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MINNESOTA ECONOMIC INDICATORS: PART II

METHODOLOGY AND FINDINGS

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MINNESOTA ECONOMIC INDICATORS PART II: METHODOLOGY AND FINDINGS

Contents

Summary

Methodology and findings covering construction, maintenance and use of a set of Minnesota economic indicators are addressed in this report. They include discussion and interpretation of:

- o Procedures in the preparation of a Minnesota and a Twin Cities series of economic indicators;
- o Findings on the performance of the indicators in tracking Minnesota business cycles.

The first step in the preparation of an economic indicator is the construction of a reference cycle. For Minnesota and the Twin Cities the nonagricultural wage and salary employment series is used. It serves as a comprehensive measure of economic activity and reflects well what is occurring in the economy at the regional level. Turning points in the economic indicator series are determined from the reference series.

Advantages of the nonagricultural wage and salary employment reference series are its:

- o Aggregate measure of economic activity;
- o Availability, and
- o Simplicity of use.

The Minnesota reference series clearly shows turning points that can be compared with the US business cycle.

A state gross product series would be preferable to nonagricultural wage and salary employment. This series is currently available only on an annual basis. Quarterly and monthly indices are being prepared, but are not yet available, to convert the annual to a monthly series for comparison with the current reference cycle.

The second step in the preparation of the indicator series is the evaluation and selection of a particular indicator series that either consistently coincides or leads the reference cycle. Potential indicators are found to represent the major economic activities of the economy such as (1) production, (2) consumption, and (3) investment. These indicators are "graded" using a system similar to the BEA (US Department of Commerce, Bureau of Economic Analysis) method for the US economic indicators. Indicators are chosen for inclusion into an index based on their "grade" and uniqueness (by not duplicating each other).

The third step is the combining of the selected indicators into appropiately weighted indexes. The method involves three further steps:

- o Standardization and weighting of index components;
- o Standardization and cumulation of the index; and
- o Adjustment of the trend of the leading indicator index to that of the coincident index.

The Minnesota index of coincident indicators (MICI) is made up of three components: (1) nonagricultural wage and salary employment, (2) retail trade, and (3) total weekly manufacturing hours. This index (1982=100) hit its low mark of 67 in 1970 then reached 100 in 1978 and was near 130 in April 1988. The Twin Cities index of coincident indicators (TCICI) is composed of two economic variables: (1) nonagricultural wage and salary employment and (2) total weekly manufacturing hours. The low point for the index (1982 = 100) is 65 in 1972. It approaches 135 in April 1988.

The Minnesota index of leading indicators (MILI) consists of five components: (1) M2 (US money supply), (2) manufacturing average weekly earnings, (3) new business incorporations, (4) average weekly initial unemployment claims (inverted), and (5) building permit and public contracts

for housing units. Each component is seasonally adjusted. The trend of the index is adjusted to the trend of the coincident index. This index reached its low mark of 86 in 1970 hitting 100 in 1973 and again in 1976, 1981 and 1982. The 1987 and 1988 values show a slowing of growth with the index approaching 130.

The Twin Cities index of leading indicators (TCILI) consists of three components: (1) manufacturing weekly earnings, (2) M2 (US money supply), and (3) the number of help wanted advertisements. The index (1982 = 100) low point is approximately 75 in 1972. Its high of 145 was reached in April 1988--the last month of the available series at the time of project initiation.

The final step of the Minnesota study is the evaluation of the performance of the indicators. Turning points of the coincident and leading indexes are compared to the reference cycle turning points. Both the Minnesota leading index and the Twin Cities leading index behaved reasonably well. The Minnesota leading index turned from 2 to 20 months before the turn in the reference cycle. The Twin Cities leading index turned around 4 to 27 months ahead of the corresponding reference cycle points.

A good deal of subjective analysis is part of using any leading indicator index. The Minnesota leading index is more volatile than the coincident index. Moreover, the double recession in the early 1980s makes the several index series difficult to interpret. The problem arises from the short time span between the recessions, coupled with the erratic behavior of the Minnesota economy since the last recession. Nonetheless, the leading indicator index clearly shows an overall growth trend since the last recession that is consistent with the Minnesota and US reference series. The double recession for the Twin Cities index is even more difficult to interpret than the Minnesota index. The TCTLI clearly shows the overall growth trend since the last recession.

MINNESOTA ECONOMIC INDICATORS PART II: FINDINGS AND APPLICATIONS

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The objective of the Minnesota Economic Indicators Project is to develop indices of state and regional economic well-being in Minnesota including a coincident economic indicator series and a leading economic indicator series. Coincident indicators help confirm or refute expectations that are based on the behavior of the leading indicators.

Coincident indicators are designed to be broad comprehensive measures of both the input and the output sides of business activity. They also give some precision to the timing of business cycle peaks and troughs. Consequently, turning points in these series have served as the primary observations in determining the reference dates for the peaks and troughs of the business cycle.

Leading indicators shed light on changes starting to occur in general business activity. They measure flows within the economy that affect the level of general business activity. They also may represent anticipations in the business decision sequence and early stages of the investment and production processes. Their shortcomings include the considerable variation in their lead times.

The reference cycle used by the Minnesota Economic Indicators Project is the nonagricultural employment series. From this series the cyclical turning points are determined. A monthly gross product series would be better since it is a more broad based measure of economic activity, but does not exist. The national reference cycle can not be used since a region often either lags or leads the turning points in the national economy due to the difference in

economic structures.

The objectives of the study are addressed in series of tasks as follows:

(1) identification of reference points, trough and peaks, in local business cycles,

(2) identification of series that are candidates for use as coincident economic indicators,

(3) selection and documentation of coincident economic indicators,

(4) identification of series that are candidates for use as leading economic indicators,

(5) selection and documentation of leading economic indicators.

These tasks are performed for both Minnesota and the Twin Cities Metropolitan Area.

Methodology of Scoring and Indexing

In this study, procedures for scoring and indexing a Minnesota economic indicator series are presented under six criteria -- statistical adequacy, timing, conformity, smoothness, and currency. A series of tabular presentations accompany the discussion for demonstrating the use of each criterion in the preparation of the Minnesota economic indicator series. The summary scores of potential indicators are given and the chosen indicators are shown.

A composite index consists of one or more indicators. The method to form composite indexes is an adaption of methods developed by Burns & Mitchell (1946), Moore & Shiskin (1967) and currently used by the Bureau of Economic Analysis. For an indicator to be included in an index it must satisfy the six economic criteria cited earlier. Each potential indicator is given a score from 0 to 100 for each criterion. The six scores are weighted and then added together to obtain a single number with a possible value from 0 to 100. The

weights are shown in Table 1. This is done to determine whether the indicator is accepted or rejected. (Actually a value of 0 is never given since the variable with this value would have been dropped automatically from further consideration very early in the process.) An example for scoring an indicator is presented in Table 2.

Economic Significance

The economic significance represents how important the role of an indicator is to the business cycle and how well understood it is. The variable is scored as follows: 100 or 90 points if the series is a measure of comprehensive output or input aggregates; 90 or 80 points if it is a major component of input or output aggregates or it is a variable to which a causal role in business cycles has been attributed; 80 or 70 points where the variable's primary role in the business cycle has been symptomatic rather than causal. If a variable does not fit into these categories it is dropped from further consideration for inclusion into an index. Hence there are no scores given below 70.

Minnesota nonagricultural wage and salary employment, for example, is given a score of 90 since it is closely associated with input aggregates. The BEA gives scores of 100 points for GNP (comprehensive measure), 90 points for industrial production (major input component), 90 points for business expenditures for plant and equipment (major input component), 80 points for average weekly unemployment insurance claims (symptomatic role in business cycle), and 70 points for the layoff rate in manufacturing (symptomatic role).

Statistical Adequacy

Statistical adequacy is determined by how well the data measures the variable. Each variable is evaluated on eight aspects: (1) reporting system quality with reference to data source; (2) coverage of process--partial or

full sampling; (3) time period covered--full month, one day per week and so on; (4) availability of estimates of the sampling and measurement errors for the series; (5) frequency of revisions of the data series (without reference to the magnitude of revision); (6) length of the time series--i.e., how far back was the series collected; (7) comparability over time--does the series mean the same at various times or was the definition changed; and (8) miscellaneous aspects (often judgemental evaluation).

The reporting system quality subcategory is assigned 15 points if the series is derived directly from the source; fewer points are given to it for series indirectly obtained by way of estimates from related variables. The statistical coverage subcategory receives 15 points for a full enumeration; it receives fewer points if it is based on a sample. Time period covered is scored 10 points for a full month (or quarter) coverage, while fewer points are given for one day per week, one week per month, or less coverage. The availability of measurement of errors is given five points if sampling and reporting errors are obtainable. Frequency of revisions counts for 20 points with no revisions. Fewer points are given if a series is revised during the reporting period. Length of the time series receives 15 points if the data begins in 1970 or earlier. Fewer points are given if the series begins later. Comparability receives 15 points if there is no change in the definition of the data series starting in 1970 with fewer points if revised. "Other considerations" are strictly judgemental evaluations.

Timing

The timing of business cycles refers to how consistently the variable has coincided, led, or lagged the business cycle over time. Timing is determined by matching the specific cycle turning points with the corresponding reference cycle and scoring the cyclical timing performance of the indicator. The

probability of leading (or lagging and roughly coinciding) is then calculated and scored.

To determine the probabilities, the timing comparisons are classified into three non-overlapping catergories: leads, lags, and exact coincidences. A series leads if it turns at least one month before the reference cycle turn; it is exactly coincident if it turns precisely at the same month as the reference cycle; it lags if it turns at least one month after the reference series turn. In the tradition of business cycle analysis, a "rough coincident" series is included and is defined as a series which turns within three months of each reference cycle turn.

Each series is first compared to the reference cycle and the series' leads (or lags or exact coincidents) are determined for each turning point. Then each series is given a timing score which is based on the probability that a given series will have the number of leads (or lags or rough coincidences) by chance. More precisely, the score, S, is

$$S = 100^* (1.0-p)$$

where,

$$p = P(X=k) = \binom{N}{k}(q)^k(1-q)^{N-k}$$

(i.e. it assumes the binomial distr.)

q is 1/2 if testing for lead or lag or

is 1/3 if testing for roughly coincident,

N is the number of turning points.

Example: Timing

(Note: lead = +, exact coincident = 0, lag = -)

A series timing with the reference cycle

Peak	+4
Trough	+1
Peak	0

Trough	+3
Peak	+4
Trough	+4

For Leading Indicator Candidates

Number of leads = 5 = k

$$p = P(X=5) = \frac{6!}{5!1!}(1/2)^5(1/2)^{(6-5)} = 6/64 = .094$$

Score = 100*(1.0-.094) = 91

For coincident indicator candidates

Number of roughly coincidents = 3 = k

$$p = P(X=3) = \frac{6!}{3!3!}(1/3)^3(2/3)^{(6-3)} = 20(1/27)(8/27) = .219$$

Score = 100* (1.0-.219) = 78

Conformity

Conformity to the historical business cycle means how regularly the movements of the indicator reflected the expansions and contractions in the general economy. A series conforms positively to business cycles if it rises during economic expansion and declines when there is contraction. If the indicator moves countercyclically it is said to conform invertedly. Conformity is measured by two aspects: (1) the number of business cycle phases (BCP) that are matched by specific-cycle movements (SCM) of the variable and (2) the number of false signals or "extra" specific-cycles given by the indicator. In Item 1, the score would be 60*(number of SCM)/(number of BCP). In Item 2, the score would be 40*(1.0-extra turns/number of BCP)) if the ratio is less than 1.0. Otherwise the score would be zero.

Example: Conformity

Business Cycle Reference Points		Specific-Cycle (of variable)	
Trough	Peak	Trough	Peak
Feb.1971	Aug.1974	Dec.1970	(July 1971)
April 1975	Feb.1980	(Dec.1971)	Aug.1974
Aug. 1980	March 1981	April 1975	Jan.1980
July 1982		June 1980	March 1981

Sept. 1982 (Nov.1984)
(July 1985)

In the example, the candidate variable conforms positively. For each business cycle phase there was a specific cycle phase so the probability score = 60 (as determined by the formula, the number of SCM divided by the number of BCP = 5/5 = 1). There are two extra-specific cycles (indicated with parentheses in the above example) hence, the score for extra turns would be 40*(1.0-2/5)=4. Thus, the total score for conformity is 64.

Smoothness

Smoothness indicates how well a cyclical turn can be distinguished from short random movements. Insufficient smoothness is the main source of problems in many indicators. Lack of smoothness is overcome by using longer time periods or moving averages, but with a resultant loss of currency.

The measure of smoothness is based on the relationship between the irregular and the cyclical component of a time series. The months for cyclical dominance, MCD, estimate is used for monthly data. This method identifies the shortest span in months for which the absolute value of the average percentage change of the trend cycle component of the series is greater than that of the irregular component. The MCD can be calculated in a X11 procedure, such as in SAS, or it may be roughly derived by observation. Observation may be preferred since one can take into account the recent data more heavily. Observation is used in this study. The smoothness score is:

MCD	Score
1	100
2	90
3	80
4	70
5 or more	60

Currency

The currency of the data is defined as the promptness and the periodicity in which the data is given out. Promptness reflects how soon the numbers are available after the period to which the figures apply. Periodicity indicates the frequency with which series are compiled. Scores are given as 90 for monthly publication, 75 for quarterly, 50 for less often. For this study only potential indicators with scores of 90 are considered.

Index Construction

The method summarized here is very similar to the method used by the BEA. The steps essentially take the individual components and combine them into the leading and coincident indexes. The leading index is adjusted to facilitate use as a complete system.

1. Standardization and Weighting of Index Components

   a. Month-to-month percent changes

      $b_{it} = 200(a_{it} - a_{it-1})/(a_{it} + a_{it-1})$ if not in percentage form and

      $b_{it} = (a_{it} - a_{it-1})$ if in percentage form

      (for component i, month t)

   b. Standardization (to prevent more volatile components from dominating the index.)

      $S_{it} = b_{it}/[(b_{it}$ summed over t) $/(n-1)]$

      where n is the total number of months.

   c. Weighted monthly averages of the standardized changes (S_{it})

      $r_t = (s_{it}$ summed over i) / (w_i summed over i)

      where w_i is the weight assigned to component i.

      Specifically $w_i = q_i/(q_i$ summed over i)/k) where k is the number of included variables and q is the performance score.

2. Standardization and Cumulation of the Index

a. Standardization of average monthly changes (r_t)

$q_t = r_t$ / [(r_t summed over t)/(n-1/[(c_t summed over t)]/(n-1)]

for a non coincident index

$q_t = r_t$ for the coincident index

where c_t is the r_t value for the coincident index.

In other words, what this step does is to make the long run averages of the leading indicator index equilvalent to the coincident index.

b. Cumulation into index

$i_t = i_{t-1}(200+q_t)/(200-q_{t-1})$

where t=2,3,...,n and i_1 is assigned 100.

This creates an index with the first period starting at 100.

3. Adjustment of trend

Results of step 2 are adjusted to make the trend in the leading index equal to the the trends of th coincident index.

a. Trends are calculated using business cycle method

$T = ((B_L/B_I)^{**m}-1)100$

where B_I and B_L represent the averages of the values for the initial and terminal specific cycles respectively of a given index and m is the number of months between the center of the initial cycle and the center of the last cycle. Specific cycles are measured either from peak to peak or trough to trough.

b. The Leading Index is adjusted by

$I_t = i_t + (G-T)$

where G is the coincident index trend.

c. The new index is rebased to the year 1982. (based period is 100.)

Steps 1 and 2 of this method can be seen a little more clearly by the

following simplified example.

Example Method of Composite Index Construction (non coincident index)

t	Var 1 (%)	Var 2 (actual number)	Var 3 (index)
1	5.0	3980	300
2	4.8	4020	305
3	5.1	4025	302
4	5.1	4028	302
Performance score	75	80	70

Sum of scores = 225
n=4 (i.e. 4 time periods)

$w_1 = 75/(225/3) = 1$
$w_2 = 80/(225/3) = 1.067$
$w_3 = 70/(225/3) = 0.933$

Step 1a
$b_{12}=(4.8-5.0)=-0.2$
$b_{22}=200(4020-3980)/(4020+3980)=1$
$b_{32}=200(305-300)/(305+300)=1.65$
etc.

resulting in

t	b_{it}	b_{2t}	b_{3t}
2	-0.2	1	1.65
3	0.3	0.12	-0.99
4	0	0.07	0
	Sum of b_{1t} =0.5	Sum of b_{2t} =1.19	Sum of b_{3t} =2.64

Step 1b
$s_{12}=-0.2/(0.5/4)=-1.6$
etc.

resulting in

t	s_{it}	s_{2t}	s_{3t}
2	-1.6	3.36	2.5
3	2.4	0.40	-1.5
4	0	0.24	0

Step 1c

$r_2=[(-1.6)(1)+(3.36)(1.067)+(2.5)(0.933)]/3=1.44$

$r_3=[(2.4)(1)+(.4)(1.067)+(-1.5)(0.933)]/3=0.48$

r_4=[0+(.24)(1.067)+0]/3=0.09

Step 2a

Let sum of c_t =3 so

q_2=1.44/ [[(1.44+0.48+0.09)/3]/[3/3]] =2.15

q_3=0.48/ [[(1.44+0.48+0.09)/3]/[3/3]] =0.72

q_4=0.09/ [[(1.44+0.48+0.09)/3]/[3/3]] =0.13

Step 2b

i_1 = 100

i_2=100(200+2.15)/(200-2.15)=102.17

i_3=102.17(200+0.72)/(200-0.72)=102.91

i_4=102.91(200+0.13)/(200-0.13)=103.04

Minnesota Economic Indicators

The Minnesota monthly indicator series start in 1970 and are a mixture of national and local indicators. A similar indicator series is made for the Twin Cities Metropolitan Area. The methodology, for the most part, applies to procedures used by the U.S. Bureau of Economic Analysis (BEA) for the national indicator series.

The first task in this project is to build a reference index which measures general economic activity. For the national economy the reference turning points are established by the National Bureau of Economic Research (NBER). While decisions on the reference cycle are taken as gospel, they are quite subjective in nature. There is no single or group of time series data that is taken as the reference cycle. A committee of analysts, convened by the NBER, establishes the official peaks and troughs. They set the peaks and

troughs in accordance to the following definition:

> "Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises; a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge in to the expansion phase of the cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten or twelve years, they are not divisible into shorter cycles of similar character with amplitudes approximately their own" (Burns and Mitchell, p.3).

Sometimes the evidence is conflicting, in which case the choosing of a single month as a turning point is a difficult problem.

Reference Cycle

The nonagricultural wage and salary employment series (Figures 3 and 11) is used as the reference cycle in this study. The series was seasonally adjusted. The advantages in using this series are that it is an aggregate measure of economic activity, it is readily available, and it is simple to use. The business cycles for the U.S. (Source: Handbook of Cyclical Indicators, 1984), for Minnesota and for the Twin Cities, based on the Nonagricultural Wage and Salary Employment, can be seen in Table 3. The Minnesota reference cycle clearly shows the turning points of the business cycles, but the Twin Cities reference cycle does not clearly reflect the first 1980's recession (Figure 11). This reflects the significant differences in economies between the Twin Cities and the rest of the state.

Coincident Index

The Minnesota coincident index is made up of three components (see

Appendix A): (1) nonagricultural wage and salary employment, (2) retail trade, and (3) total weekly manufacturing hours. The correspondence between the composite index and the reference cycle can be seen in Table 4. Nonagricultural wage and salary employment is seasonally adjusted. Retail trade is in constant 1982 dollars (PCE deflator) and is seasonally adjusted. Retail trade is an indicator of personal income and consumption. Total weekly manufacturing hours is an indicator of production level and is seasonally adjusted. Manufacturing employment is also a good coincidental indicator, but it is not included since it is reflected in the nonagricultural wage and salary employment. The index is based at 100 for the year 1982 (i.e. the average value for the 12 months of 1982 equals 100.)

The Minnesota coincident index behaves fairly well as shown in Figure 1. It is smooth except for the occasional one or two month small jumps in the index. The low mark of 67 occured in 1970. A change in direction, denoting a cycle phase, can be ascertained with a good degree of assuredness within 4 months. The two recessions in the 1980's can be seen clearly. The index was close to 130 in April 1988.

The Twin Cities coincident index (1982 = 100) is composed of two economic indicators: nonagricultural wage and salary employment and total weekly manufacturing hours. Nonagricultural employment and total weekly manufacturing hours are seasonally adjusted. The Twin Cities index also behaves fairly well, as shown in Figure 2. There are small one and two month random movements, but in general the direction the economy is moving can be determined in several months. The TCICI was at its lowest point, 65, in 1972 and reached 135 in April 1988. The Twin Cities showed a greater consistency in its economic growth than Minnesota. The trouble in the computer industry can be seen in the Twin Cities index during 1986.

Leading Indicator Index

The Minnesota leading indicator index consists of five components (Appendix A): (1) M2 (U.S. money supply), (2) manufacturing average weekly earnings, (3) new business incorporations, (4) average weekly initial unemployment claims (inverted), and (5) building permit and public contracts for housing units. Each component is seasonally adjusted. The trend of the index is adjusted to the trend of the coincident index. The correspondences between the leading indicator index and the reference cycle can be seen in Table 5 of the Minnesota leading index shown in Figure 1. The index consistently leads the reference cycle turning points, however, the lead varies from 2 to 20 months. The index ranged from 86 in 1970 to nearly 130 in April 1988.

There is a good deal of subjective analysis in using any leading indicator index. The MILI index is not as smooth as the coincident index and the 1980's are a particular problem. The double recession at the beginning of the decade is somewhat difficult to interpret. The problem arises from the short space of time between the recessions and from the more erratic behavior of the growth economy since the last recession. However, the leading indicator index clearly shows the growth trend since the last recession. The values for 1987 and 1988 tend to indicate a slowing of economic growth.

The Twin Cities index of leading indicators (TCILI) consists of three components (Appendix A): manufacturing average weekly earnings, M2, and the number of help wanted ads. Each component is seasonally adjusted and earnings is in 1982 dollars (PCE deflator). The trend of the composite index is adjusted to the coincident index.

The Twin Cities leading indicator index consistently led the reference cycle, but the leads varied greatly (from 4 to 27 months). The leading

indicator also tended to react more sharply to turns, or slowdowns, in the economy than the coincident indicator. The TCILI was at its lowest point, as shown in Figure 2, approximatly 75, in 1972 and approached 145 in April 1988. The Twin Cities index also indicates a slowing of economic growth.

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Appendix A: Minnesota Economic Indicators*

Components of Minnesota Coincident Index

(1) Nonagricultural Wage and Salary Employment (weight = 90.6)

(2) Retail Trade Sales (weight = 85.28)

(3) Total Weekly Manufacturing Hours (weight = 83.23)

Components of Minnesota Leading Index

(1) M2 (weight = 90.09)

(2) Manufacturing Average Weekly Earnings (weight = 83.46)

(3) New Business Incorporations (weight = 85.67)

(4) Average Weekly Initial Unemployment Claims (weight = 84.76)

(5) Building Permits and Public Contracts for Housing Units (weight = 87.77)

Components of Twin Cities Coincident Index

(1) Nonagricultural Wage and Salary Employment (weight = 89.26)

(2) Total Weekly Manufacturing Hours (weight = 83.27)

Components of Twin Cities Leading Index

(1) Manufacturing Average Weekly Earnings (weight = 80.75)

(2) M2 (weight = 85.88)

(3) Number of Help Wanted Ads (weight = 83.14)

* All indicators are seasonally adjusted.

Indexes are 1982 based (i.e. the year 1982 = 100).

Appendix B: Summary Scores for Selected Potential Indicators

Indicator	Economic Sign. (0-100)	Stat. Adequacy (0-199)	Timing (0-100)	Con-formity (0-100)	Smooth-ness (0-100)	Currency (0-100)	Adjusted Total (0-100)
MINNESOTA							
NonAg Wage & Salary Emp	90	75	100	100	80	90	90.60
Retail Trade Sales*	80	80	93.2	100	60	90	85.28
Durable Manuf. Emp.	70	75	99.7	92	80	90	85.82
Total Weekly Manuf. Hrs.	70	70	99.3	90	70	90	83.23
NonDur. Manuf. Emp.	70	75	86.3	100	70	90	82.27
Avg. Weekly Initial Unemp. Claims (Inverted)	80	90	100	76	60	90	84.76
Total Initial Unemploy. Claims (Inverted)	80	90	99	68	60	90	77.70
Avg. Weekly Insured Unemployment (Inverted)	80	90	20.5	60	60	90	60.86
Commercial/Industrial Loans Outstanding*	80	75	94.5	100	70	90	86.13
Personal Consumption Loans Outstanding*	80	75	90.6	65	70	90	79.24
Demand Deposit*	70	75	76.6	65	60	90	72.50
Dain Bosworth Stock Index	80	85	62.5	65	70	90	73.41
M2**	80	82	100	100	80	90	90.09
Manuf. Avg. Weekly Hours	70	75	93	100	60	90	82.73
Manuf. Avg. Weekly Earnings*	80	65	97	90	70	90	83.46
Building Permits and Public Contracts for Housing Units	80	90	100	90	70	90	87.77
Building Permits for Single-unit Housing	70	90	100	90	70	90	86.13
New Business Incorporations	70	90	97	100	60	90	85.67
Residential Construct. Contract Awards*	80	72	98.4	100	60	90	85.26
TWIN CITIES							
NonAg Wage & Salary Emp.	90	67	100	100	80	90	89.26
Total Manuf. Emp.	70	67	98.4	86.3	80	90	83.20
Total Weekly Manuf. Hrs.	70	67	98.4	86.7	80	90	83.27
Manuf. Avg. Weekly Hours	70	67	90.6	100	50	90	79.42
Manuf. Avg. Weekly Earnings*	80	57	90.6	100	60	90	80.75
Retail Sales*	80	70	94.5	86.3	50	90	80.34
M2**	80	82	99.2	100	80	90	85.88
Number of Help Wanted Ads	70	85	83.6	100	70	90	83.14
Total Unemployment Insurance Claims	80	85	72.7	86.3	70	90	79.69

* in 1982 constant dollars (using the national PCE deflator).
** in 1982 constant dollars (using the national CPI-U deflator).

Table 1: Weighting Indicator Criteria

Criterion	Index
1. Economic significance	16.6
2. Statistical Adequacy	16.7
3. Timing	26.7
4. Conformity	16.7
5. Smoothness	13.3
6. Currency	10.0

Table 2: Example of Tests For a Candidate Variable

Criteria	Possible Subscore	Weight	Subscore	Score
Economic Significance		16.7		90
Statistical Adequacy		16.7		70
Reporting system	15		10	
Statistical coverage	15		5	
Time period covered	10		10	
Measure of error	5		0	
Frequency of revisions	20		15	
Length of time series	15		15	
Comparability over time	15		15	
Other considerations	5		0	
Timing		26.7		91
Conformity		16.7		84
Probability	60		60	
Extra turns	40		24	
Smoothness		13.3		80
Currency		10.0		90
Total Score	--	100	--	84

Table 3: Comparison of Business Cycle Peaks and Troughs, US, MN and Twin Cities, 1960-1988.

Trough			Peak		
US	MN	TC	US	MN	TC
--	--	--	Apr 60	Sep 60	--
Feb 61	Feb 61	--	Dec 69	Mar 70	--
Nov 70	Feb 71	Mar 71	Nov 73	Aug 74	Jun 74
Mar 75	Apr 75	Jul 75	Jan 80	Jan 80	Dec 79
Jul 80	Aug 80	Jul 80	Jul 81	Mar 81	Mar 81
Nov 82	Aug 82	Nov 82	--	--	--

Table 4: Turning Points of Minnesota Coincident Index (1970-1988)

Trough	Difference	Peak	Difference
Feb. 1971	0	Aug. 1974	0
April 1975	0	Oct. 1979	-3
Aug. 1980	0	April 1981	+1
June 1982	-1	--	--

(Note: Difference is the number of months separating the turning points in the coincident index and the reference cycle. Positive indicates ahead, negative behind, and zero indicates matching.)

Table 5: Turning Points of Minnesota Leading Indicator Index (1970-1988)

Trough	Difference	Peak	Difference
Feb. 1970	+9	Dec. 1972	+20
Feb. 1975	+2	Sept. 1978	+16
June 1980	+2	Oct. 1980	+5
Feb. 1981	+17		

Table 6: Turning Points of Twin Cities Coincident Indicator Index (1972-1988)

Trough	Difference	Peak	Difference
--	--	March 1984	-4
July 1975	0	Jan. 1980	+1
Aug. 1980	+2	March 1981	0
Nov. 1982	0	--	--

Table 7: Turning Points of Twin Cities Leading Indicator Index (1972-1988)

Trough	Difference	Peak	Difference
--	--	Nov. 1972	+19
July 1974	+12	Sept. 1977	+27
March 1980	+4	Sept 1980	+7
Nov. 1980	+24		

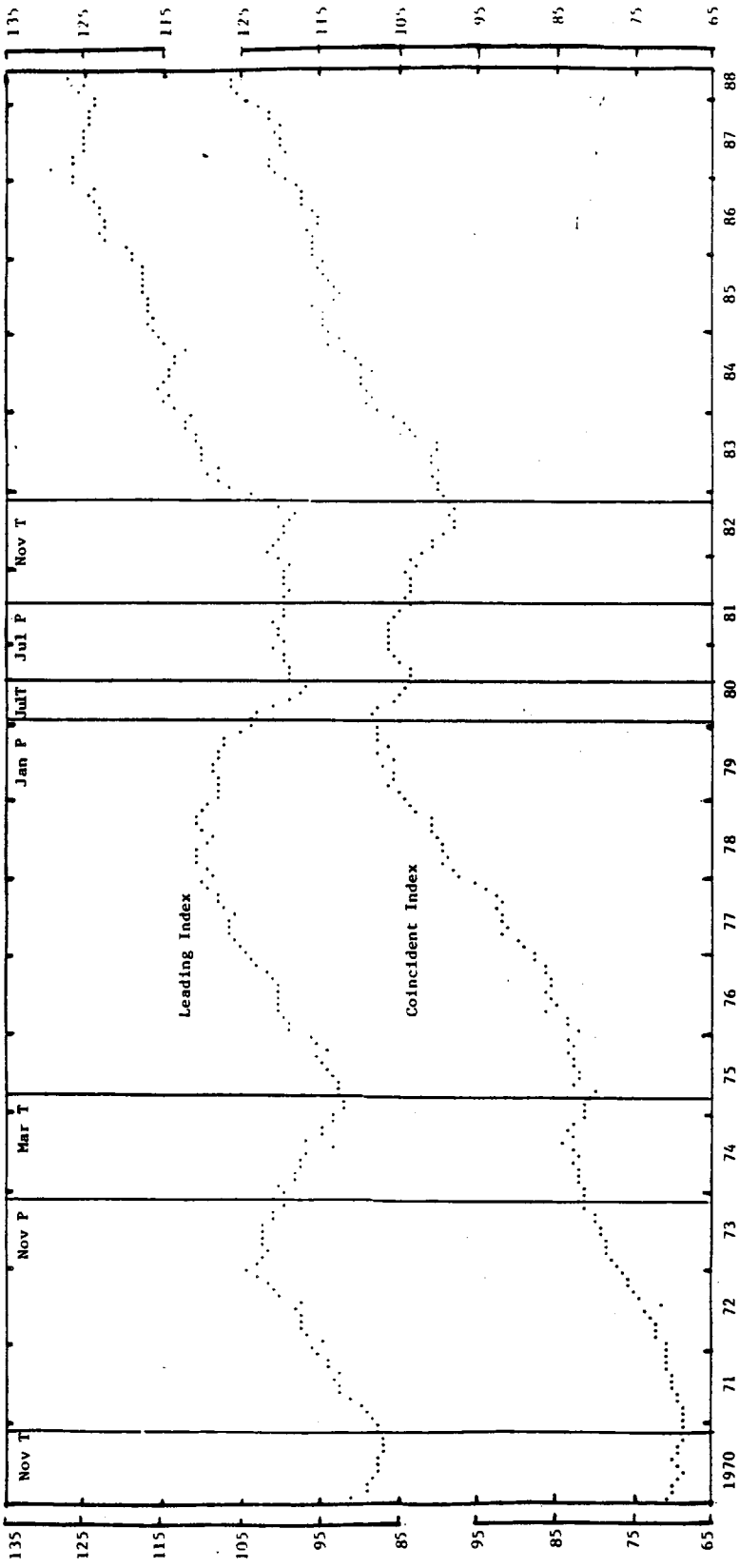


Figure 1. Minnesota Index of Leading Indicators (MILI) and Minnesota Index of Coincident Indicators (MICI), 1970-88. (U.S. business cycle peaks and troughs were indicated.)

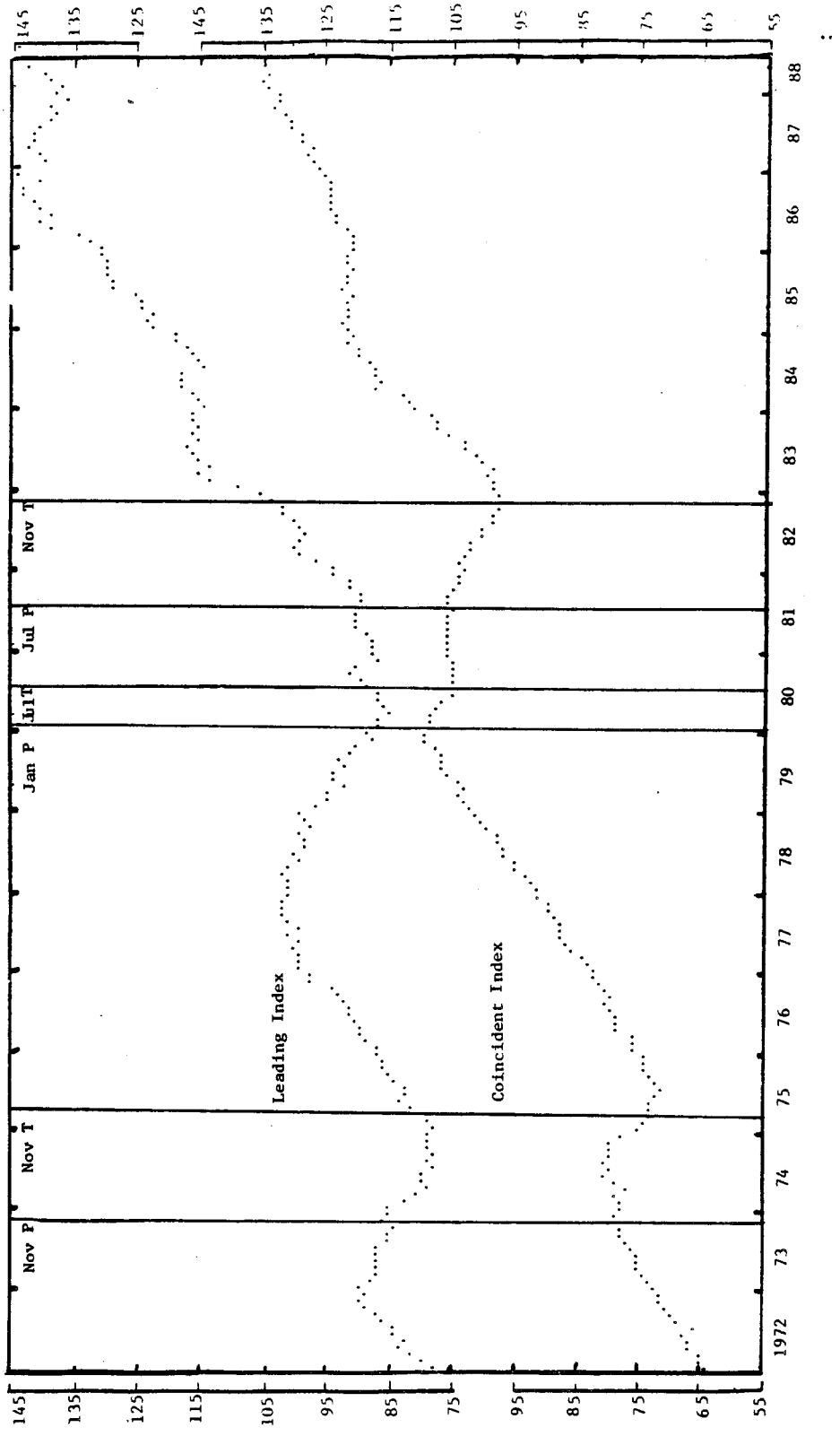
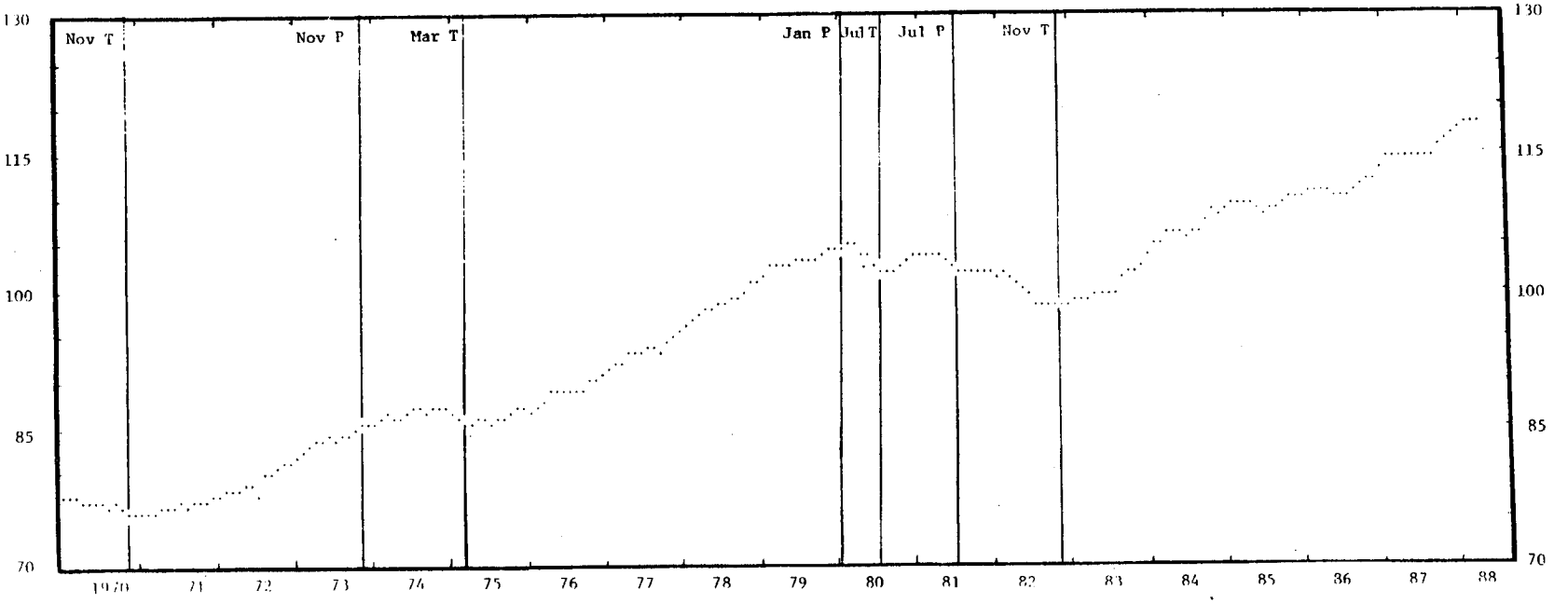


Figure 2. Twin Cities Index of Leading Indicators (TCILI) and Twin Cities Index of Coincident Indicators (TCICI), 1972-88. (U.S. business cycle peaks and troughs are indicated.)

Figure 1. Minnesota Nonagricultural Wage and Salary Employment (1982=100). (U.S. business cycle peaks and troughs are indicated.)



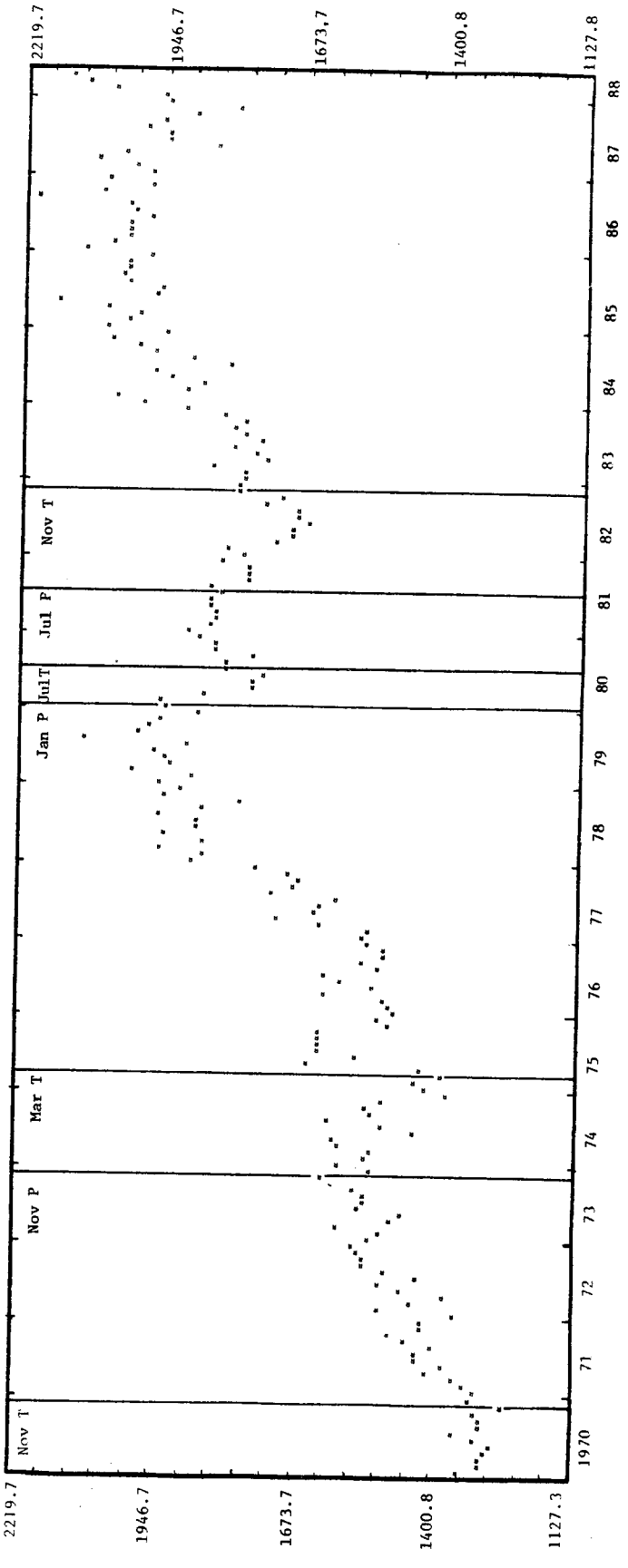


Figure 4. Minnesota Retail Trade Sales (1982 $ in millions). (U.S. business cycle peaks and troughs are indicated.)

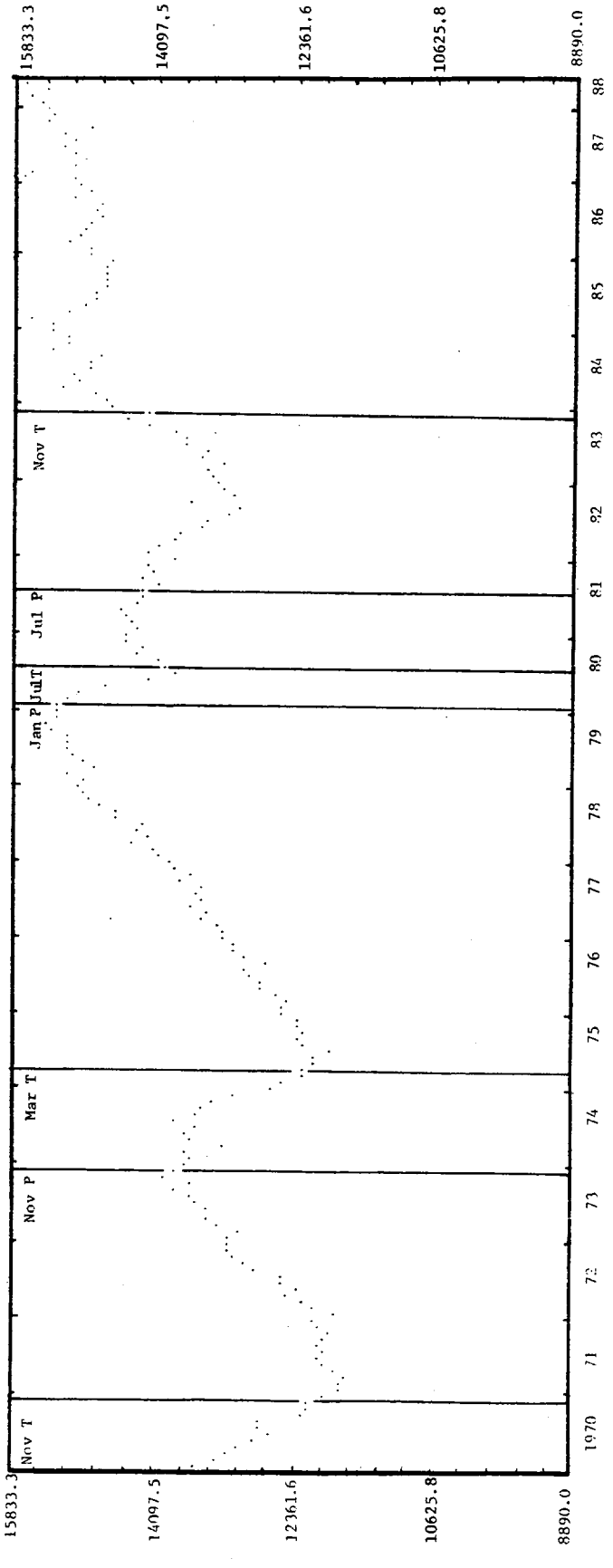


Figure 5. Minnesota Total Weekly Manufacturing Hours. (U.S. business cycle peaks and troughs are indicated.)

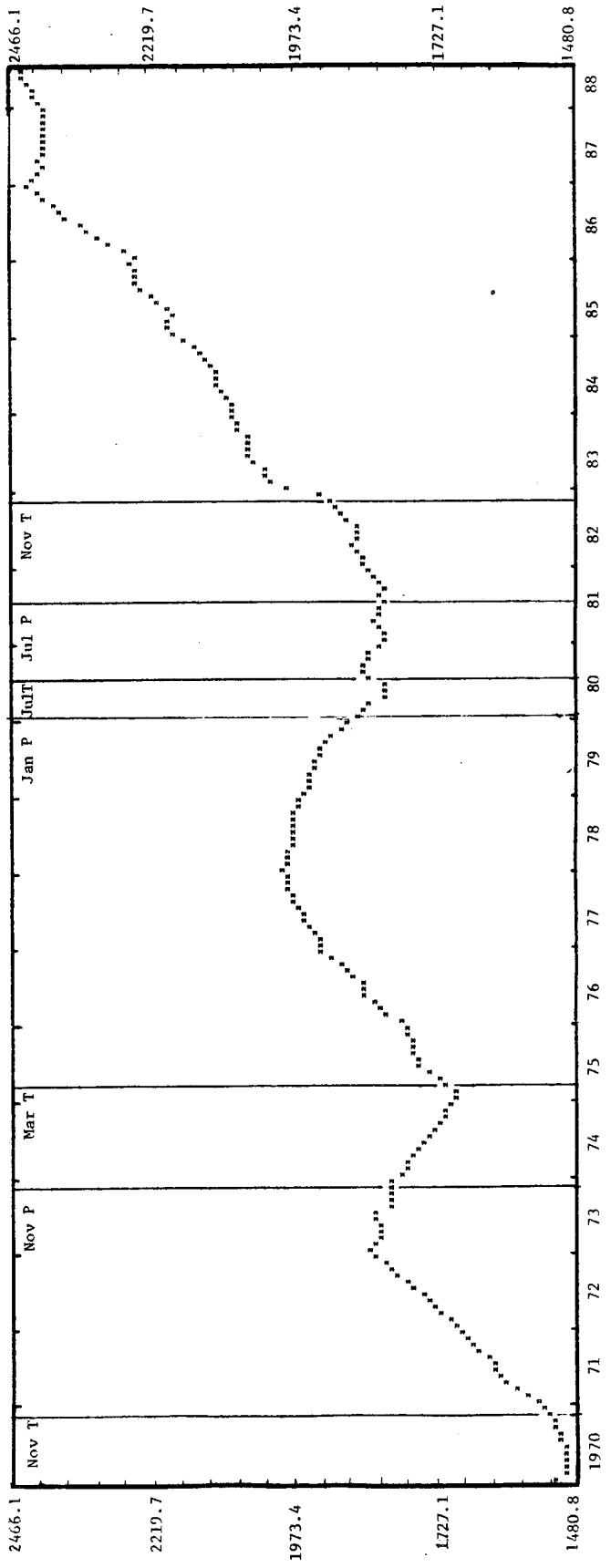


Figure 6. U.S. Money Supply - M2 (1982 $ in billions) (U.S. business cycle peaks and troughs are indicated.)

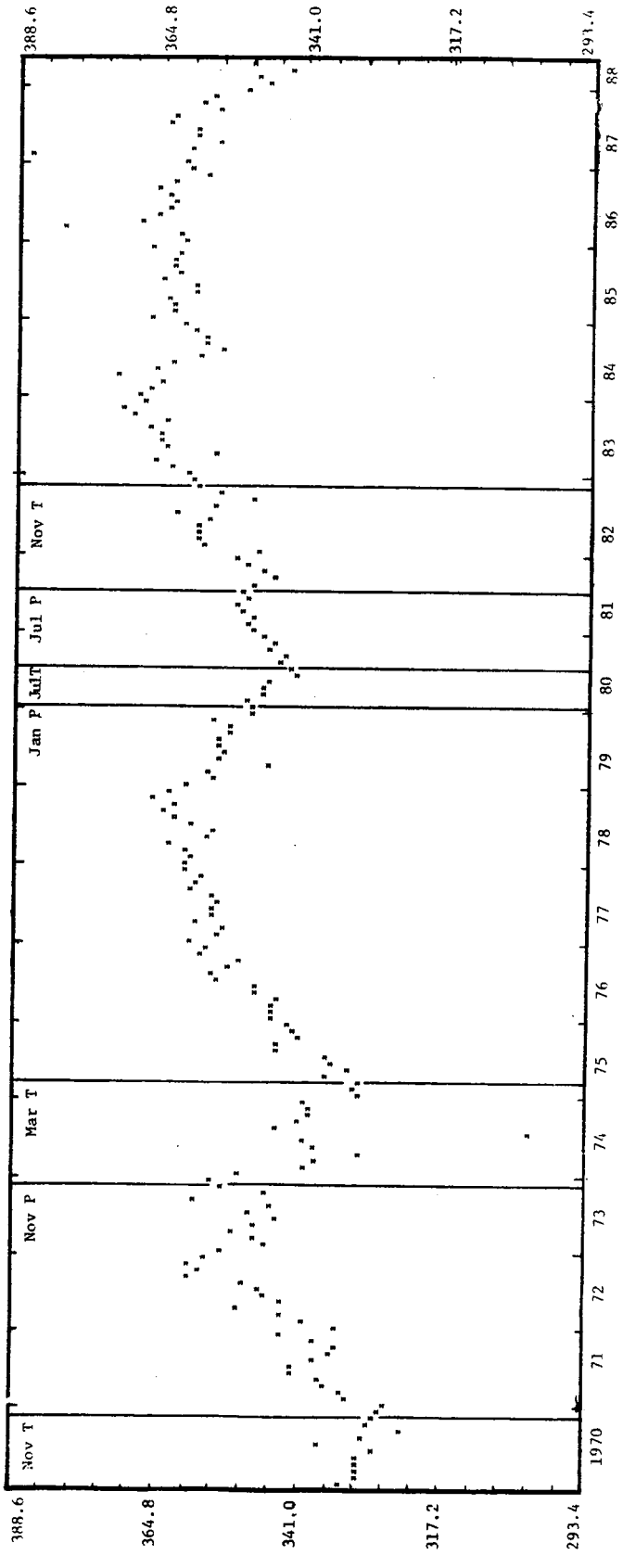


Figure 7. Minnesota Manufacturing Average Weekly Earnings (1982$). (U.S. business cycle peaks and troughs are indicated.)

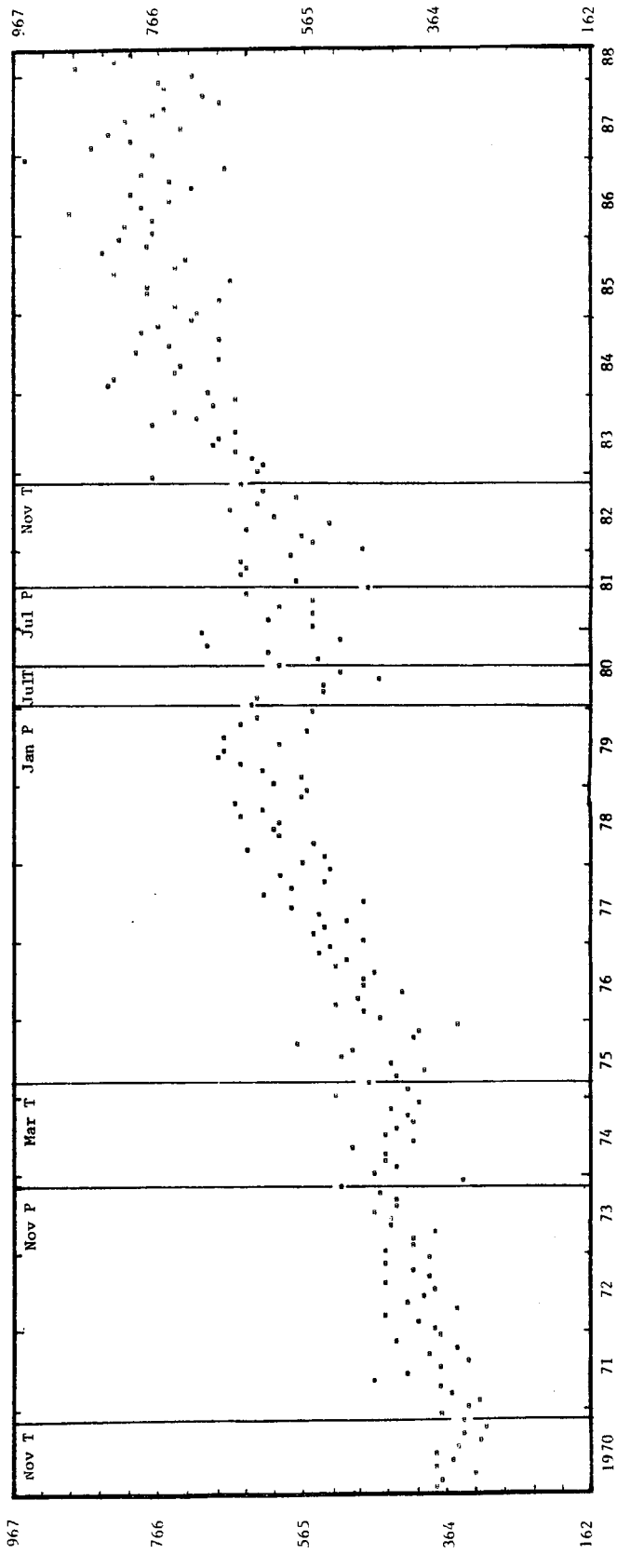


Figure 8. Minnesota New Business Incorporations. (U.S. business cycle peaks and troughs are indicated.)

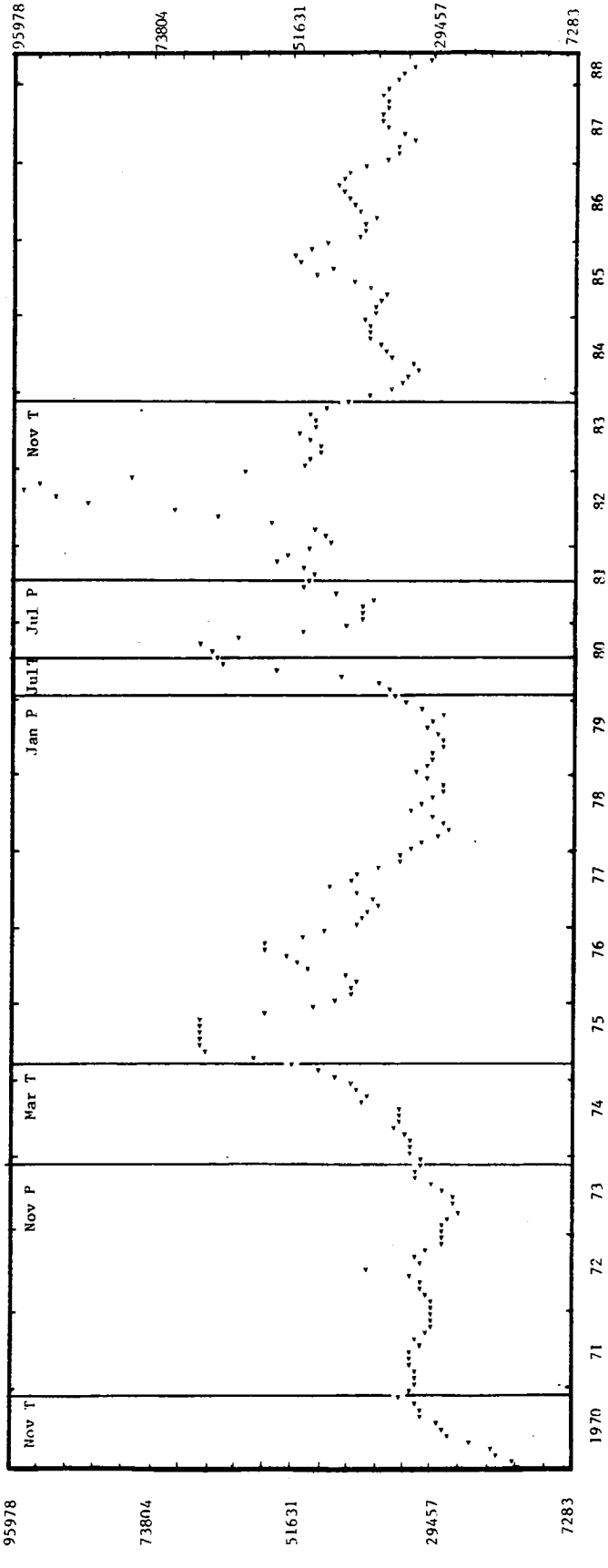


Figure 9. Minnesota Average Weekly Initial Unemployment Claims. (U.S. business cycle peaks and troughs are indicated.)

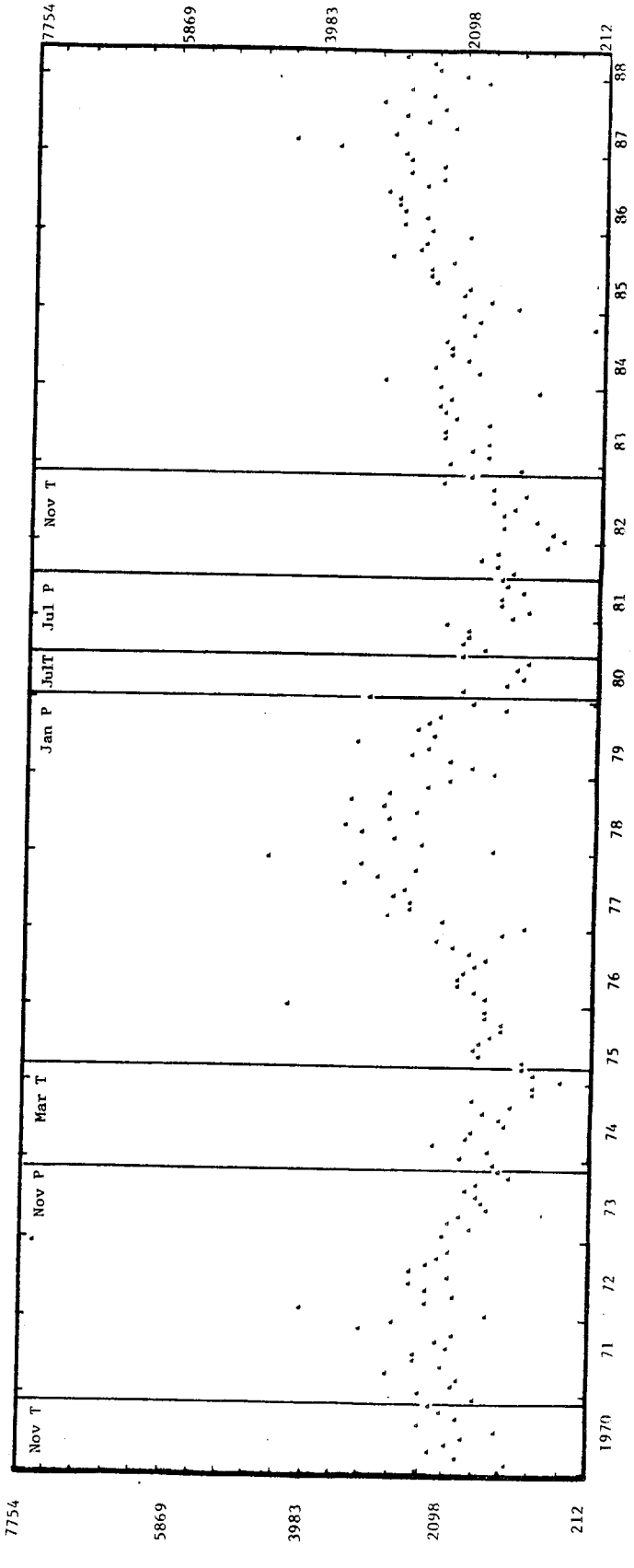


Figure 10. Minnesota Building Permits and Public Contracts for Housing Units. (U.S. business cycle peaks and troughs are indicated.)

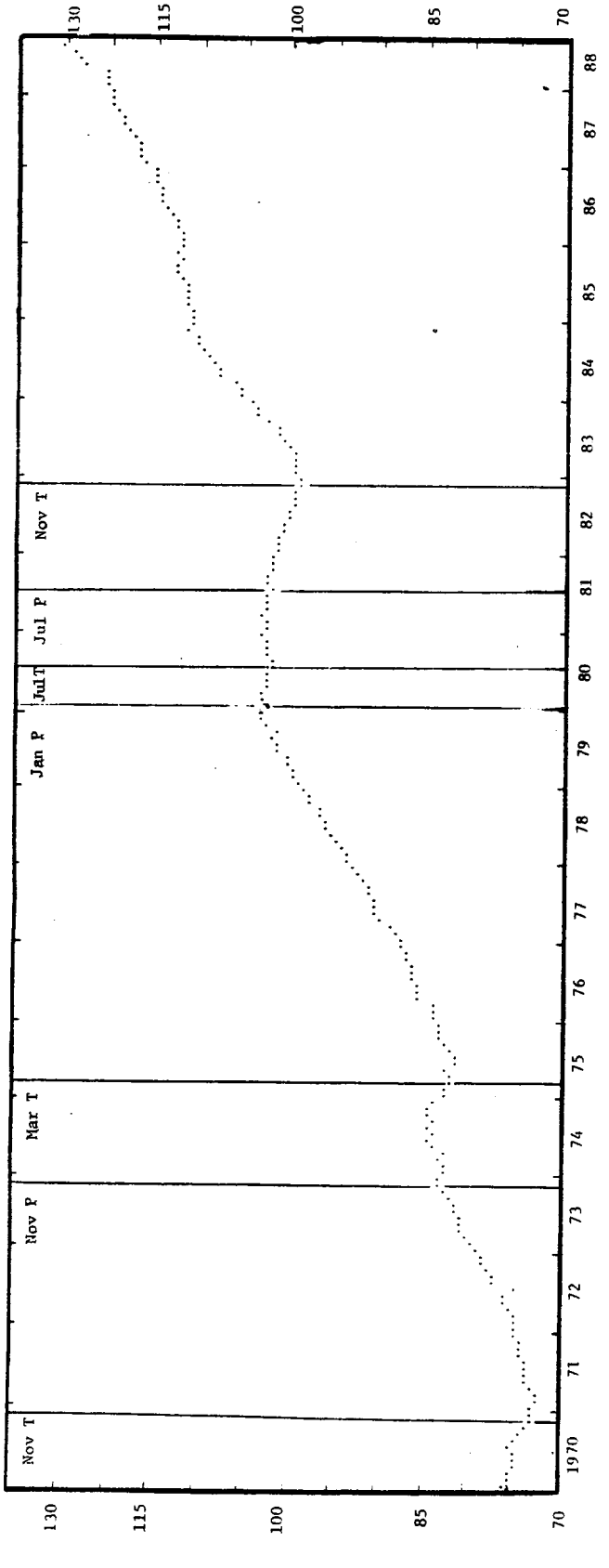


Figure 11. Twin Cities Nonagricultural Wage and Salary Employment (1982=100). (U.S. business cycle peaks and troughs are indicated.)

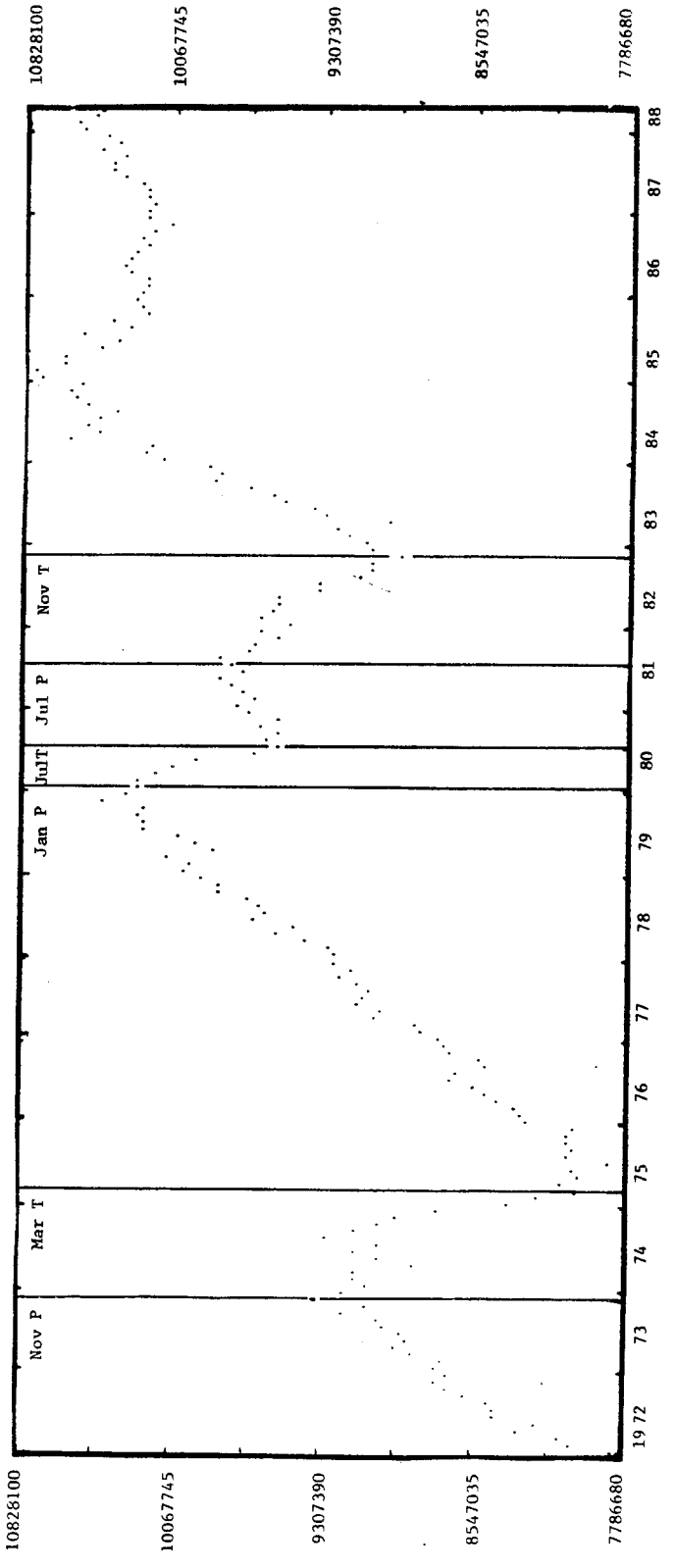


Figure 12. Twin Cities Total Weekly Manufacturing Hours. (U.S. business cycle peaks and troughs are indicated.)

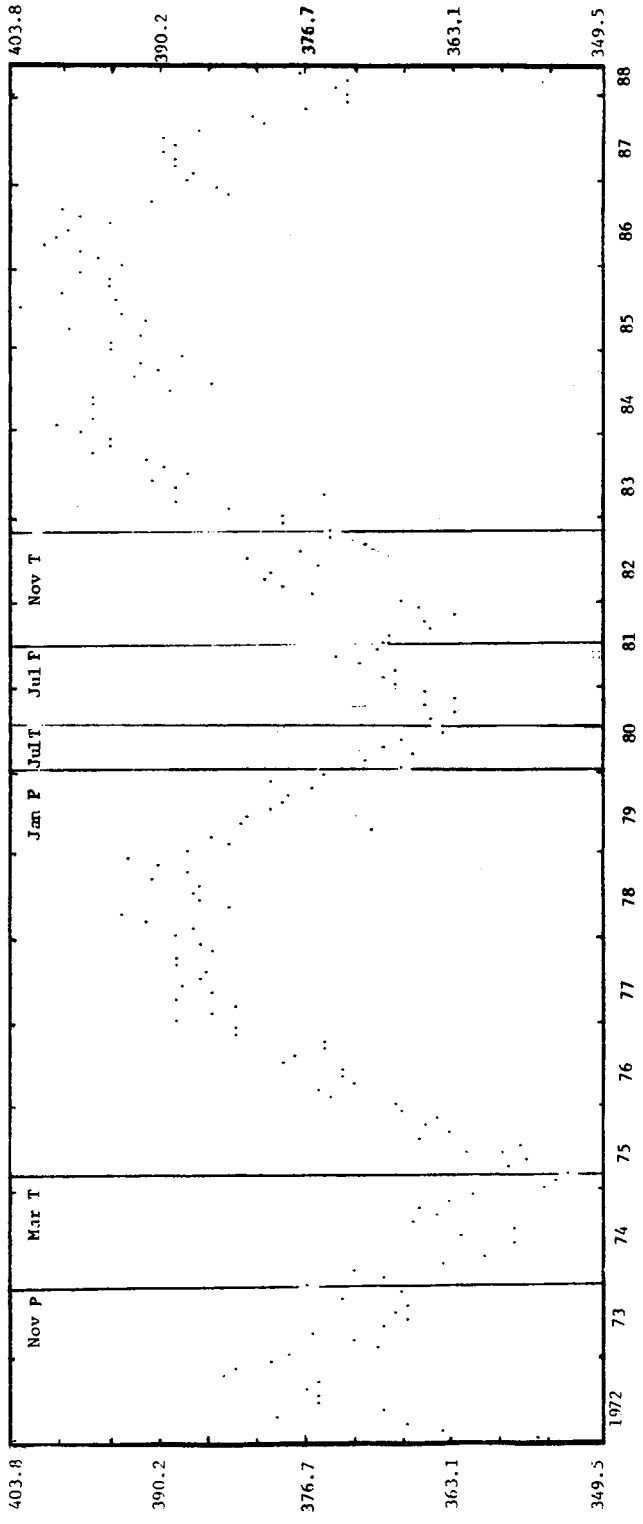


Figure 13. Twin Cities Manufacturing Average Weekly Earnings (1982 $). (U.S. business cycle peaks and troughs are indicated.)

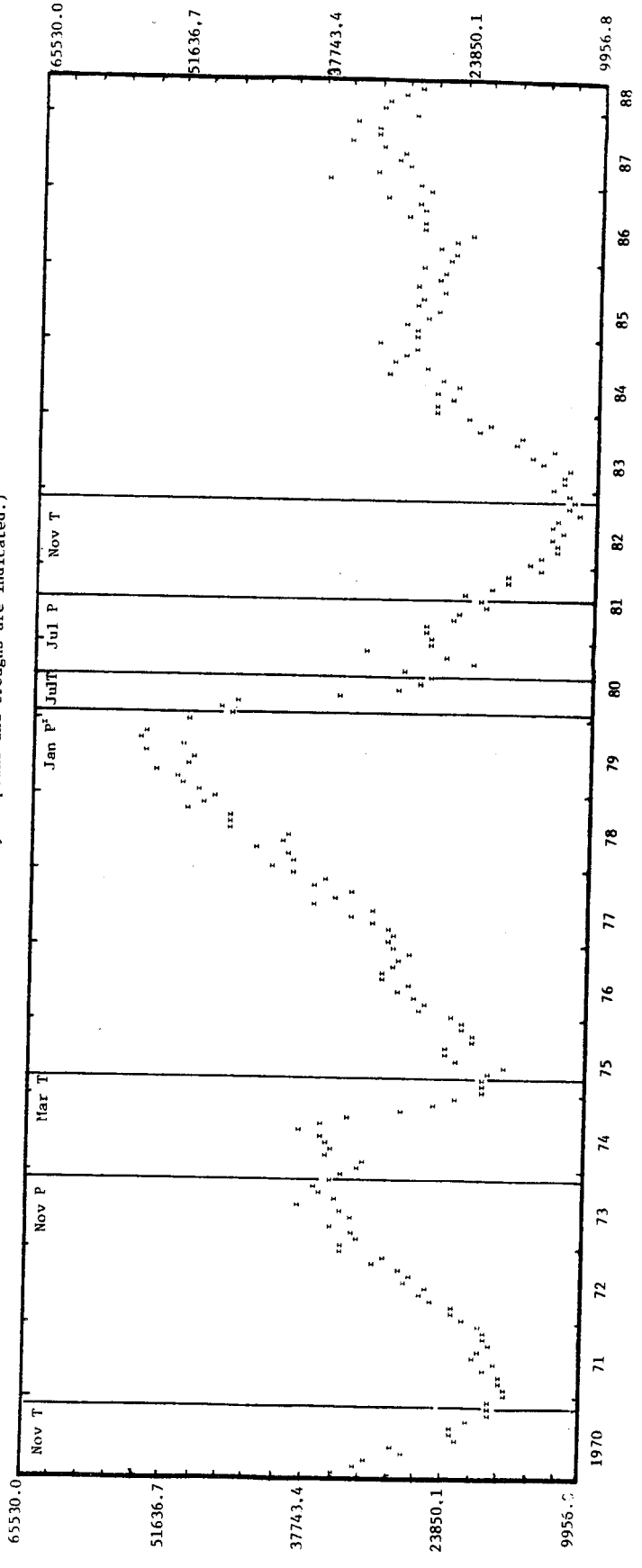


Figure 14. Twin Cities Number of Help Wanted Ads. (U.S. business cycle peaks and troughs are indicated.)