000 | 0.817 | Sep 56 |
| $B_4(L)$ | 116 | 116 | 6.32 | 0.850 | 0.935 | 0.795 | Aug 56 |
| $P_4$ | 121 | 120 | 7.50 | 0.817 | 0.884 | 0.722 | Dec 56 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_4$(S) | 133 | 131 | 6.90 | 0.856 | 0.773 | 0.661 | Nov 57 |
| $D_4$(L) | 130 | 124 | 7.72 | 0.807 | 0.806 | 0.651 | Apr 57 |
| $E_4$ | 131 | 131 | 6.54 | 0.848 | 1.000 | 0.848 | Nov 57 |
| $T_4$ | 138 | 137 | 6.21 | 0.859 | 0.837 | 0.719 | May 58 |
| $S_4$(S) | 139 | 138 | 7.13 | 0.845 | 0.841 | 0.711 | Jun 58 |
| $S_4$(L) | 140 | 138 | 8.17 | 0.826 | 0.839 | 0.693 | Jun 58 |

TABLE XIX

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, FIFTH EPISODE,

1958-1961, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_5(S)$ | 141 | 141 | 8.95 | 0.771 | 0.455 | 0.350 | Sep 58 |
| $I_5(L)$ | 140 | 140 | 8.41 | 0.790 | 0.516 | 0.408 | Aug 58 |
| $C_5$ | 146 | 146 | 7.24 | 0.804 | 0.956 | 0.768 | Feb 59 |
| $B_5(S)$ | 151 | 150 | 7.68 | 0.767 | 0.659 | 0.506 | Jun 59 |
| $B_5(L)$ | 149 | 148 | 7.26 | 0.773 | 0.613 | 0.474 | Aug 59 |
| $P_5$ | 153 | 153 | 7.05 | 0.786 | 0.744 | 0.585 | Sep 59 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_5$(S) | 159 | 158 | 7.65 | 0.717 | 0.614 | 0.440 | Feb 60 |
| $D_5$(L) | 155 | 155 | 6.57 | 0.788 | 0.581 | 0.458 | Nov 59 |
| $E_5$ | 161 | 162 | 6.59 | 0.787 | 0.978 | 0.769 | Jun 60 |
| $T_5$ | 167 | 166 | 6.00 | 0.793 | 0.791 | 0.627 | Oct 60 |
| $S_5$(S) | 171 | 169 | 5.28 | 0.830 | 0.886 | 0.736 | Jan 61 |
| $S_5$(L) | 169 | 169 | 5.34 | 0.870 | 0.935 | 0.814 | Jan 61 |

TABLE XX

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, SIXTH EPISODE

1961-1963, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_6(S)$ | 179 | 178 | 4.49 | 0.879 | 0.318 | 0.280 | Oct 61 |
| $I_6(L)$ | 177 | 175 | 4.51 | 0.871 | 0.194 | 0.169 | Jul 61 |
| $C_6$ | 177 | 178 | 5.77 | 0.820 | 0.844 | 0.692 | Oct 61 |
| $B_6(S)$ | 185 | 183 | 4.63 | 0.860 | 0.409 | 0.352 | Mar 62 |
| $B_6(L)$ | 184 | 182 | 4.59 | 0.865 | 0.290 | 0.251 | Feb 62 |
| $P_6$ | 187 | 186 | 5.36 | 0.838 | 0.488 | 0.409 | Jun 62 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_6(S)$ | 187 | 186 | 4.18 | 0.851 | 0.205 | 0.174 | Jun 62 |
| $D_6(L)$ | 185 | 185 | 2.51 | 0.916 | 0.129 | 0.118 | May 62 |
| $E_6$ | 189 | 190 | 5.00 | 0.821 | 0.778 | 0.639 | Oct 62 |
| $T_6$ | 192 | 193 | 3.44 | 0.873 | 0.465 | 0.406 | Jan 63 |
| $S_6(S)$ | 195 | 193 | 5.53 | 0.770 | 0.727 | 0.560 | Jan 63 |
| $S_6(L)$ | 194 | 193 | 6.10 | 0.746 | 0.645 | 0.481 | Jan 63 |

TABLE XXI

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, SEVENTH EPISODE,

1963-1965, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_7$(S) | 202 | 202 | 6.12 | 0.745 | 0.455 | 0.339 | Oct 63 |
| $I_7$(L) | 204 | 205 | 5.02 | 0.833 | 0.484 | 0.403 | Jan 64 |
| $C_7$ | 204 | 207 | 7.93 | 0.727 | 0.822 | 0.598 | Mar 64 |
| $B_7$(S) | 208 | 209 | 4.64 | 0.822 | 0.477 | 0.392 | May 64 |
| $B_7$(L) | 211 | 211 | 4.41 | 0.848 | 0.516 | 0.438 | Jul 64 |
| $P_7$ | 210 | 211 | 6.32 | 0.742 | 0.349 | 0.259 | Jul 64 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_7$(S) | 220 | 218 | 5.65 | 0.823 | 0.136 | 0.112 | Feb 65 |
| $D_7$(L) | 220 | 219 | 4.55 | 0.866 | 0.161 | 0.140 | Mar 65 |
| $E_7$ | 215 | 218 | 9.30 | 0.668 | 0.711 | 0.475 | Feb 65 |
| $T_7$ | 218 | 219 | 5.99 | 0.873 | 0.465 | 0.406 | Mar 65 |
| $S_7$(S) | 219 | 218 | 5.32 | 0.787 | 0.273 | 0.215 | Feb 65 |
| $S_7$(L) | 221 | 220 | 4.38 | 0.838 | 0.323 | 0.271 | Apr 65 |

TABLE XXII

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, EIGHTH EPISODE, 1965-1967, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_8(S)$ | 224 | 223 | 6.45 | 0.693 | 0.409 | 0.283 | Jul 65 |
| $I_8(L)$ | 225 | 224 | 7.05 | 0.629 | 0.452 | 0.284 | Aug 65 |
| $C_8$ | 234 | 234 | 9.86 | 0.635 | 0.933 | 0.593 | Jun 66 |
| $B_8(S)$ | 232 | 233 | 7.61 | 0.683 | 0.864 | 0.590 | May 66 |
| $B_8(L)$ | 231 | 232 | 6.04 | 0.712 | 0.774 | 0.551 | Apr 66 |
| $P_8$ | 238 | 239 | 8.05 | 0.712 | 0.628 | 0.447 | Nov 66 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_8(S)$ | 248 | 247 | 8.08 | 0.721 | 0.636 | 0.459 | Jul 67 |
| $D_8(L)$ | 245 | 243 | 7.94 | 0.669 | 0.516 | 0.345 | Mar 67 |
| $E_8$ | 249 | 248 | 7.90 | 0.767 | 0.933 | 0.716 | Aug 67 |
| $T_8$ | 250 | 251 | 7.79 | 0.757 | 0.558 | 0.422 | Nov 67 |
| $S_8(S)$ | 252 | 250 | 8.34 | 0.739 | 0.727 | 0.537 | Oct 67 |
| $S_8(L)$ | 250 | 249 | 8.97 | 0.691 | 0.645 | 0.446 | Sep 67 |

TABLE XXIII

BUSINESS CYCLE REFERENCE POINTS FOR CANADA, NINTH EPISODE,

FROM 1967, UPON ALTERNATIVE ASSUMPTIONS AS TO TREND

| | Numerical Date of Central Reference Point | | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|---|
| | Median | Mean | (Months) | (1-v) | (p) | W=p(1-v) | |
| $I_9(S)$ | 257 | 252 | 11.53 | 0.602 | 0.250 | 0.151 | Dec 67 |
| $I_9(L)$ | 254 | 251 | 10.29 | 0.588 | 0.323 | 0.190 | Nov 67 |
| $C_9$ | 263 | 263 | 3.71 | 0.872 | 0.800 | 0.698 | Nov 68 |
| $B_9(S)$ | 266 | 263 | 7.95 | 0.735 | 0.318 | 0.234 | Feb 69 |
| $B_9(L)$ | 267 | 263 | 8.98 | 0.710 | 0.323 | 0.229 | Nov 68 |
| $P_9$ | 267 | 265 | 5.99 | 0.770 | 0.279 | 0.215 | Jan 69 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $D_9(S)$ | -- | -- | -- | -- | -- | -- | -- |
| $D_9(L)$ | -- | -- | -- | -- | -- | -- | -- |
| $T_9$ | -- | -- | -- | -- | -- | -- | -- |
| $S_9(S)$ | -- | -- | -- | -- | -- | -- | -- |
| $S_9(L)$ | -- | -- | -- | -- | -- | -- | -- |

# TABLE XXIV

## SPECIFIC RELATIVE AMPLITUDES AT B AND S POINTS IN STANDARD DEVIATION UNITS USING THE LONG TREND

| Indicator No. | $B_1$ (+) | $S_1$ (-) | $B_2$ (+) | $S_2$ (-) | $B_3$ (+) | $S_3$ (-) | $B_4$ (+) | $S_4$ (-) | $B_5$ (+) | $S_5$ (-) | $B_6$ (+) | $S_6$ (-) | $B_7$ (+) | $S_7$ (-) | $B_8$ (+) | $S_8$ (-) | $B_9$ (+) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.294 | 0.470 | 0.570 | 1.211 | --- | 1.951 | 2.390 | 0.017 | 1.830 | 1.201 | --- | 1.773 | --- | --- | 0.515 | 0.591 | 1.184 |
| 2 | 3.878 | 0.874 | --- | --- | 1.300 | 0.836 | 1.628 | 0.450 | 1.786 | 1.726 | 1.105 | --- | 1.934 | --- | 1.732 | 1.263 | --- |
| 3 | --- | --- | 3.054 | 1.125 | 1.397 | 2.566 | 0.865 | 2.355 | --- | 1.263 | 0.799 | --- | 1.455 | --- | 1.453 | 0.676 | 0.360 |
| 4 | --- | --- | 2.442 | 0.661 | 0.641 | --- | 1.744 | 2.599 | 0.369 | --- | --- | 2.113 | 0.219 | 0.481 | 1.007 | 0.905 | --- |
| 5 | --- | 1.946 | 0.245 | 0.502 | 1.232 | 0.169 | 1.516 | 3.340 | --- | 1.970 | 0.185 | 1.564 | 0.896 | --- | 2.163 | 0.488 | --- |
| 9 | --- | --- | 0.866 | --- | 2.284 | 0.508 | 1.528 | 1.544 | --- | 2.080 | --- | --- | 0.189 | 0.484 | 0.814 | 0.040 | --- |
| 10 | --- | --- | 1.037 | 1.111 | 1.532 | 0.305 | 2.607 | 1.233 | --- | 2.537 | --- | --- | --- | --- | 1.529 | 0.379 | --- |
| 11 | --- | 1.897 | 0.711 | --- | 1.175 | 1.826 | 1.399 | --- | 2.268 | --- | 0.856 | 1.369 | --- | 1.118 | 0.783 | 0.084 | --- |
| 18 | --- | 1.776 | 0.734 | 0.763 | --- | 2.023 | 1.114 | 2.790 | --- | 1.570 | 0.093 | 0.241 | --- | --- | 0.948 | --- | --- |
| 19 | --- | --- | 1.127 | 1.084 | 3.148 | 0.489 | 2.039 | 1.183 | 2.156 | 1.169 | 0.670 | 1.534 | 0.959 | 0.252 | 1.402 | 0.905 | --- |
| 36 | --- | --- | 1.511 | --- | 1.354 | 0.458 | 1.870 | 0.567 | --- | 2.133 | --- | 1.198 | --- | 0.374 | 1.031 | 0.023 | --- |
| 39 | --- | --- | 2.178 | --- | 2.715 | 2.056 | 2.085 | 1.138 | 0.253 | 1.025 | --- | --- | --- | --- | 1.161 | --- | --- |
| 40 | --- | --- | 1.490 | 1.081 | 1.855 | 1.832 | 1.986 | 0.883 | --- | 1.327 | --- | --- | 1.512 | --- | 1.448 | 0.526 | --- |
| 44 | --- | --- | 1.801 | --- | 1.363 | --- | 2.058 | 0.811 | --- | 1.687 | --- | --- | --- | --- | --- | --- | --- |
| 50 | --- | --- | 1.090 | 0.622 | 2.017 | 1.452 | 1.288 | 1.472 | 0.125 | 1.499 | 0.875 | 0.841 | 2.500 | 0.106 | 2.352 | 1.836 | --- |
| 54 | 0.590 | --- | --- | 1.491 | 2.995 | 0.233 | 1.317 | 1.157 | --- | 1.480 | --- | 1.356 | 0.430 | 0.777 | 0.898 | 0.418 | --- |
| 55 | 0.465 | 1.027 | 1.854 | --- | 1.358 | --- | --- | 0.508 | --- | 1.641 | --- | 1.239 | --- | --- | --- | --- | --- |
| 56 | --- | --- | 2.398 | --- | 1.392 | 0.409 | 2.038 | 0.496 | 0.137 | 1.489 | --- | 1.710 | --- | 1.105 | 0.684 | --- | --- |
| 57 | --- | --- | 1.706 | --- | 1.609 | --- | 2.091 | --- | --- | 1.548 | --- | 1.591 | --- | --- | --- | --- | --- |
| 60 | --- | 1.161 | 1.124 | --- | 1.465 | 1.719 | 3.055 | 0.995 | 0.518 | 1.933 | --- | --- | 1.223 | --- | 1.622 | 0.002 | 0.370 |
| 61 | --- | 1.858 | 1.284 | --- | 1.796 | 1.665 | 2.630 | --- | --- | 1.736 | --- | 1,952 | 1.033 | 0.035 | 1.384 | --- | 0.662 |
| 62 | --- | --- | --- | 1.254 | 1.229 | --- | 1.847 | 0.132 | --- | 2.123 | --- | 1.753 | 1.260 | --- | 1.488 | 0.838 | 2.949 |
| 64 | --- | --- | 2.083 | 0.158 | 1.609 | 0.335 | 2.387 | 1.459 | 0.237 | 1.749 | --- | 1.429 | --- | --- | 0.442 | --- | --- |
| 65 | --- | --- | 1.470 | --- | 1.742 | --- | 2.108 | 1.116 | 0.291 | 1.659 | --- | 1.682 | --- | --- | --- | --- | --- |
| 67 | --- | --- | --- | 0.489 | 0.235 | 0.351 | 1.177 | --- | 1.563 | 0.370 | --- | --- | --- | --- | --- | 1.506 | --- |
| 68 | --- | --- | 1.782 | --- | 1.559 | --- | 2.420 | 1.849 | 1.422 | 1.280 | --- | 1.631 | --- | --- | --- | --- | 1.204 |
| 69 | --- | --- | 0.956 | 0.343 | 0.649 | --- | 2.068 | 0.411 | 1.574 | 1.280 | --- | 1.583 | --- | 1.533 | --- | 0.861 | 2.048 |
| 70 | --- | 2.145 | 1.957 | --- | 2.390 | 1.117 | 2.462 | 1.270 | 0.556 | 1.538 | --- | 2.151 | 1.495 | --- | 1.210 | 1.432 | --- |
| 75 | --- | 1.772 | 1.703 | 0.839 | 1.502 | 0.859 | 2.517 | 1.433 | 0.750 | 2.235 | 0.427 | 1.023 | 1.615 | 0.327 | 1.194 | 0.646 | 1.279 |
| 76 | --- | --- | 2.192 | 1.146 | 2.322 | 1.401 | 0. 110 | 1.980 | 0.415 | 1.258 | --- | --- | 1.945 | --- | 0.780 | 1.048 | --- |
| 85 | --- | --- | 1.474 | 0.225 | 1.525 | 1.163 | 2.221 | 1.203 | --- | 2.354 | --- | --- | --- | --- | 1.857 | --- | 0.319 |
| 94 | --- | 1.969 | 1.912 | --- | --- | 1.837 | 1.874 | 1.717 | 0.194 | 1.521 | 0.852 | 1.287 | --- | --- | 1.370 | 0.921 | --- |

## TABLE XXV

## SPECIFIC RELATIVE AMPLITUDES AT B AND S POINTS IN STANDARD DEVIATION UNITS USING THE SHORT TREND.

| Indicator No. | $B_3$ (+) | $S_3$ (-) | $B_4$ (+) | $S_4$ (-) | $B_5$ (+) | $S_5$ (-) | $B_6$ (+) | $S_6$ (-) | $B_7$ (+) | $S_7$ (-) | $B_8$ (+) | $S_8$ (-) | $B_9$ (+) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | --- | 1.589 | 2.105 | 0.124 | 1.556 | 1.268 | --- | 1.786 | --- | --- | 0.435 | 0.560 | 1.274 |
| 2 | --- | 0.234 | 2.289 | 0.544 | 1.730 | 2.468 | 0.759 | 0.453 | 1.886 | --- | 1.795 | 1.052 | 0.197 |
| 3 | --- | 2.296 | 1.218 | 2.567 | --- | 1.503 | 0.782 | --- | 1.523 | --- | 1.550 | 0.784 | 0.538 |
| 4 | --- | --- | 2.214 | 3.139 | 1.183 | --- | --- | 2.058 | 0.795 | 0.243 | 1.477 | 1.623 | --- |
| 5 | 0.548 | 0.811 | 1.447 | 3.422 | --- | 1.892 | 0.377 | 1.451 | 1.097 | --- | 2.345 | 0.526 | --- |
| 9 | --- | 2.513 | 2.187 | 1.363 | --- | 1.959 | --- | --- | 1.359 | --- | --- | 0.867 | --- |
| 10 | 0.314 | 1.433 | 2.556 | 1.078 | --- | 2.236 | 0.442 | --- | --- | --- | 1.729 | 0.555 | --- |
| 11 | --- | 2.016 | 1.738 | 0.235 | 2.419 | --- | 0.680 | 1.929 | --- | 1.488 | 0.989 | --- | 1.809 |
| 12 | --- | --- | 2.219 | --- | 1.547 | --- | --- | 1.839 | --- | 1.436 | 0.993 | 0.056 | 1.393 |
| 13 | --- | 1.436 | 2.618 | 0.216 | 0.722 | 1.300 | --- | 1.831 | --- | --- | 1.271 | 0.509 | 0.539 |
| 14 | --- | 1.455 | 1.915 | 1.913 | --- | 1.655 | --- | --- | --- | --- | 1.610 | 1.234 | --- |
| 15 | --- | 1.397 | 1.669 | 1.079 | 1.409 | 0.759 | --- | 2.118 | --- | 1.105 | 2.146 | 1.579 | 1.189 |
| 18 | --- | 1.582 | 1.202 | 2.811 | --- | 1.780 | --- | 0.510 | --- | --- | 0.800 | --- | --- |
| 19 | --- | --- | 2.164 | 1.479 | 2.627 | 1.240 | 0.965 | 1.674 | 1.261 | 0.220 | 1.703 | 1.251 | --- |
| 36 | --- | 1.612 | 2.439 | 0.414 | 0.364 | 2.232 | --- | 0.958 | 0.527 | --- | 1.628 | 0.598 | --- |
| 37 | --- | 1.267 | 2.349 | 1.244 | --- | 1.460 | --- | 0.895 | --- | --- | 1.724 | --- | --- |
| 38 | 0.274 | 1.293 | 2.387 | --- | --- | 1.549 | --- | 1.059 | --- | --- | 1.677 | --- | --- |
| 39 | --- | 2.972 | 2.829 | 1.154 | 0.853 | 0.743 | --- | --- | --- | --- | 1.607 | 0.877 | --- |
| 40 | 2.580 | 2.017 | 1.940 | 0.767 | 0.517 | 0.996 | --- | --- | 2.029 | --- | 1.704 | 0.813 | --- |
| 41 | --- | --- | 1.972 | 1.335 | --- | 1.514 | 0.454 | 0.312 | 1.943 | --- | 1.889 | 0.577 | --- |
| 42 | --- | 1.969 | 2.126 | 1.650 | --- | 1.113 | --- | --- | 1.568 | --- | 2.164 | 0.749 | --- |
| 44 | --- | 2.036 | 3.041 | 0.813 | --- | 1.613 | --- | --- | --- | --- | --- | --- | --- |
| 48 | --- | --- | 1.616 | 0.946 | 2.215 | 2.491 | 0.296 | 1.880 | 2.090 | --- | 1.654 | 1.831 | 1.717 |
| 50 | --- | 1.088 | 1.546 | 1.306 | 0.232 | 1.538 | 0.800 | 0.946 | 2.399 | 0.193 | 2.308 | 1.828 | --- |
| 54 | --- | 1.708 | 2.477 | 1.191 | 1.250 | 1.471 | 0.269 | 1.534 | 1.733 | 0.741 | 1.533 | 1.310 | --- |
| 55 | --- | 1.402 | 1.893 | --- | 2.071 | 1.914 | 0.543 | 1.282 | --- | --- | 1.389 | --- | --- |
| 56 | --- | 1.835 | 2.613 | 0.218 | 0.883 | 1.119 | --- | 1.440 | --- | 0.877 | 0.944 | --- | --- |
| 57 | 1.634 | 2.713 | 0.282 | 0.604 | 1.215 | --- | 1.277 | --- | 0.753 | 1.192 | 0.346 | --- | --- |
| 60 | --- | 1.886 | 2.786 | 0.773 | 0.610 | 1.581 | --- | --- | 1.198 | --- | 1.495 | 0.074 | 0.225 |
| 61 | --- | 2.126 | 2.612 | --- | --- | 1.475 | --- | 1.684 | 1.263 | --- | 1.397 | 0.423 | 0.343 |
| 62 | --- | --- | 1.831 | --- | --- | 1.708 | --- | 1.354 | 1.582 | --- | 1.628 | 0.779 | 2.843 |
| 64 | --- | 1.622 | 2.866 | 1.505 | 1.054 | 1.421 | 0.497 | 1.060 | --- | --- | 1.012 | 0.114 | --- |
| 65 | --- | 1.499 | 2.660 | 1.071 | 1.377 | 1.269 | 0.470 | 1.401 | --- | --- | 0.571 | --- | --- |

TABLE XXV (continued)

| Indicator No. | $B_3$ (+) | $S_3$ (-) | $B_4$ (+) | $S_4$ (-) | $B_5$ (+) | $S_5$ (-) | $B_6$ (+) | $S_6$ (-) | $B_7$ (+) | $S_7$ (-) | $B_8$ (+) | $S_8$ (-) | $B_9$ (+) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 67 | --- | --- | 1.085 | --- | 1.926 | --- | --- | --- | --- | --- | --- | 1.560 | --- |
| 68 | --- | 1.365 | 2.602 | 2.340 | 2.631 | 0.915 | --- | 1.271 | --- | --- | --- | --- | 1.512 |
| 69 | --- | --- | 1.770 | 0.401 | 2.329 | 0.748 | 0.466 | 1.140 | --- | 1.298 | --- | 0.940 | 1.528 |
| 70 | --- | 1.492 | 2.661 | 1.190 | 0.890 | 1.282 | --- | 1.949 | 1.879 | --- | 1.299 | 1.841 | --- |
| 75 | --- | 1.934 | 2.110 | 1.481 | 0.926 | 2.030 | 0.989 | 0.597 | 2.207 | --- | 1.514 | 0.768 | 0.878 |
| 76 | 2.593 | 1.199 | 0.261 | 1.883 | 0.540 | 1.183 | --- | --- | 2.033 | --- | 0.764 | 1.175 | --- |
| 81 | 1.265 | 1.016 | 2.335 | 2.737 | --- | 0.924 | 1.967 | 0.442 | 2.615 | 0.261 | 1.116 | 1.008 | 1.882 |
| 82 | --- | --- | 3.021 | 0.459 | 2.176 | --- | 1.906 | --- | 1.167 | 0.953 | 1.004 | 1.553 | --- |
| 85 | --- | 1.610 | 2.100 | 0.999 | 0.249 | 1.965 | --- | 0.742 | --- | 0.509 | 1.923 | --- | --- |
| 92 | --- | 1.401 | 2.414 | --- | --- | 1.507 | --- | 1.414 | --- | --- | 1.542 | --- | --- |
| 94 | --- | 1.579 | 2.028 | 1.665 | 0.273 | 1.495 | 0.190 | 1.385 | --- | --- | 1.396 | 0.957 | --- |

TABLE XXVI

SUMMARY OF RELATIVE AMPLITUDES

| | Mean Relative Amplitude $\overline{A}$ | Standard Deviation s | Index of concentration $c=(1-\frac{\alpha}{\overline{A}})$ | Index of Coverage p | Index of Reliability of Evidence p.c. | Date of Reference Point |
|---|---|---|---|---|---|---|
| $B_1$ | 1.557 | 1.5900 | 0 | 0.172 | 0 | Sep 48 |
| $S_1$ | -1.691 | 0.5744 | 0.660 | 0.387 | 0.256 | Oct 49 |
| $B_2$ | 1.527 | 0.6430 | 0.579 | 0.903 | 0.523 | Jan 51 |
| $S_2$ | -0.830 | 0.3889 | 0.532 | 0.548 | 0.291 | Oct 51 |
| $B_3(L)$ | 1.634 | 0.6544 | 0.600 | 0.903 | 0.541 | Feb 53 |
| $B_3(S)$ | 1.262 | 1.0856 | 0.140 | 0.136 | 0.019 | Jan 54 |

TABLE XXVI, (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| $S_3$(L) | -1.148 | 0.7297 | 0.364 | 0.710 | 0.259 | Aug 54 |
| $S_3$(S) | -1.609 | 0.4892 | 0.696 | 0.795 | 0.553 | Aug 54 |
| $B_4$(L) | 1.885 | 0.6024 | 0.681 | 0.935 | 0.636 | Aug 56 |
| $B_4$(S) | 2.151 | 0.5640 | 0.738 | 1.000 | 0.738 | Sep 56 |

| | Mean Relative Amplitude $\bar{A}$ | Standard Deviation s | Index of Concentration $c=(1-\frac{s^{\alpha}}{\bar{A}})$ | Index of Coverage p | Index of Reliability of Evidence p.c | Date of Reference Points |
|---|---|---|---|---|---|---|
| $S_4(L)$ | -1.290 | 0.7980 | 0.381 | 0.839 | 0.320 | Jun 58 |
| $S_4(S)$ | -1.275 | 0.8557 | 0.329 | 0.841 | 0.277 | Jun 58 |
| $B_5(L)$ | 0.908 | 0.7676 | 0.155 | 0.613 | 0.095 | Apr 59 |
| $B_5(S)$ | 1.308 | 0.7601 | 0.419 | 0.659 | 0.276 | Jun 59 |
| $S_5(L)$ | -1.613 | 0.4432 | 0.725 | 0.935 | 0.678 | Jan 61 |
| $S_5(S)$ | -1.509 | 0.4488 | 0.703 | 0.886 | 0.623 | Jan 61 |

TABLE XXVI, (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| $B_6(L)$ | 0.651 | 0.3426 | 0.474 | 0.290 | 0.137 | Feb 62 |
| $B_6(S)$ | 0.754 | 0.4836 | 0.359 | 0.409 | 0.147 | Mar 62 |
| $S_6(L)$ | -1.482 | 0.4308 | 0.709 | 0.645 | 0.458 | Jan 63 |
| $S_6(S)$ | -1.302 | 0.5089 | 0.609 | 0.727 | 0.443 | Jan 63 |
| $B_7(L)$ | 1.244 | 0.6510 | 0.477 | 0.516 | 0.246 | Jul 64 |
| $B_7(S)$ | 1.606 | 0.5355 | 0.667 | 0.477 | 0.318 | May 64 |

| | Mean Relative Amplitude | Standard Deviation | Index of Concentration | Index of Coverage | Index of Reliability of Evidence | Date of Reference Point |
|---|---|---|---|---|---|---|
| | $\overline{A}$ | s | $c=(1-\frac{\alpha}{\overline{A}})$ | p | p.c | |
| $S_7(L)$ | -0.599 | 0.4757 | 0.206 | 0.323 | 0.067 | Apr 65 |
| $S_7(S)$ | -0.797 | 0.4822 | 0.395 | 0.273 | 0.108 | Feb 65 |
| $B_8(L)$ | 1.250 | 0.4802 | 0.616 | 0.774 | 0.477 | Apr 66 |
| $B_8(S)$ | 1.487 | 0.4396 | 0.704 | 0.864 | 0.609 | May 66 |
| $S_8(L)$ | -0.845 | 0.5180 | 0.387 | 0.645 | 0.250 | Sep 67 |
| $S_8(S)$ | -0.920 | 0.5278 | 0.426 | 0.727 | 0.310 | Oct 67 |
| $B_9(L)$ | 1.153 | 0.8820 | 0.235 | 0.323 | 0.076 | Nov 68 |
| $B_9(S)$ | 1.142 | 0.7445 | 0.348 | 0.318 | 0.111 | Feb 69 |

chapter four

# INTERPRETATION OF THE RESULTS

Before the results reported in the previous chapter can be used to throw light on the history of fluctuations in Canada, a certain amount of interpretation and appraisal is called for. Four matters, in particular, require comment. First, it is necessary to decide whether the evidence of the "long" or the "short" trend should be preferred. Secondly, in cases where the frequency distribution of reference point indications are skewed or bimodal, a decision on the usefulness of each is needed. After these judgments have been made, the reliability of evidence for each reference cycle reference point must be assessed. And finally, when a decision has been made about the dating of the reference cycle, the evidence for the relative amplitude of fluctuations must be weighed.

## The Effect of Choice of Trend

Table XXVII shows that after the middle of the third episode the alternative estimates of I, B, D and S points differ by no more than three months except in two cases,

$D_4$ (April 1957 or November 1957) and $D_8$ (March 1967 or July 1967).

However, there is sufficient discrepancy, especially for the I and D points, to require attention. The evidence of W-values was therefore compared.

TABLE XXVII

COMPARISON OF DATES WITH ALTERNATIVE TRENDS

| Episode | No. of Months Difference Between Estimates. | | | |
|---|---|---|---|---|
| | I | B | D | S |
| 1 | - | - | - | - |
| 2 | - | - | - | - |
| 3 | 16 | 11 | 1 | 1 |
| 4 | 2 | 1 | 7 | 0 |
| 5 | 1 | 2 | 3 | 0 |
| 6 | 3 | 1 | 1 | 0 |
| 7 | 3 | 2 | 1 | 2 |
| 8 | 1 | 1 | 4 | 1 |
| 9 | 1 | 0 | - | - |

Table XXVIII sets out the values of this index for each point upon either assumption as to trend. It appears from the column "Means" as a whole that there is little difference between the reliability of evidence under either assumption. A significance test (which assumed that W-values associated with episodes three and nine are a random sample of all possible such W-values) revealed no

TABLE XXVIII

COMPARISON OF THE EVIDENCE OF SHORT AND LONG TREND
(W-values)

| Episodes | I-points S | I-points L | B-points S | B-points L | D-points S | D-points L | S-points S | S-points L | Means S | Means L |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 0.062 | 0.254 | 0.124 | 0.607 | 0.413 | 0.449 | 0.651 | 0.554 | 0.313 | 0.466 |
| 4 | 0.723 | 0.511 | 0.817 | 0.795 | 0.661 | 0.651 | 0.711 | 0.693 | 0.728 | 0.663 |
| 5 | 0.350 | 0.408 | 0.506 | 0.474 | 0.440 | 0.458 | 0.736 | 0.814 | 0.508 | 0.539 |
| 6 | 0.280 | 0.169 | 0.352 | 0.251 | 0.174 | 0.118 | 0.560 | 0.481 | 0.341 | 0.255 |
| 7 | 0.339 | 0.403 | 0.392 | 0.438 | 0.112 | 0.140 | 0.215 | 0.271 | 0.265 | 0.313 |

TABLE XXVIII, (continued)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 0.283 | | 0.590 | | 0.459 | | 0.537 | | 0.467 | | | |
| | | 0.284 | | 0.551 | | 0.345 | | 0.446 | | 0.407 | | |
| 9 | 0.151 | | 0.234 | | | | | | | | | |
| | | 0.190 | | 0.229 | | | | | | | | |
| Means | 0.313 | | 0.431 | | 0.377 | | 0.568 | | | | | |
| | | 0.317 | | 0.478 | | 0.360 | | 0.543 | | | | |

difference at the 10 per cent level for any of I, B, D or S points.

The row means are slightly more discrepant, especially in the third and sixth episodes, but no clear pattern emerges. The mean W-value is greater with the short trend in episodes four, six and eight; but greater with the long trend in episodes three, five and seven.

In some individual cases, however, there are considerable differences between the two values of W. In four instances $B_3$, $B_5$, $S_6$, and $S_8$, the value lies above 0.5 with one trend and below it with the other.

It appears from these results that there is no way of discriminating between one or the other trend in general. Given the decision (to be discussed in the third section of this chapter) to ignore evidence for which the W-value is less than 0.5; and given the fact that in all but one case ($D_4$), the means differ by no more than two months in all cases where W exceeds 0.5 under either assumption, it was decided to use that estimate for which the W-value was greater in each individual instance. In the case of $D_4$ only, where with either trend W is high, the mid-point between the two estimates (month 128, August 1957) was chosen as the reference cycle D point. The effect of these decisions is shown in Table XXIX.

## The Shape of the Frequency Distributions

In Table XXX the evidence of Table XIV is summarized. Frequency distributions in which the modal class lies more than seven months from the central class are described as "skewed" (s). Those in which bunching occurs in two, non-contiguous classes are called "bi-modal" (b). Where no one or two classes are very obviously modal, the distribution is described as "dispersed" (d).

The description of those suspect distributions for which the W-value is less than 0.5 are enclosed in parentheses. $I_4$(L) has a W-value greater than 0.5. but since $I_4$(S) has an even greater W-value, it is preferred to the former. The description of the frequency distribution of $I_4$(L) is marked with an asterisk to draw attention to this fact.

TABLE XXIX

CHOICE OF TREND FOR EACH REFERENCE POINT

| Episode | Reference point | | | |
|---|---|---|---|---|
| | I | B | D | S |
| 1* | - | - | - | - |
| 2* | Long | Long | - | - |
| 3 | - | Long | - | Short |
| 4 | Short | Short | Compromise | Short |
| 5 | - | Short | - | Long |
| 6 | - | - | - | Short |
| 7 | - | - | - | - |
| 8 | - | Short | - | Short |
| 9 | - | - | - | - |

*Long trend only available

TABLE XXX
UNSATISFACTORY FREQUENCY DISTRIBUTIONS OF REFERENCE POINT INDICATIONS

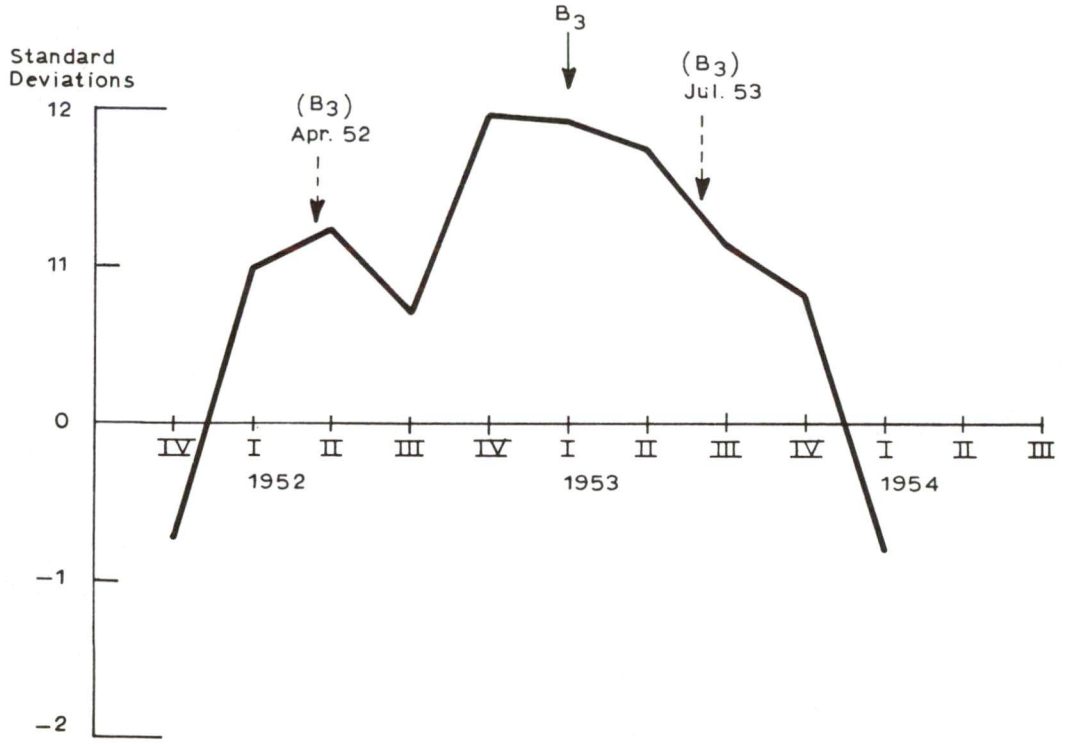
| Reference Point | Episode 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| I (L) | - | - | (d) | b* | (b) | - | - | - | (s) |
| I (S) | - | - | - | - | - | - | - | - | (d) |
| C | - | - | - | - | - | - | - | b | - |
| B (L) | - | - | b | - | - | - | - | - | - |
| B (S) | - | - | - | - | - | - | - | b | - |
| P | (d) | - | - | - | - | - | - | (b) | - |
| D (L) | - | - | - | - | - | - | - | (b) | - |
| D (S) | - | - | (b) | - | - | - | - | - | - |
| E | - | - | - | - | - | - | - | - | - |
| T | (d) | - | - | - | - | - | - | (b) | - |
| S (L) | - | - | - | - | - | - | - | - | - |
| S (S) | - | - | - | - | - | - | - | - | - |

When all bracketted and starred descriptions are omitted from consideration, three only remain: $B_3(L)$, $C_8$ and $B_8(S)$, all of which are bimodal.

In the author's study of the Australian business cycle it has been shown that bimodality in the distribution of observations for a well-authenticated reference point may result from the existence of two overlapping "waves" of

FIGURE 4

CYCLICAL COMPONENT OF QUARTERLY, REAL GNP: 1951:IV - 1954:I



activity which give rise to secondary peaks and troughs in the time-series which represent it. (See Economic Fluctuations in Australia, op.cit chapter 4, section: "The Second Episode: April 1954 to December 1956"). With this in mind the distributions of $B_3(L)$, $C_8$ and $B_8(S)$ were examined in conjunction with other evidence of economic fluctuations in the third and eighth episodes.

TABLE XXXI

FREQUENCY DISTRIBUTION OF OBSERVATIONS OF $B_3(L)$

| Class | Number of Observations | |
|---|---|---|
| Sep. 51-Jan. 52 | 2 | |
| Feb. 52-Jun. 52 | 6 | Secondary mode, Apr.52 |
| Jul. 52-Nov. 52 | 1 | |
| Dec. 52-Apr. 53 | 5 | Ref $B_3(L)$, Feb. 53 |
| May 53-Sep. 53 | 9 | Primary mode, Jul. 53 |
| Oct. 53-Feb. 54 | 5 | |

In the case of $B_3(L)$, the frequency distribution (Table XXXI) would suggest that some evidence may exist for a preliminary peak in the first half of 1952. In Figure 4 the standardized logarithmic deviation of seasonally-adjusted, quarterly, real GNP from a log-quadratic trend is plotted for the third episode. It is clear from this graph that a minor peak did in fact occur in the second quarter of 1952; that this was followed by a temporary decline of activity, and that from the third quarter of 1952 there was renewed expansion culminating in a cyclical peak during the winter of 1952-53. In view of this it seems reasonable to accept the mean of the distribution, February 1953, as the best estimate of the cyclical peak in the third episode.

The other two well-vouched reference points having a suspicious frequency distribution both lie in the eighth episode, as do three others, $P_8$, $D_8(L)$ and $T_8$, (Table XXX), the evidence for which has been rejected on other grounds.

TABLE XXXII

FREQUENCY DISTRIBUTION OF OBSERVATIONS OF $B_8(S)$

| Class | Number of Observations | |
|---|---|---|
| Dec. 64-Apr. 65 | 2 | |
| May 65-Sep. 65 | 1 | |
| Oct. 65-Feb. 66 | 14 | Primary mode, Dec. 65 |
| Mar. 66-Jul. 66 | 6 | Ref $B_8(S)$, May 66 |
| Aug. 66-Dec. 66 | 10 | Secondary mode, Oct. 66 |
| Jan. 67-May 67 | 2 | |
| Jun. 67-Nov. 67 | 2 | |

TABLE XXXIII

FREQUENCY DISTRIBUTION OF OBSERVATIONS OF $C_8$

| Class | Number of Observations | |
|---|---|---|
| Jan. 65-May 65 | 3 | |
| Jun. 65-Oct. 65 | 9 | Primary mode, Aug. 65 |
| Nov. 65-Mar. 66 | 7 | |
| Apr. 66-Aug. 66 | 5 | Ref $C_8$, Jun. 66 |
| Sep. 66-Jan. 67 | 6 | |
| Feb. 67-Jun. 67 | 8 | Secondary mode, Apr. 67 |
| Jul. 67-Nov. 67 | 1 | |
| Dec. 67- | 3 | |

Cyclical components of the monthly indicators were graphed for the eighth episode and inspected. Considerable variation was apparent. Some indicators showed B-points in 1966, some in 1967 (possibly reflecting the effect of the Centennial

Year activities) and some showed a camel-humped shape, with cyclical peaks in each year. Figure 5 displays the standardized, trend-free component of three series chosen to illustrate the diversity. Tables XXXII and XXXIII, and Figure 6 show the effect of this heterogeneous behavior upon the estimates of $B_8$ and $C_8$.

The tendency for activity to reach a trend-free peak in the eighth episode is apparent from the quarterly GNP data. A maximum seems to have been reached by the first quarter of 1966; but there are suggestions of subsidiary peaks in the fourth quarter of 1966 and again as late as the second quarter of 1967. The frequency distribution of $B_8(S)$ is roughly consistent with this, revealing modes at around December 1965 and October 1966. It would seem that the entire period from the first quarter of 1966 to the second quarter of 1967 was a high plateau of activity. However, the evidence of GNP supports the view suggested by the monthly indicators: that the highest point of this plateau occurred in the first half of 1966. For this reason, and also because the evidence for $B_8(L)$, at April 1966, is almost as good as that for $B_8(S)$, the estimate of the latter (May 1966) has been allowed to stand.

It is clear from Figure 6 that the estimate of June 1966 for $C_8$ is far more questionable. The frequency distribution (Table XXXIII) reveals two widely separated modes, at around August 1965 and April 1967; and it would appear from Figure 6 that these might correspond roughly with points of inflexion of a trend cycle occuring before cyclical peaks at the beginning of 1966 and in the first half of 1967.

Figure 7 shows a plot of centered, proportionate first differences of seasonally-adjusted, real GNP, expressed in annual percentage rates of change. It is obvious from this graph that a genuine peak of the growth-rate curve took place not in June 1966, but in the latter part of the previous year - as suggested by the primary mode of the frequency distribution. A further, secondary peak occurred in the early part of 1967, corresponding roughly with the secondary mode. The date of June 1966 for $C_8$ actually locates not a peak but a secondary trough of the growth-rate curve.

In face of these facts, the preliminary estimate of $C_8$

FIGURE 5

CYCLICAL COMPONENT OF THREE INDICATORS IN

THE EIGHTH EPISODE

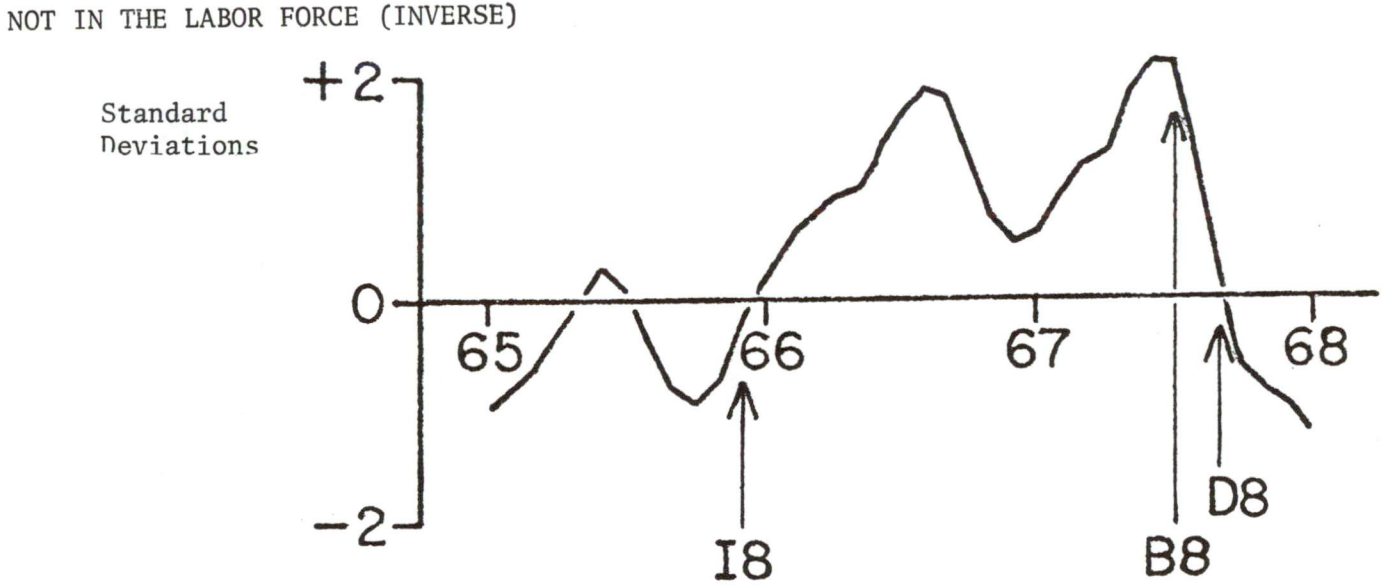


FIGURE 5 (contd.)

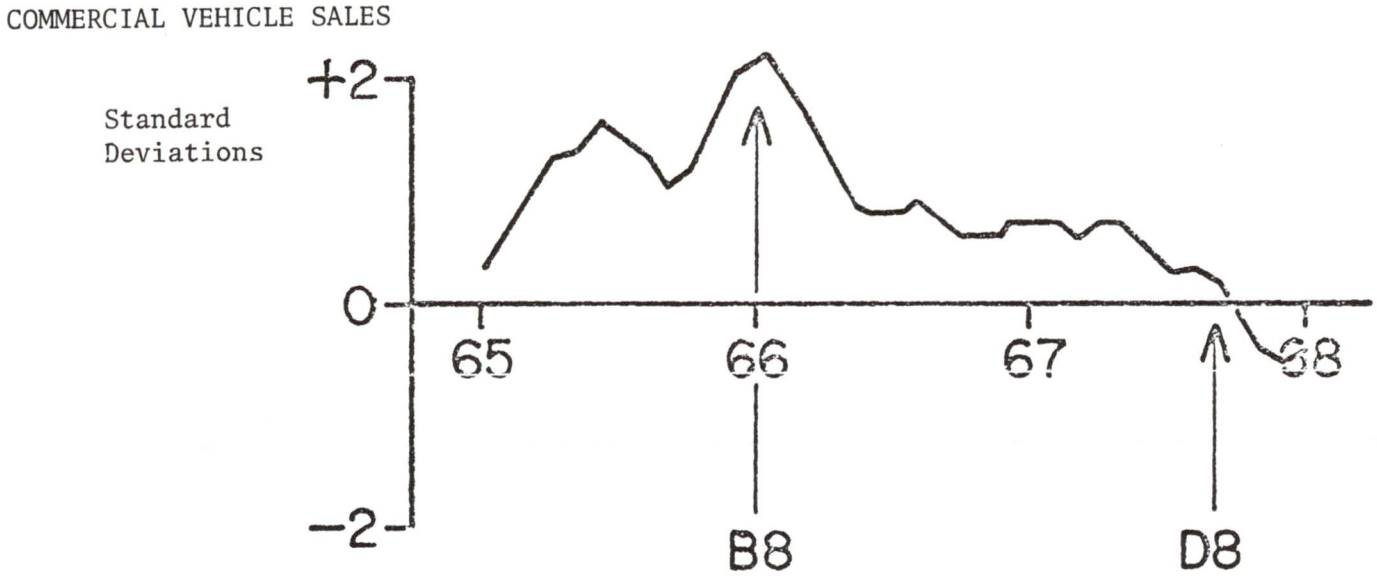


FIGURE 5 (contd.)

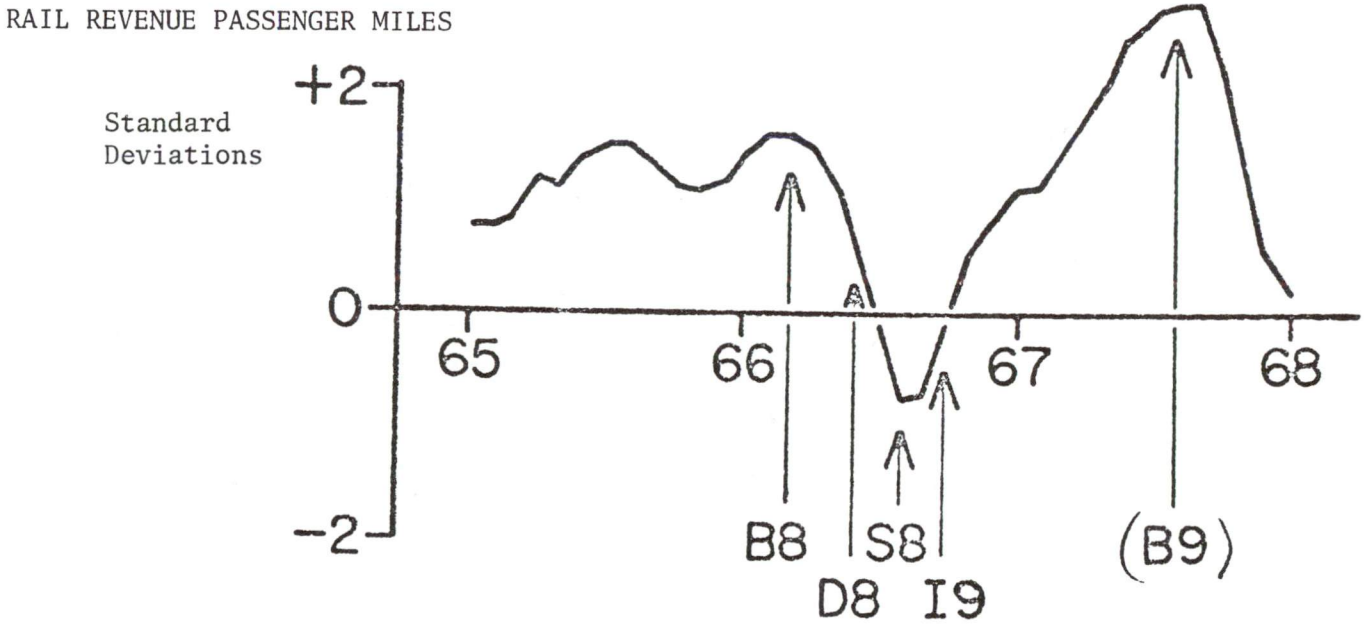


FIGURE 6

CYCLICAL COMPONENT OF QUARTERLY, REAL GNP: 1965:I - 1968:I

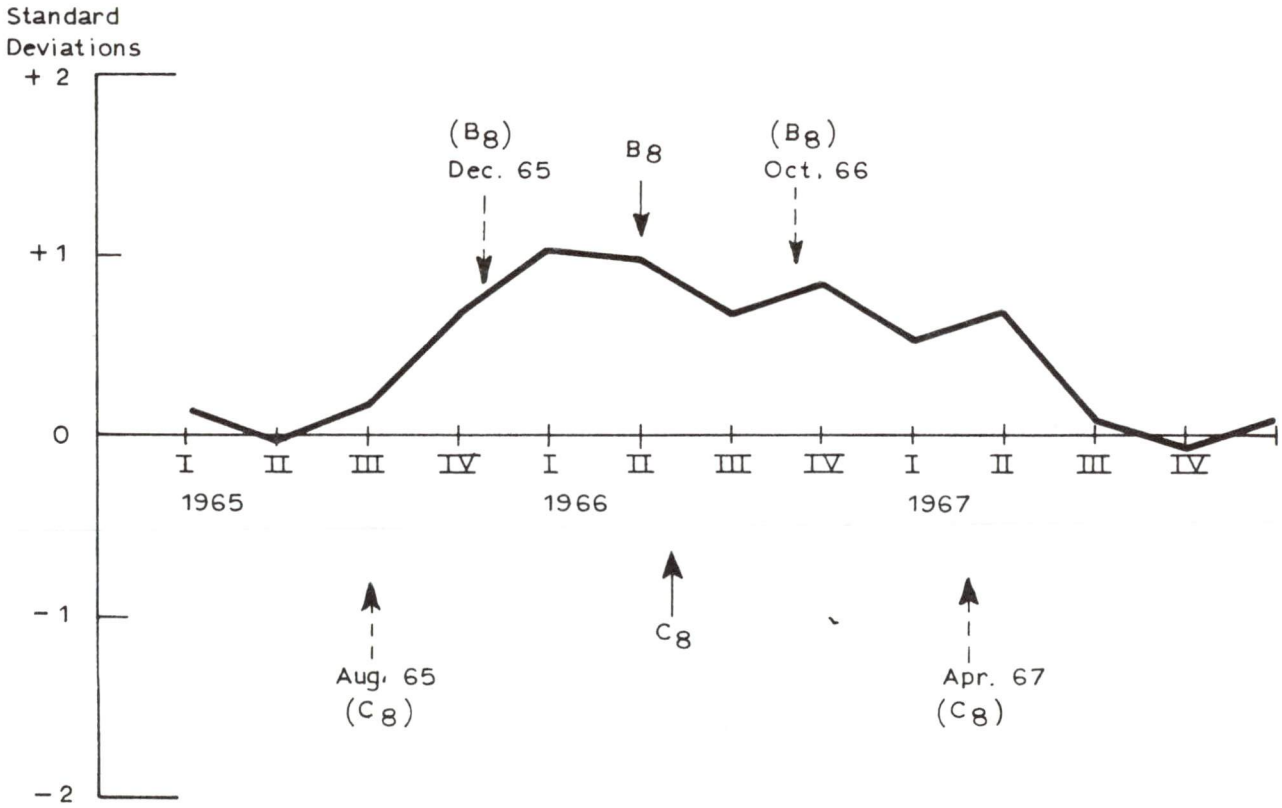


FIGURE 7

QUARTERLY RATE OF GROWTH OF SEASONALLY-ADJUSTED REAL GNP: 1965:I - 1967:IV

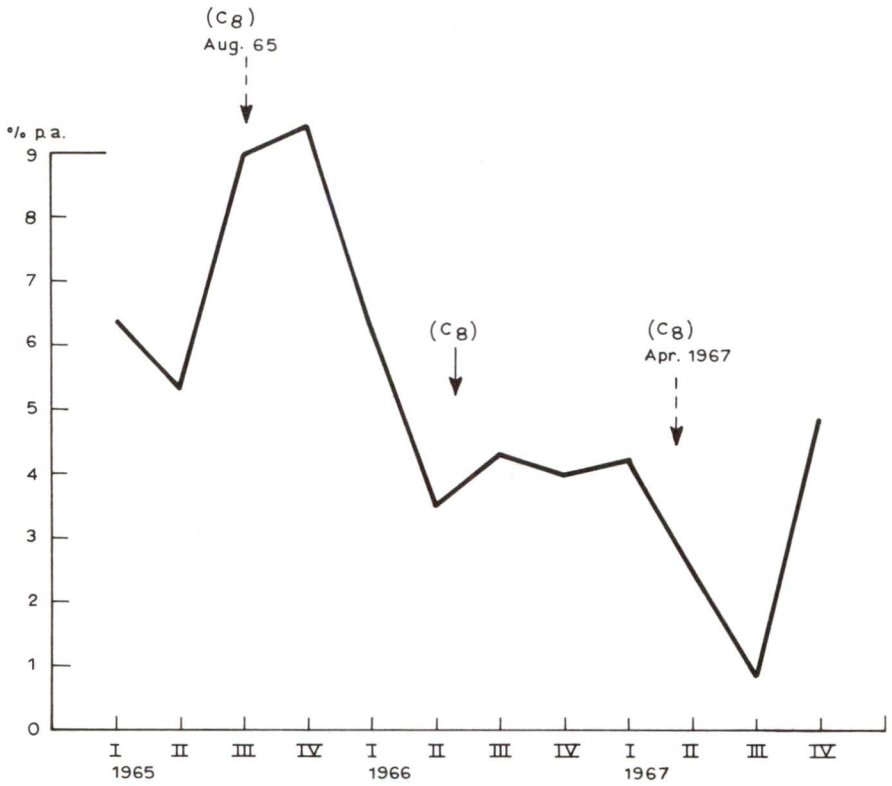


TABLE XXXIV

BEST VALUES OF W

| Episode | Reference Point | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I | C | B | P | D | E | T | S |
| 1 | 0.096 | 0.422 | 0.137 | 0.205 | 0.330 | 0.648 | 0.335 | 0.328 |
| 2 | 0.557 | 0.537 | 0.668 | 0.556 | 0.336 | 0.450 | 0.487 | 0.322 |
| 3 | 0.254 | 0.534 | 0.607 | 0.567 | 0.449 | 0.748 | 0.682 | 0.651 |
| 4 | 0.723 | 0.762 | 0.817 | 0.722 | -- | 0.848 | 0.719 | 0.711 |
| 5 | 0.408 | 0.768 | 0.506 | 0.585 | 0.458 | 0.769 | 0.627 | 0.814 |
| 6 | 0.280 | 0.692 | 0.352 | 0.409 | 0.174 | 0.639 | 0.406 | 0.560 |
| 7 | 0.403 | 0.598 | 0.438 | 0.259 | 0.140 | 0.475 | 0.406 | 0.271 |
| 8 | 0.284 | -- | 0.590 | 0.447 | 0.459 | 0.716 | 0.422 | 0.537 |
| 9 | 0.190 | 0.698 | 0.234 | 0.214 | ——— | ——— | ——— | ——— |

TABLE XXXIV (contd.)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.355 | 0.626 | 0.483 | 0.441 | 0.335 | 0.662 | 0.511 | 0.524 |
| S.D. | 0.195 | 0.124 | 0.216 | 0.184 | 0.134 | 0.140 | 0.145 | 0.200 |

Note: Values of W exceeding 0.5 are underlined.

must be abandoned as a meaningless average of two separate clusters of observations. The combined evidence of Table XXXIII and Figure 7 suggests that the rate of growth began to decline in the fourth quarter of 1965, at the boundary between class (Jun 65-Oct 65) and class (Nov 65-Mar 66). October 1965 will therefore be nominated as the reference cycle $C_8$ point in place of June 1966. It should be noted that in this case, as with the compromise estimate of the reference cycle date of $D_4$, no comparison is possible between the evidence for these and other reference points.

## Reliability of Evidence for Each Reference Point

Values of W for the best estimates of each reference point except $D_4$ and $C_8$ are set out in Table XXXIV. It will appear from this that the reliability of evidence differs widely from 0.848 ($E_4$, November 1957) to 0.096 ($I_1$, September 1948). It also appears that in certain episodes, such as the fourth and fifth, the evidence for fluctuation is stronger than in certain others, such as the first and seventh.

Given the evident mutability of the amplitude and period of fluctuations in Canada as in all other countries, these results are hardly surprising. What is more interesting, in view of the methodological novelty of this study, is the apparent variation in the reliability with which different reference points are vouched on average, over a lengthy period. Supposing the nine episodes vouchsafed by post-War Canadian history to be a random sample of all possible episodes, we may apply tests of significance to the differences between column "Means" in Table XXXIV. The following results emerge.

(1) There is no significant difference between the average values of W for P and B points; or between T and S points.

(2) The average W-value for C points is significantly greater than that for P points at the five per cent level; and for E points significantly greater than for T points at the ten per cent level.

(3) The average W-value for C points is significantly greater than that for I points at the two per cent

level; and for E points significantly greater than for D points at the one per cent level.

It may be inferred from these that the growth-rate curve, giving rise to C and E points at its maxima and minima, is the most clearly marked feature of Canadian fluctuations since 1947. In virtually every episode there is unmistakeable evidence of growth-rate peaks and troughs, even when, as in the sixth, seventh and eighth, the economy is growing so strongly that the traditional peaks and troughs are only weakly indicated.

It may also be inferred that the evidence for trend-free peaks and troughs (B and S points) is at least as good as that for P and T points, so justifying the process of trend extraction to some extent. The evidence for I and D points is significantly weaker than that for the other six however, which casts some doubt on the extent to which the fitted, log-quadratic trends correspond to the time-path of "normal" levels of operation.

It was found in the author's study of the Australian business cycle that values of W which exceeded 0.5 afforded evidence of reference points most clearly supported by the behavior of real GNP time series. In Table XXXIV W-values exceeding 0.5 are underlined. When these are considered apart from the rest it appears that "strong" evidence for fluctuations in Canada is confined to the following periods:

(a) first half of second episode (May 1950 - July 1951)

(b) third episode (February 1952 - May 1955)

(c) fourth episode (June 1955 - July 1958)

(d) fifth episode (August 1958 - September 1961)

(e) part of the eighth episode from $C_8$ to $S_8$ (June 1966 - October 1967.

As a check against these results the "cyclical-irregular" component was extracted from seasonally-adjusted, quarterly GNP at constant prices by a log-quadratic trend. A portion of this series, plotted in standard deviation units, has been graphed in Figure 4 above. The entire series from

1947:I - 1969:IV is shown in Figure 8. Those estimates of B and S points with a W-value greater than 0.5 are shown on the graph. All clearly marked maxima and minima of the quarterly GNP data except for those corresponding to $S_1$ (October 1949) and $B_9$ (November 1968) are coincident with "reliable" reference point data. One "reliable" estimate, $B_5$ (June 1959) does not appear very clearly in the GNP series.

A "growth-rate curve" was extracted from the quarterly GNP data by the usual formula:

$$g_t^Y = \frac{200.(Y_{t+1} - Y_{t-1})}{Y_t}$$

Part of this curve has been plotted in Figure 7 above. The entire series is graphed in Figure 9, together with those estimates of C and E for which W exceeds 0.5, and also the arbitrary estimate of $C_8$. Apart from $E_1$ (July 1949), the E points either coincide with or lead the minima of the quarterly GNP growth-rate curve. Most of the C points occur after the curve has passed its peak but before it begins a decisive downward plunge. These results are consistent with the application of principle (6) of chapter two, section three above.

In general the evidence of quarterly GNP confirms the expediency of selecting 0.5 as a cut-off value for W. This is not to say that evidence any weaker than this is worthless. $B_6$ (March 1962) for example represents a definite local maximum in the cyclical component, even though activity was far below trend at that date. Mid-1962 can hardly be called a "boom", yet it was a time up to which activity had been rising steadily for nearly 18 months and after which the pace of advance was to fall off sharply for another year. But for many purposes it is sufficient to describe economic fluctuations in terms of those reference points - dates and amplitudes - with a high index of reliability. According to that criterion there has been a clearly marked growth-rate cycle in Canada from 1949 with peaks and troughs in every episode; at least four unmistakeable cyclical peaks, $B_2$ (January 1951), $B_3$ (February 1953), $B_4$ (September 1956) and $B_8$ May 1966); at least three clear cyclical troughs, $S_3$ (August 1954), $S_5$ (January 1961) and $S_8$ (October 1967); and absolute peaks and troughs in

FIGURE 8

QUARTERLY GNP AT CONSTANT 1961 PRICES, SEASONALLY ADJUSTED,
AS DEVIATIONS FROM A LEAST-SQUARES LOG-QUADRATIC TREND

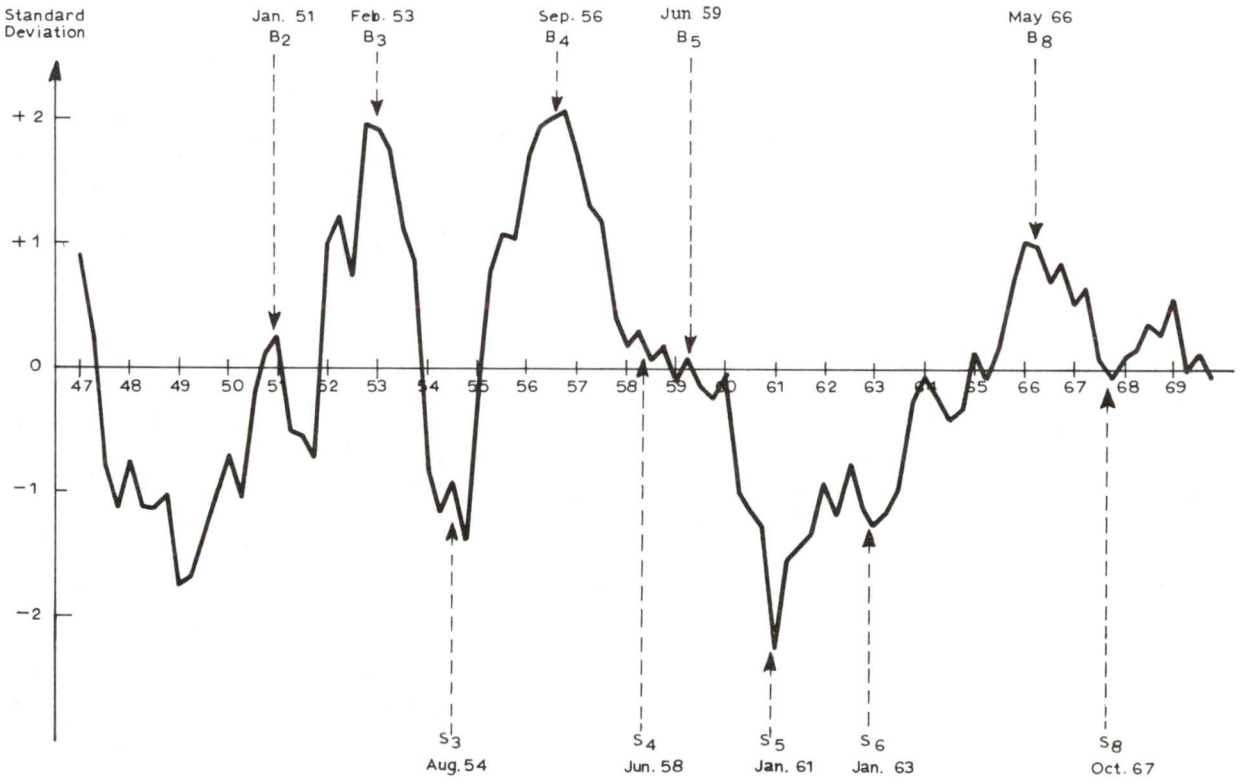
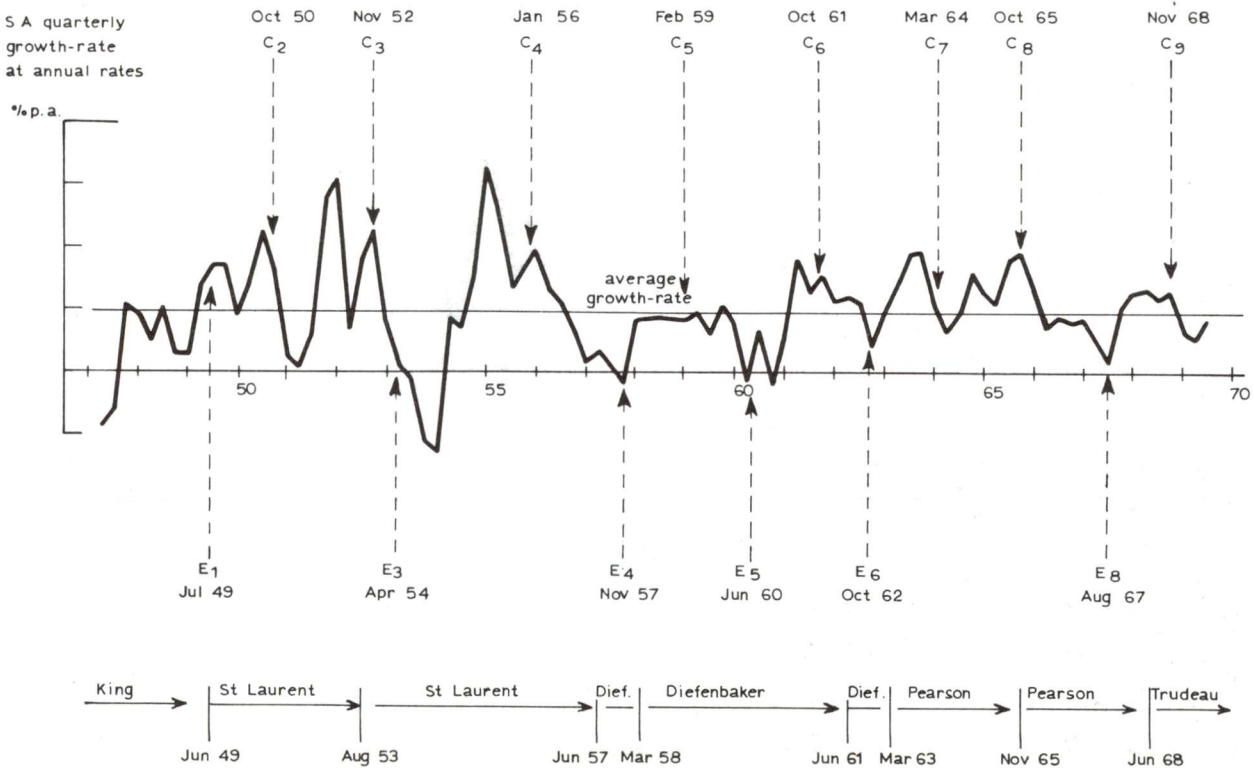


FIGURE 9

QUARTERLY GROWTH-RATE OF SEASONALLY-ADJUSTED CONSTANT PRICE GNP

AT ANNUAL AVERAGE PERCENTAGE RATES



the second, third, fourth and fifth episodes. There are no strong indications of I or D points (though these must exist if there have been genuine B and S points independent of P and T points), and no convincing evidence of any absolute peaks or troughs since 1960 or 1961. The story from 1947 to 1950 is doubtful. There are too few monthly indicators from this period for any clear patterns to be visible, and the relation of GNP to its trend may be dubious in those years. Other analysts recognise $P_1$ in the latter part of 1948 and $T_1$ about a year later (see Table XXXVI).

## Evidence for Amplitude of Fluctuations

Values of the index of reliability of evidence for the best estimates of amplitude are set out in Table XXXV. From the third episode alternative estimates are available, depending on whether deviations are measured from the "long" or the "short" trend. In each such case the higher value of the index has been listed, the trend used being denoted by the letter (L) or (S) placed after the figure.

Values of the index exceeding 0.5 are underlined. Estimates of relative amplitude with which they correspond are listed below.

| | | |
|---|---|---|
| $B_2$(L) | January 1951 | +1.527 SDs |
| $B_3$(L) | February 1953 | +1.634 SDs |
| $S_3$(S) | August 1954 | -1.609 SDs |
| $B_4$(S) | September 1956 | +2.151 SDs |
| $S_5$(L) | January 1961 | -1.613 SDs |
| $B_8$(S) | May 1966 | +1.487 SDs |

Reference to Table XXIX above confirms that the best estimate of amplitude is associated with the same choice of trend, in every case, as the best estimate of dating. In two cases, $B_4$ and $S_5$, the index of reliability of evidence exceeded 0.5 under either assumption as to trend. Reference to Table XXVI above confirms that for each the alternative estimates of the relative amplitude of deviation are of the same order of magnitude.

TABLE XXXV

BEST ESTIMATES OF AMPLITUDE
(values of index of reliability)

| Episode | Reference Point | | Mean |
|---|---|---|---|
| | B | S | |
| 1 | 0 (L) | 0.256 (L) | 0.128 |
| 2 | 0.523 (L) | 0.291 (L) | 0.407 |
| 3 | 0.541 (L) | 0.553 (S) | 0.547 |
| 4 | 0.738 (S) | 0.320 (L) | 0.529 |
| 5 | 0.276 (S) | 0.678 (L) | 0.477 |
| 6 | 0.147 (S) | 0.458 (L) | 0.302 |
| 7 | 0.318 (S) | 0.108 (S) | 0.213 |
| 8 | 0.609 (S) | 0.310 (S) | 0.458 |
| 9 | 0.111 (S) | -- | -- |
| Mean | 0.364 | 0.372 | |

Figure 8 reveals that the "reliable" indications of amplitude occur at precisely those cyclical maxima and minima which show up most clearly in the GNP series. None of $S_4$, $B_5$, or $S_8$ are included in the list, although their W-values for dating exceed 0.5 Failure to obtain a reliable amplitude estimate for $S_1$, which seems very well marked from Figure 8 may result from the inadequacy of the log-quadratic trends to represent "normal" levels of activity at the extremes of their fitted ranges.

chapter five

# SUMMARY AND CONCLUSIONS

A list of "relatively reliable reference points" for Canadian fluctuations between January 1947 and December 1969 is set out in Table XXXVI. Where dates of a reference cycle P or T point have been nominated by previous investigators (as reported by White) these also are shown. Best estimates of the relative amplitude at reference cycle B and S points are included where the index of reliability of evidence exceeds 0.5.

It is clear from Table XXXVI that the eight and a half or nine episodes which have taken place in Canada during the past 23 years differ very widely both in period and in amplitude.

The most clearly marked departure from steady growth is evidently the third episode, February 1952 to May 1955, which lasted 10 months, showed clearly marked peaks and troughs of considerable amplitude, and is noted by other students of the Canadian business cycle. Both the fourth and fifth episodes are also longer than three years, display well-marked reference points, and are recorded by other observers. But the evidence is relatively weak for

TABLE XXXVI

RELATIVELY RELIABLE REFERENCE POINTS

| Episode | | Timing Index | Timing Date | Date nominated by White | Amplitude Index | Amplitude (SD units) |
|---|---|---|---|---|---|---|
| I | ($P_1$) | | | Oct 48 | | |
| Sep 48 - Apr 50 | $E_1$ | .648 | Jul 49 | | | |
| (20 months) | ($T_1$) | | | Sep 49 | | |
| II | $I_2$ | .557 | May 50 | | | |
| May 50 - Jan 52 | $C_2$ | .537 | Oct 50 | | | |
| (21 months) | $B_2$ | .668 | Jan 51 | | 0.523 | +1.527 |
| | $P_2$ | .556 | Apr 51 | - | | |
| III | $C_3$ | .534 | Nov 52 | | | |
| Feb 52 - May 55 | $B_3$ | .607 | Feb 52 | | 0.541 | +1.634 |
| (40 months) | $P_3$ | .567 | Jul 53 | May 53 | | |
| | $E_3$ | .748 | Apr 54 | | | |
| | $T_3$ | .682 | Sep 54 | Jun 54 | | |
| | $S_3$ | .651 | Aug 54 | | 0.553 | -1.609 |

| | | | | | | |
|---|---|---|---|---|---|---|
| IV | $I_4$ | .723 | Jun 55 | | | |
| Jun 55 - Jul 58 | $C_4$ | .762 | Jan 56 | | | |
| (38 months) | $B_4$ | .817 | Sep 56 | | 0.738 | +2.151 |
| | $P_4$ | .722 | Dec 56 | Apr 57 | | |
| | $D_4$ | -- | Aug 57 | | | |
| | $E_4$ | .848 | Nov 57 | | | |
| | $T_4$ | .719 | May 58 | Apr 58 | | |
| | $S_4$ | .711 | Jun 58 | | - | - |
| V | $C_5$ | .768 | Feb 59 | | | |
| Aug 58 - Sep 61 | $B_5$ | .506 | Jun 59 | | - | - |
| (38 months) | $P_5$ | .585 | Sep 59 | Jan 60 | | |
| | $E_5$ | .769 | Jun 60 | | | |
| | $T_5$ | .627 | Oct 60 | Mar 61 | | |
| | $S_5$ | .814 | Jan 61 | | 0.678 | -1.613 |
| VI | $C_6$ | .692 | Oct 61 | | | |
| Oct 61 - Dec 63 | $E_6$ | .639 | Oct 62 | | | |
| (27 months) | $S_6$ | .560 | Jan 63 | | - | - |

TABLE XXXIV (contd.)

| | | | | | |
|---|---|---|---|---|---|
| VII<br>Jan 64 - Jun 65<br>(19 months) | $C_7$ | .598 | Mar 64 | | |
| VIII<br>Jul 65 - Oct 67<br>(28 months) | $C_8$ | -- | Oct 65 | | |
| | $B_8$ | .590 | May 66 | 0.609 | +1.487 |
| | $E_8$ | .716 | Aug 67 | | |
| | $S_8$ | .537 | Oct 67 | - | - |
| IX<br>Nov 67 | $C_9$ | .698 | Nov 68 | | |

the trough of the fourth episode (Spring of 1958) and for the peak of the fifth (second half of 1959). Figure 8 showed that neither of these appears clearly in the graph of trend-free GNP. The evidence for relative amplitude falls below the required standard of reliability in both instances, and in the case of the latter, there is wide discrepancy between the reference cycle peak nominated by White (January 1960) and that suggested by the data of this study ($P_5$, September 1959; $B_5$, June 1959).

The remaining episodes are all of much shorter duration, in three cases (one, two, seven) no more than half that of three, four and five. The first episode is peculiar in that peaks and troughs are reported by previous investigators, whereas the evidence for $P_1$ and $T_1$ now available suggests that these were relatively unimportant. Only the first half of the ninth episode appears to have taken place by December 1969, the terminus ad quem of this study.

A classification of post-War Canadian business cycles is attempted in Table XXXVII. A "major cycle" is defined as an episode in which the evidence for both B and S points is reliable. A "minor cycle" is one in which the evidence for both C and E points is reliable. "Incomplete" major or minor cycles are those in which one of the necessary reference points is well attested. It is clear that the four classes overlap to some extent. A complete major cycle, for example, will not take place in an episode unless there has also been a complete minor cycle. The relation between the classes, and the precise character of each episode, is illustrated in the Venn diagram of Figure 10.

Few general conclusions can be formed about Canadian business cycles from this study, apart from the fact that fluctuations in the growth-rate are more clearly marked than fluctuations in the level of activity. A number of particular conclusions may be drawn, however, some of which have considerable relevance to the study of Canadian economic history since the last war.

(1) Such fluctuations as there have been in the Canadian economy since 1947 would seem to have been diminishing over the past two decades. A log-quadratic trend fitted to quarterly GNP by least-squares reveals virtually no curvature, implying that on average there has been growth at

TABLE XXXVII

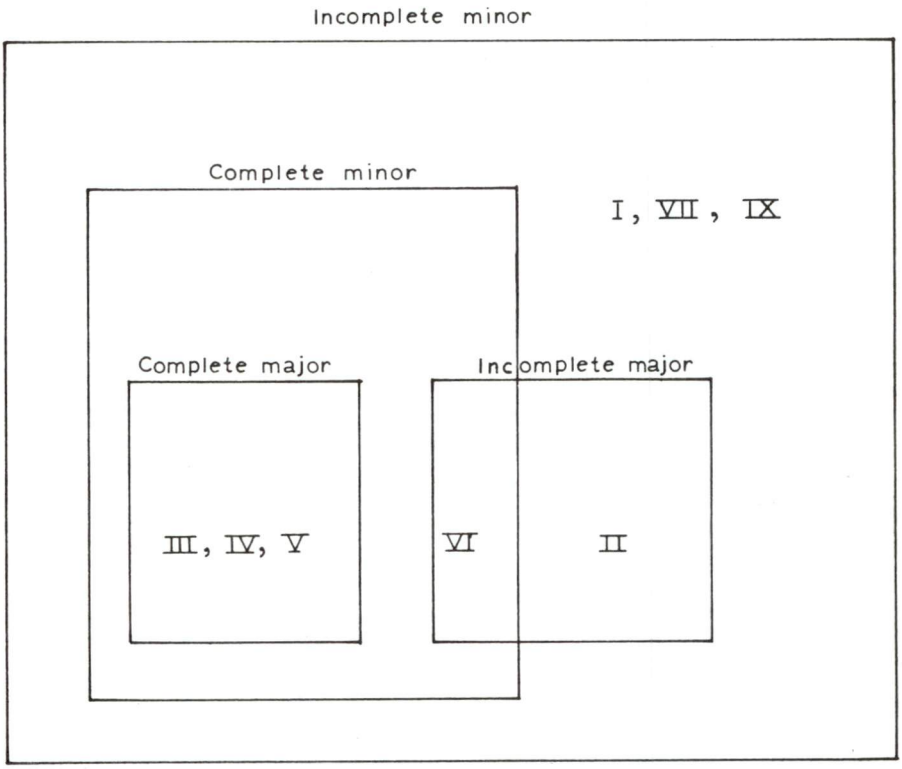
CLASSIFICATION OF CYCLICAL EPISODES IN CANADA

JANUARY 1947 TO DECEMBER 1969

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Complete Major | - | - | III | IV | V | - | - | VIII | - |
| Incomplete Major | - | II | - | - | - | VI | - | - | - |
| Complete Minor | - | - | III | IV | V | VI | - | VIII | - |
| Incomplete Minor | I | II | - | - | - | - | VII | - | IX |

FIGURE 10

CLASSIFICATION OF CYCLICAL EPISODES IN CANADA
JANUARY 1947 TO DECEMBER 1969



about 4.8 per cent per annum with no tendency to acceleration or retardation. But as Figure 8 shows (and as Figure 9 suggests) the amplitude of fluctuations about the growth-path has declined since the 1950s.

(2) The boom which culminated in the second half of 1956 was evidently much stronger, both in amplitude and period, than any which has taken place since. The "boom" of 1959 was scarcely strong enough, and that of 1962 too weak, to raise activity above long-term trend levels. The boom of 1965-66 reached a maximum relative amplitude of 1.49 standard deviations compared with 2.15 standard deviations at $B_4$; and its duration was barely more than half that of the late 1950s. The amplitude of troughs, on the other hand, has diminished steadily since $S_5$ (January 1961).

(3) In common with the Australian economy, but unlike that of the USA, Canada experienced a noticeable boom in 1950-51 as a result of the effect on commodity prices of the Korean War stock-piling of the US government. The fact that $P_2$ is noted by none of the observers reported by White may be explained by the preoccupation of Canadian economists with the US economy.

(4) The same preoccupation with the US business cycle may explain why previous investigators have been willing to assign dates for the reference cycle $P_1$ and $T_1$ points. Weak evidence for these reference points does exist, and the dating - for what it is worth- is in approximate agreement with that reported by White. (See Table XV). But there does not seem to have been as much relative disturbance to Canadian growth in 1948-49 as there was in that of the USA.

(5) From the middle of 1959 to the beginning of 1965 the Canadian economy was operated at "below trend" levels. According to the Economic Council of Canada (First Annual Review, p. 49, etc.) actual output was never more than 94 per cent of potential during these years. Two episodes, however, the sixth (incomplete major, October 1961 to December 1963) and the seventh (incomplete minor, January 1964 to July 1965) occurred during the period. Some sign of these episodes may be seen in Figure 8. Growth-rate fluctuations are clearly visible in Figure 9. The NBER recognises no US cycle between 1961 and 1970, regarding the

whole of that period as one of sustained growth.

(6) Although it would be necessary to study the data for 1970 and 1971 to confirm it, there are signs that the Canadian economy began to turn down (ninth episode) somewhere between the end of 1967 and the beginning of 1969.