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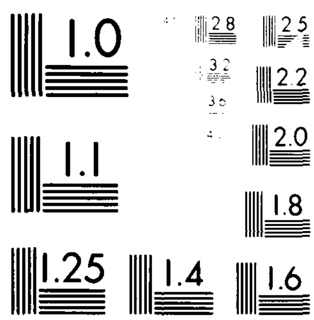

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NAVAL POSTGRADUATE SCHOOL

Monterey, California

THESIS

A STATISTICAL ANALYSIS OF DAILY AND WEEKLY RAINFALL FOR THE MONTEREY PENINSULA, IN CENTRAL CALIFORNIA

by

Davut Kirca

September 1981

Thesis Advisor: D. P. Gaver

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This thesis presents a preliminary statistical analysis of the daily and weekly rainfall for the Monterey Peninsula, in central California. The analysis begins by examining the daily rainfall data, also the relationship among the length of the storms, amount of rainfall in the storms and length of the successive days of rain. Also included is a study of the distribution of the amount of rainfall in the storms. Also →

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This paper attempts to analyze rainfall data in the statistical sense. No attempt is made to provide a physical explanation of the findings from the point of view of a meteorologist.

A Statistical Analysis of Daily and Weekly Rainfall for the Monterey Peninsula, in Central California

by

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Lieutenant, Turkish Navy
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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN OPERATIONS RESEARCH

from the

NAVAL POSTGRADUATE SCHOOL
September, 1981

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ABSTRACT

This thesis presents a preliminary statistical analysis of the daily and weekly rainfall for the Monterey Peninsula, in central California. The analysis begins by examining the daily rainfall data, also the relationship among the length of the storms, amount of rainfall in the storms and length of the successive days of rain. Also included is a study of the distribution of the amount of rainfall in the storms. Also study of the distribution was carried out for non-zero weekly rainfalls. 4x4 contingency tables are used to identify dependence/independence among the weeks in a given month. Also, 2x2 contingency tables are used to examine dependencies between weekly rainfalls; logistic analysis is used as a parametric model for dependence.

This paper attempts to analyze rainfall data in the statistical sense. No attempt is made to provide a physical explanation of the findings from the point of view of a meteorologist.

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GLOSSARY OF SYMBOLS

WEEK	JULIAN DATE	DESCRIPTION
J1:	001-007	is first week of January.
J2:	008-014	is second week of January.
J3:	015-021	is third week of January.
J4:	022-028	is fourth week of January.
JF:	029-035	is end of January--beginning of February.
F1:	035-042	is first week of February.
F2:	043-049	is second week of February.
F3:	050-056	is third week of February.
FM:	056--63	is end of February--beginning of March.
M1:	064-070	is first week of March.
M2:	071-077	is second week of March.
M3:	078-084	is third week of March.
M4:	085-091	is fourth week of March.
A1:	092-098	is first week of April.
A2:	099-105	is second week of April.
A3:	106-112	is third week of April.
A4:	113-119	is fourth week of April.
AM:	120-126	is end of April--beginning of May.
O1:	272-278	is first week of October.
O2:	279-285	is second week of October.
O3:	286-292	is third week of October.

O4: 292-299 is fourth week of October.

ON: 300-306 is end of October-beginning of November.

N1: 307-313 is first week of November.

N2: 314-320 is second week of November.

N3: 321-327 is third week of November.

N4: 328-334 is fourth week of November.

D1: 335-341 is first week of December.

D2: 342-348 is second week of December.

D3: 349-355 is third week of December.

D4: 356-362 is fourth week of December.

I. INTRODUCTION

The Monterey Peninsula Water District, in the central California coastal area, has as one of its responsibilities the duty to recommend and/or impose water rationing on its constituents.

To do this in a rational way requires the district to have some way for predicting future water availability. This thesis analyzes rainfall data for the Forest Lake station of Monterey by purely statistical methodology in order to identify possible ways for predicting future water availability.

No strong evidence for useful procedures has been uncovered in this thesis, although some week indications of possible dependencies have been found.

II. DATA

A. GENERAL

Daily and weekly rainfall data were used in this analysis. The data were accumulated at the Forest Lake station of Monterey, in Central California. Rainfall data has been gathered by the California American-Water Company since 1891.

Although this data set started quite early, the data prior to 1938 has frequent missing observations. Therefore this data set includes observations from January 1938 through December 1974. Appendix A contains a listing of the daily rainfall data.

Weekly rainfall amounts have been obtained by summing daily rainfall amounts, starting from the beginning of October and running to the end of the April (which is considered the rainy season for Monterey Peninsula area) for the 36-year period (1938-1939 through 1973-1974). A week is defined in terms of Julian dates rather than the usual calendar week. For example the first week of January is defined to include the first seven days of the year. For other definitions of weeks, see the Table of Symbols.

B. WEEKLY DATA

Appendix B contains a listing of weekly rainfall data. Appendix C shows plots of the weekly rainfall. As can be seen the data are strongly seasonal. This is enough to indicate that it is quite non-stationary.

Means and variances of the weekly rainfall are shown in Tables 1 and 2 for weeks with and without positive rainfall respectively. Figures 1 and 2 show plots of means and variances for weeks with and without positive rainfalls. On the figures week 1 represents the first week of October as O1 and week 31 represents the end of April and beginning of May as AM.

Table 1 : MEANS AND VARIANCES FOR WEEKLY RAINFALL (WITH ZERO RAINFALL)

WEEK	MEAN	VARIANCE
O1	0.07	0.04
O2	0.20	0.15
O3	0.16	0.11
O4	0.15	0.09
ON	0.23	0.28
N1	0.44	0.40
N2	0.77	1.08
N3	0.50	0.85
N4	0.55	1.32
D1	0.71	0.65
D2	0.39	0.37
D3	0.57	0.36
D4	1.04	1.87
J1	0.60	0.80
J2	0.79	0.98
J3	0.85	1.20
J4	0.73	0.73
JF	0.92	1.11
F1	0.74	0.85
F2	0.50	0.36
F3	0.67	0.80
FM	0.86	1.28
M1	0.54	0.37
M2	0.67	0.66
M3	0.47	0.37
M4	0.72	1.34
A1	0.52	0.65
A2	0.25	0.16
A3	0.24	0.25
A4	0.30	0.13
AM	0.13	0.03

Table 2: MEANS AND VARIANCES FOR POSITIVE WEEKLY RAINFALL

WEEK	MEAN	VARIANCE
O1	0.29	0.11
O2	0.42	0.22
O3	0.36	0.18
O4	0.37	0.15
ON	0.58	0.53
N1	0.79	0.45
N2	0.99	1.18
N3	0.94	1.22
N4	0.89	1.88
D1	0.91	0.65
D2	0.63	0.45
D3	0.73	0.34
D4	1.55	2.00
J1	0.83	0.92
J2	1.13	1.02
J3	1.46	1.17
J4	0.97	0.74
JF	1.14	1.13
F1	0.98	0.89
F2	0.67	0.36
F3	1.15	0.83
FM	1.03	1.36
M1	0.61	0.38
M2	0.86	0.69
M3	0.67	0.40
M4	1.13	1.65
A1	0.90	0.78
A2	0.42	0.18
A3	0.61	0.42
A4	0.50	0.12
AM	0.26	0.03

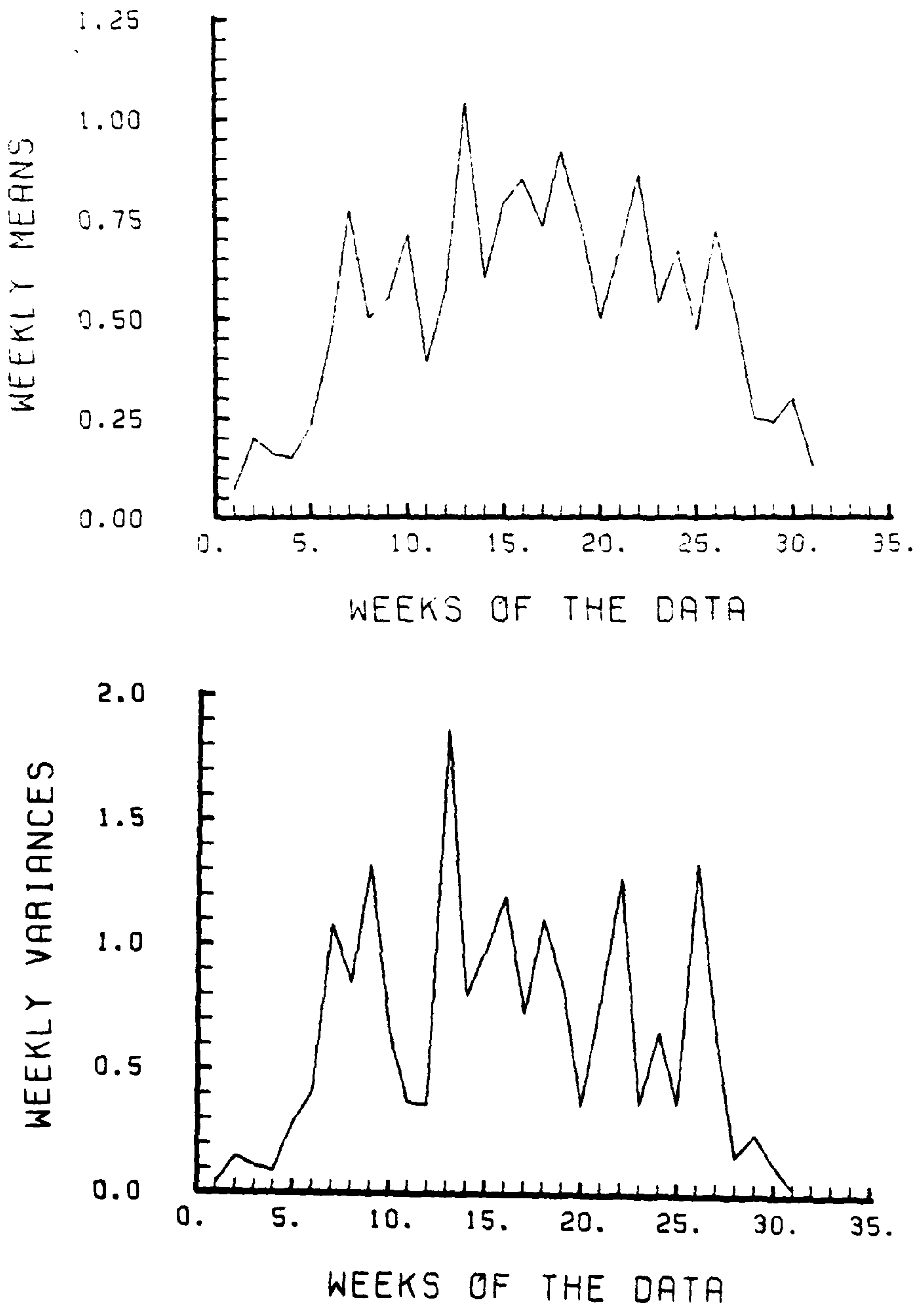


Figure 1. Weekly means and variances for the weeks zero rainfalls included.

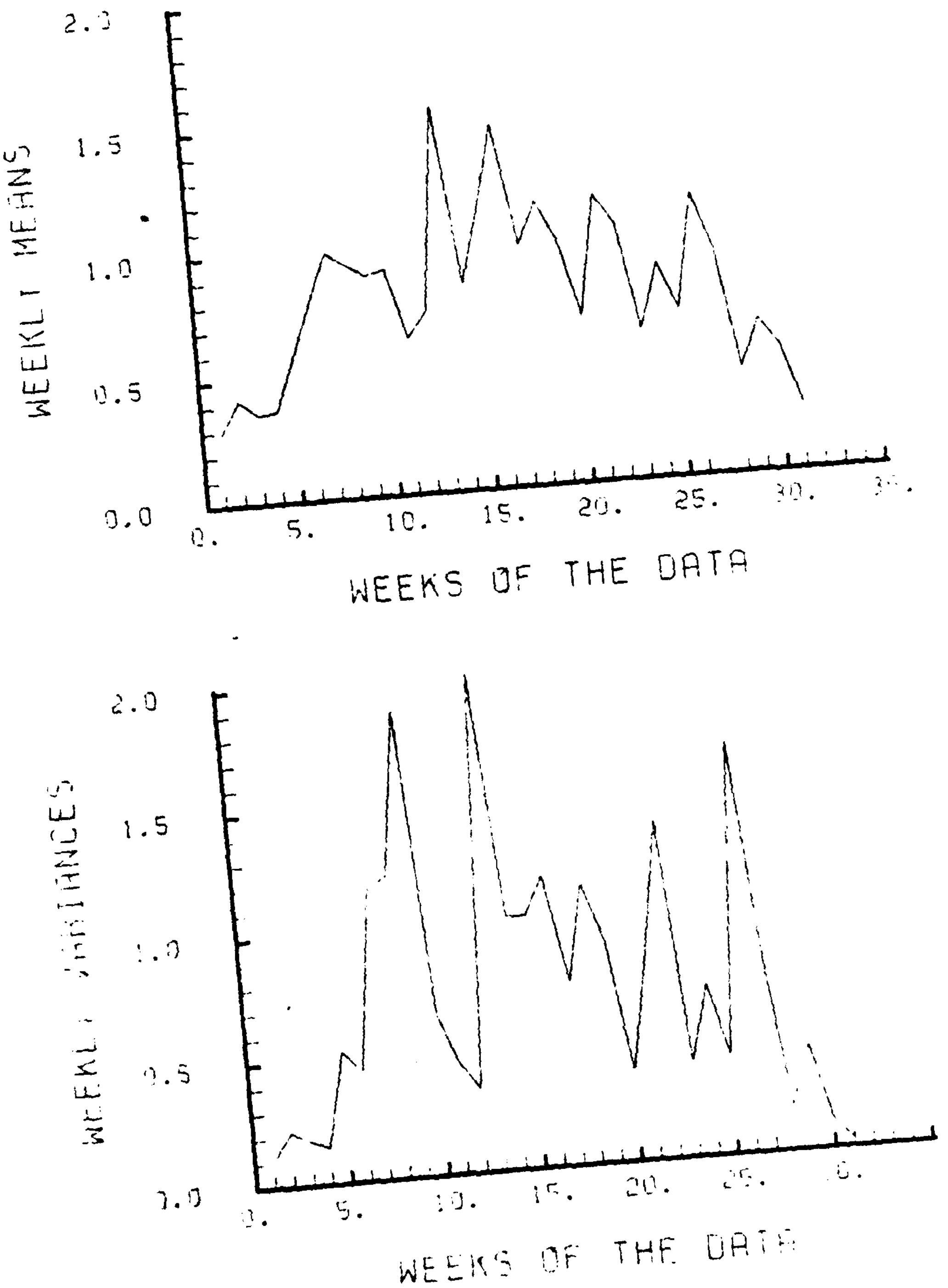


Figure 2. Weekly means and variances for the positive weekly rainfalls

III. ANALYSIS OF STORMS

A. GENERAL

This analysis is carried out on rainfall data from October to May for a 36-year period (1938-1939 through 1973-1974). The rainy period is considered to run from October to May for the Monterey Peninsula.

B. STORMS

It will be said that a storm lasts exactly n days if there are exactly n consecutive days having rainfall greater than 0.02 inches. For example, if on January 10th there is no rainfall and on the 11th, 12th, and 13th of January there are 0.30", 0.15", 1.15" recorded in inches of rain respectively, and on the 14th of January there is again no rainfall, this means that a storm of length of duration 3 days has occurred, and the amount of rainfall in this storm is 1.60" (0.30 + 0.15 + 1.15 = 1.60).

Based on the above definition the historical lengths of storms and the amount of rainfall in the storms will be examined.

Appendix E shows the histograms of length of the storms, as denoted by LS, amount of the rainfall in the storms, as denoted by AR, and length of the non-rainy period after the storms, as denoted by LN for October through April and December through February in the 36-year period. The rainy period in the December through February months is more homogeneous than the October through April period so for this reason the December through February period is also examined. Figures 3 through 5 show the time series plots of the LS, AR, and the LS in the 36-year period. On the figures, dot (·) indicates the beginning of each year from 1938-1939 through 1973-1974. Figures 6 through 11 show the plot of LS against AR, LS against LN, and LN against AR for the October through April and December through February months in the 36-year period.

Plots of LS versus LN indicates that if the length of the storms is small then the following non-rainy period (dry period) is large. Table 3 shows the LS and the mean of the length of the following non-rainy period for the October through April and December through February months. Figure 12 shows the LS versus the mean of the following non-rainy period for the October through April and December through February in the 36-year period. The length of the storms (LS) and amount of the rainfall (AR) in the storms appear to have a linear relationship. By using median methods the slope of the length of the storms against the amount of the rainfall in the storm was computed as 0.71 for October through April and 0.79 for December through February.

Here are some statistics from the historgrams of LS, AR, and LN (Table 4).

Appendix E shows the histograms of the amount of rainfalls in exactly n days lasting storms which are made for

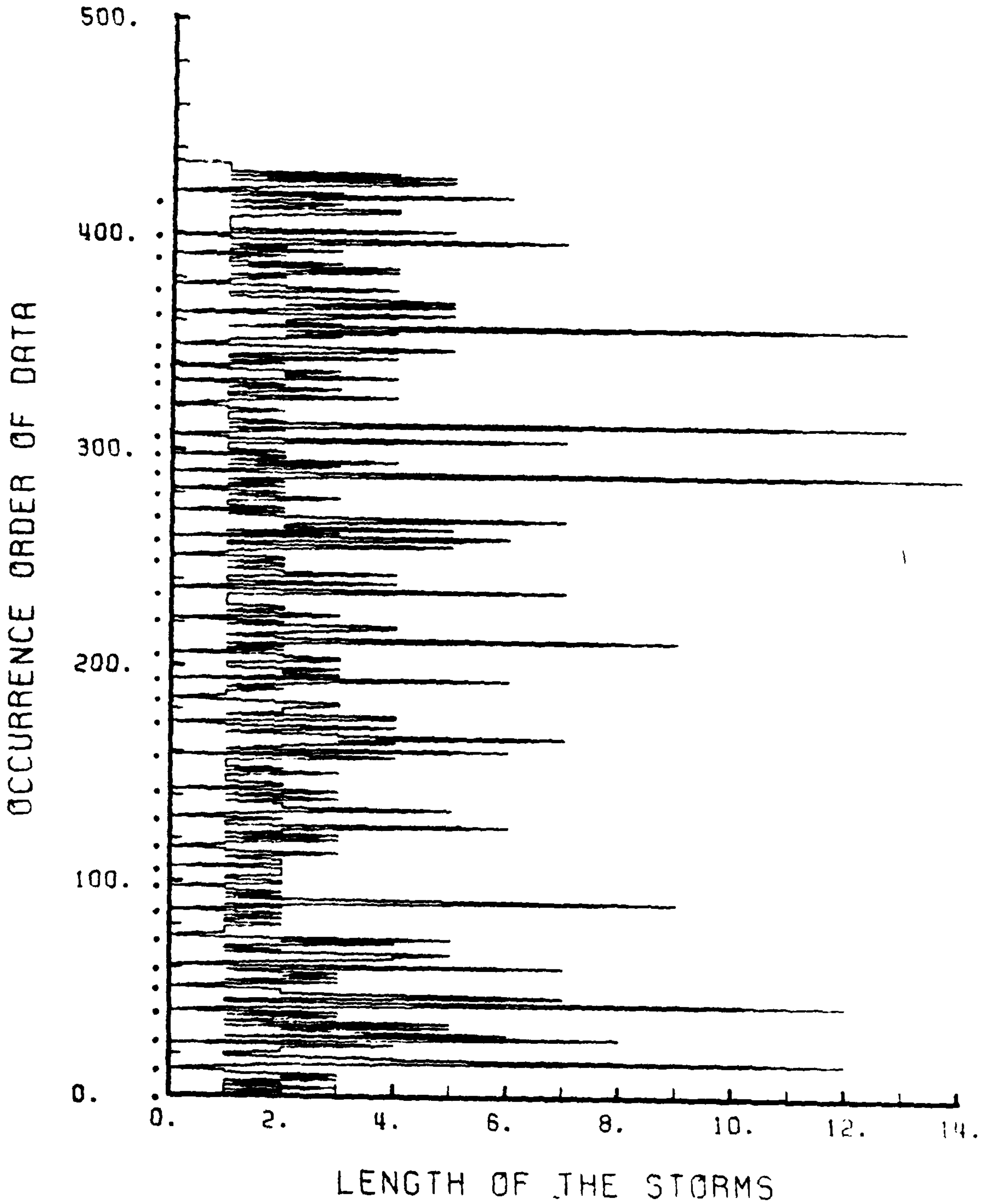


Figure 3. Time series plot of the LS for December-February.

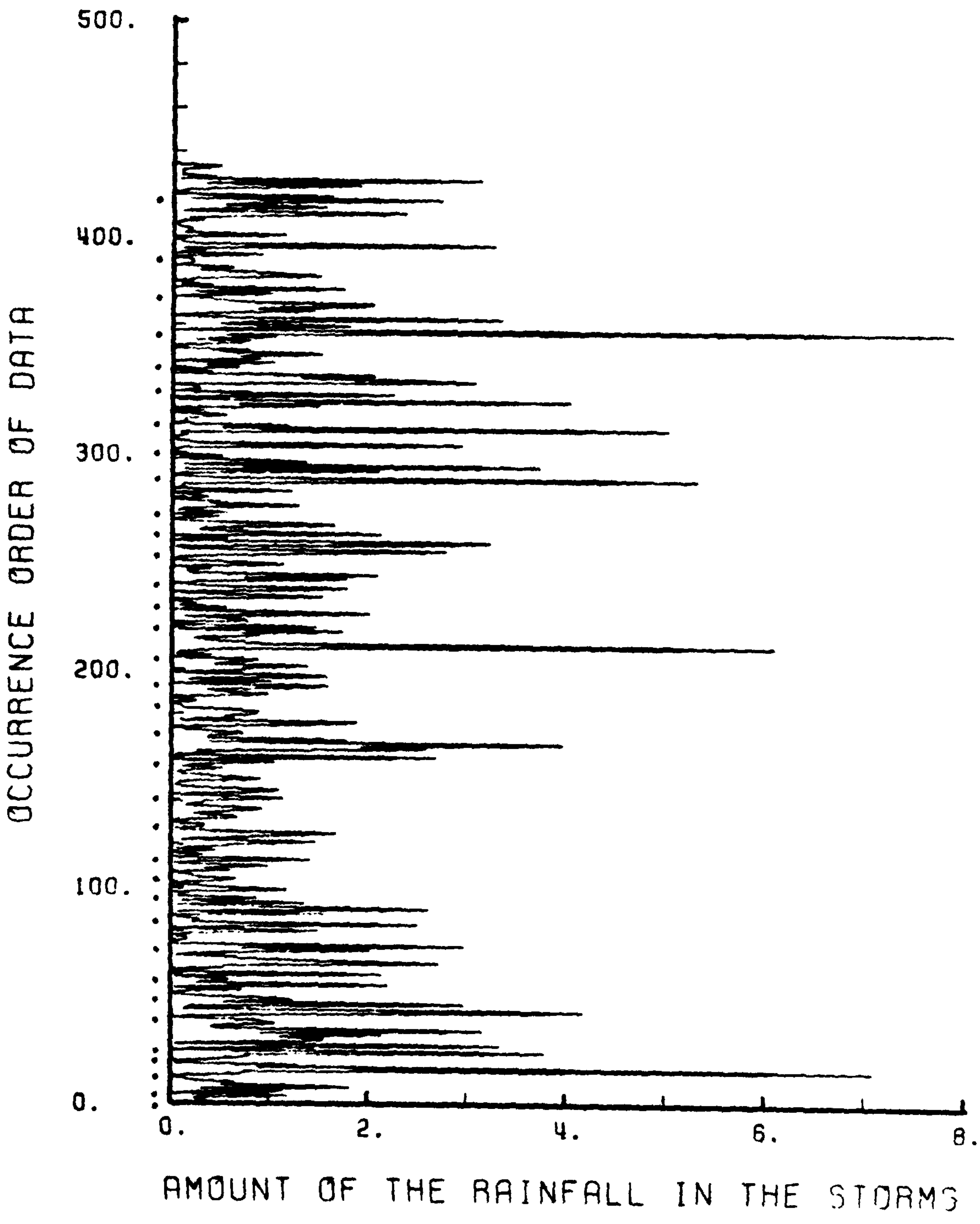


Figure 4. Time series plot of the AR for December-February.

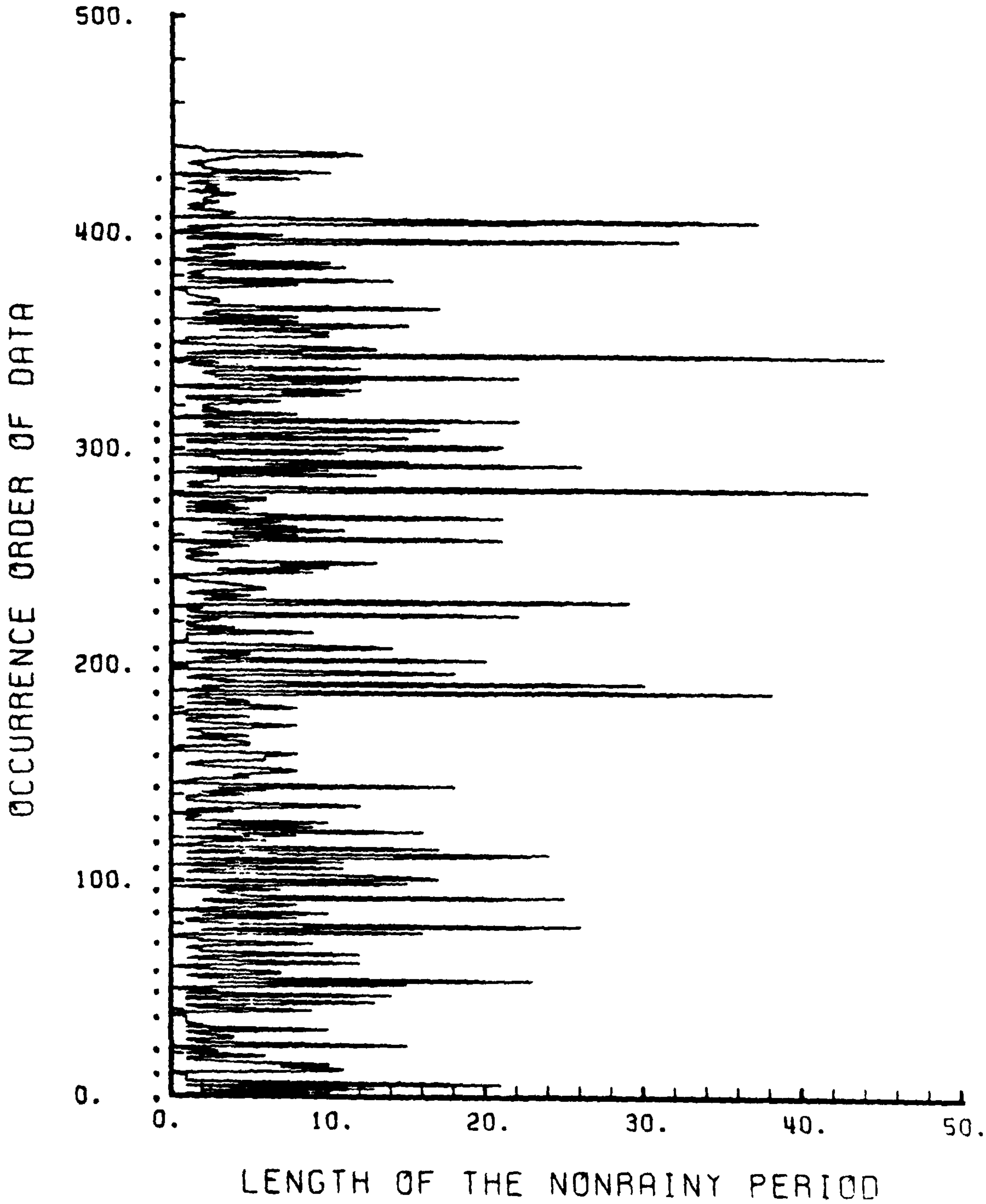


Figure 5. Time series plot of the LN for December-February.

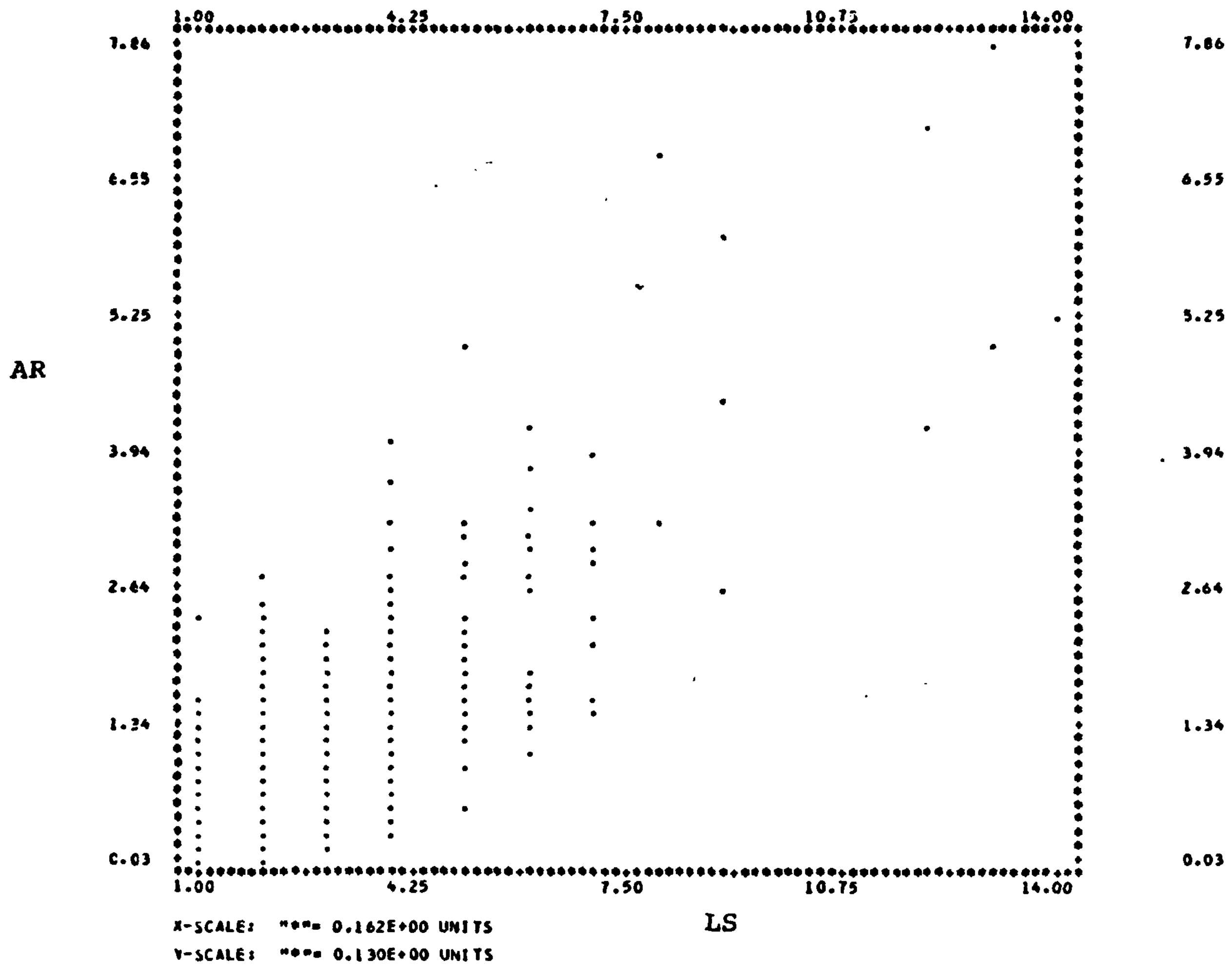


Figure 6. Plot of the LS against AR for October-April

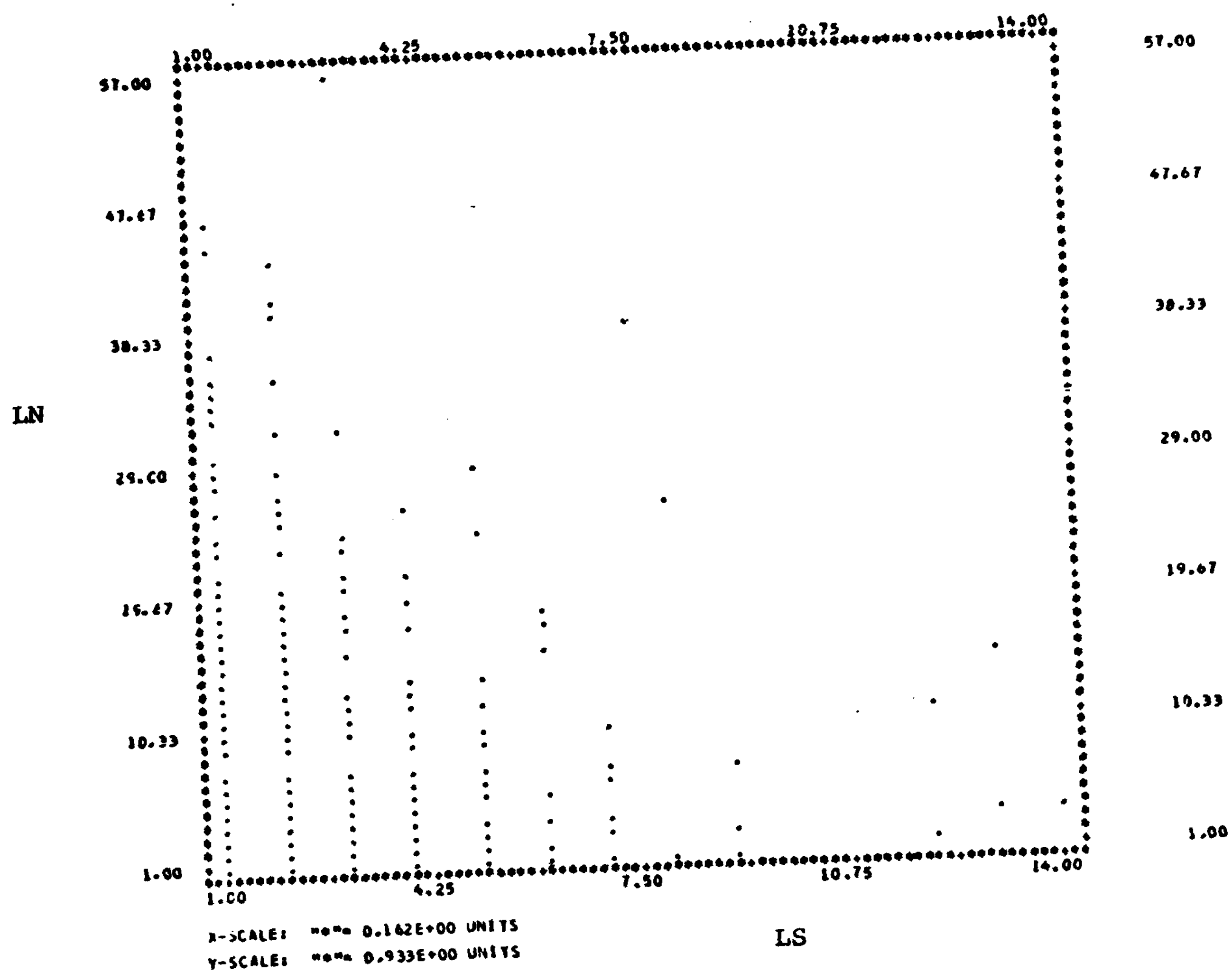


Figure 7. Plot of the LS against LN for October-April

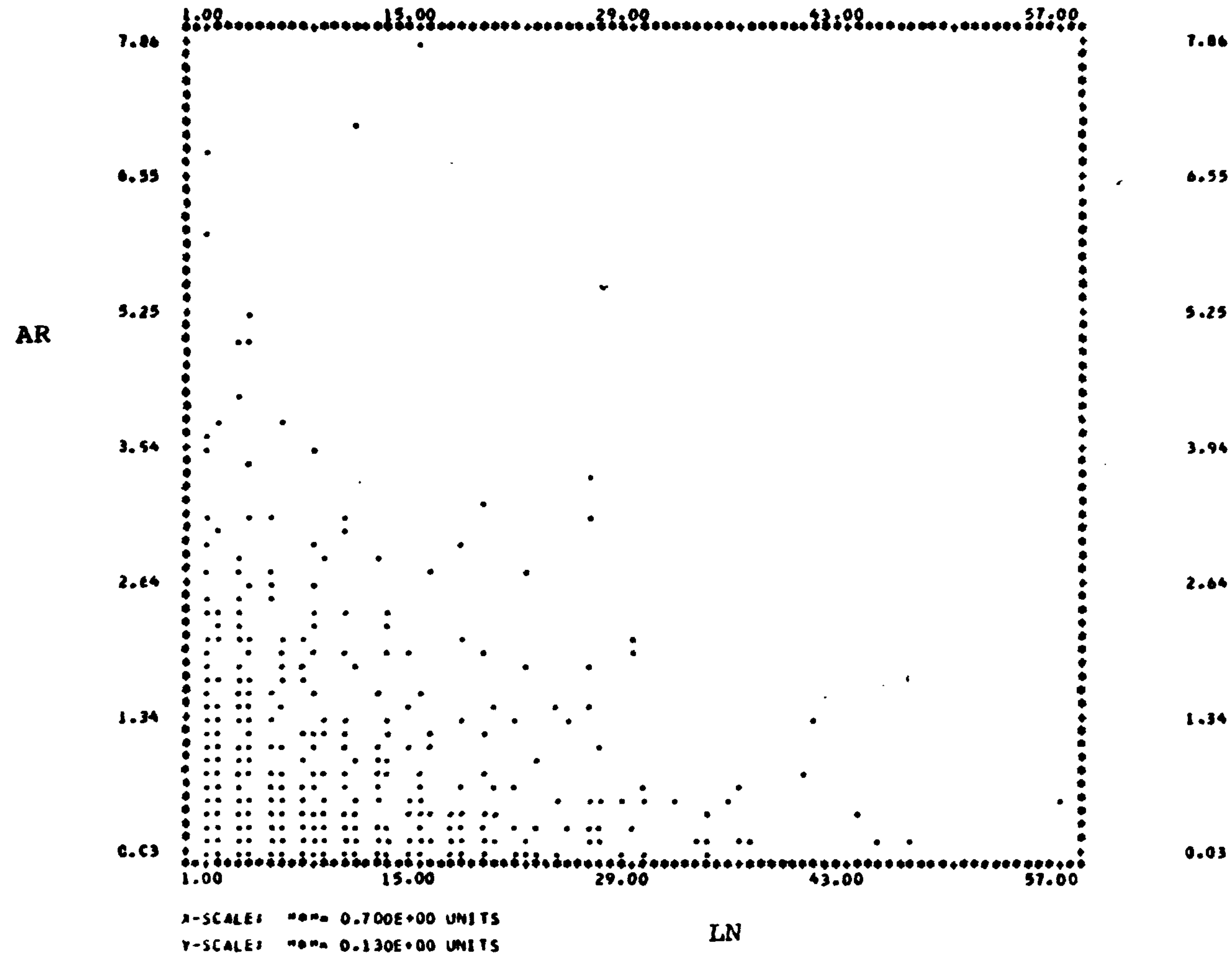


Figure 8. Plot of the LN against AR for October-April

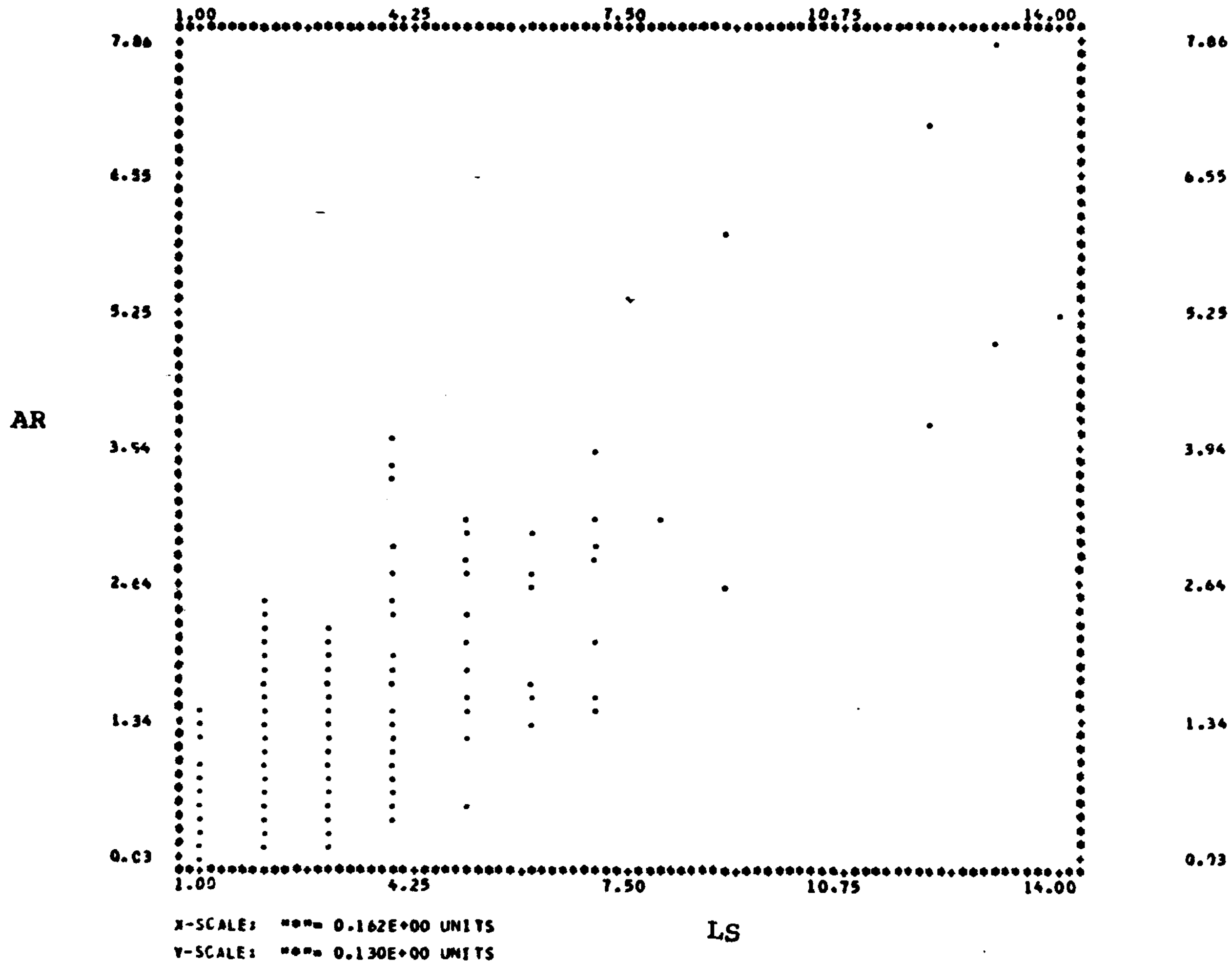


Figure 9. Plot of the LS against AR for December-February

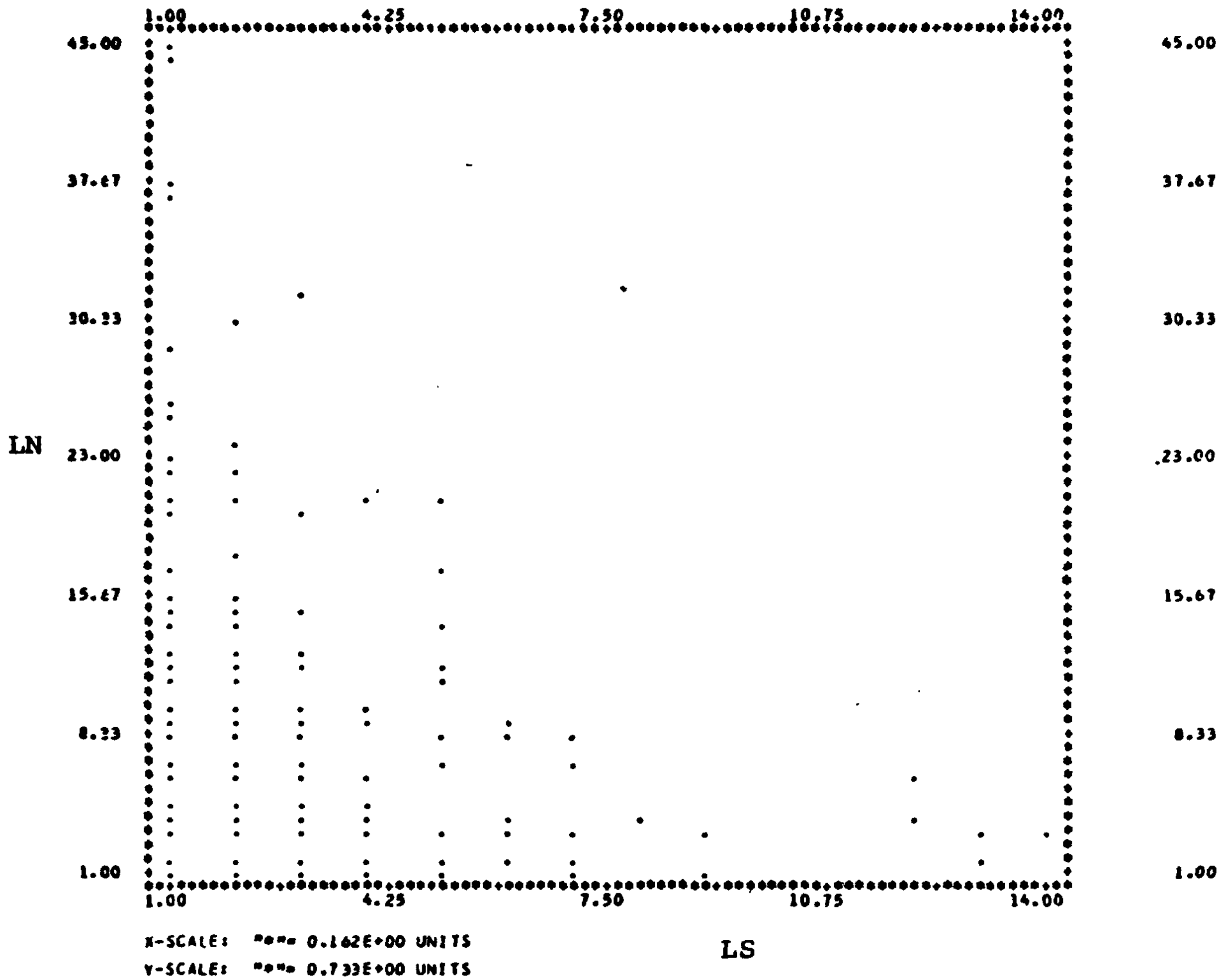


Figure 10. Plot of the LS against LN for December-Feburary

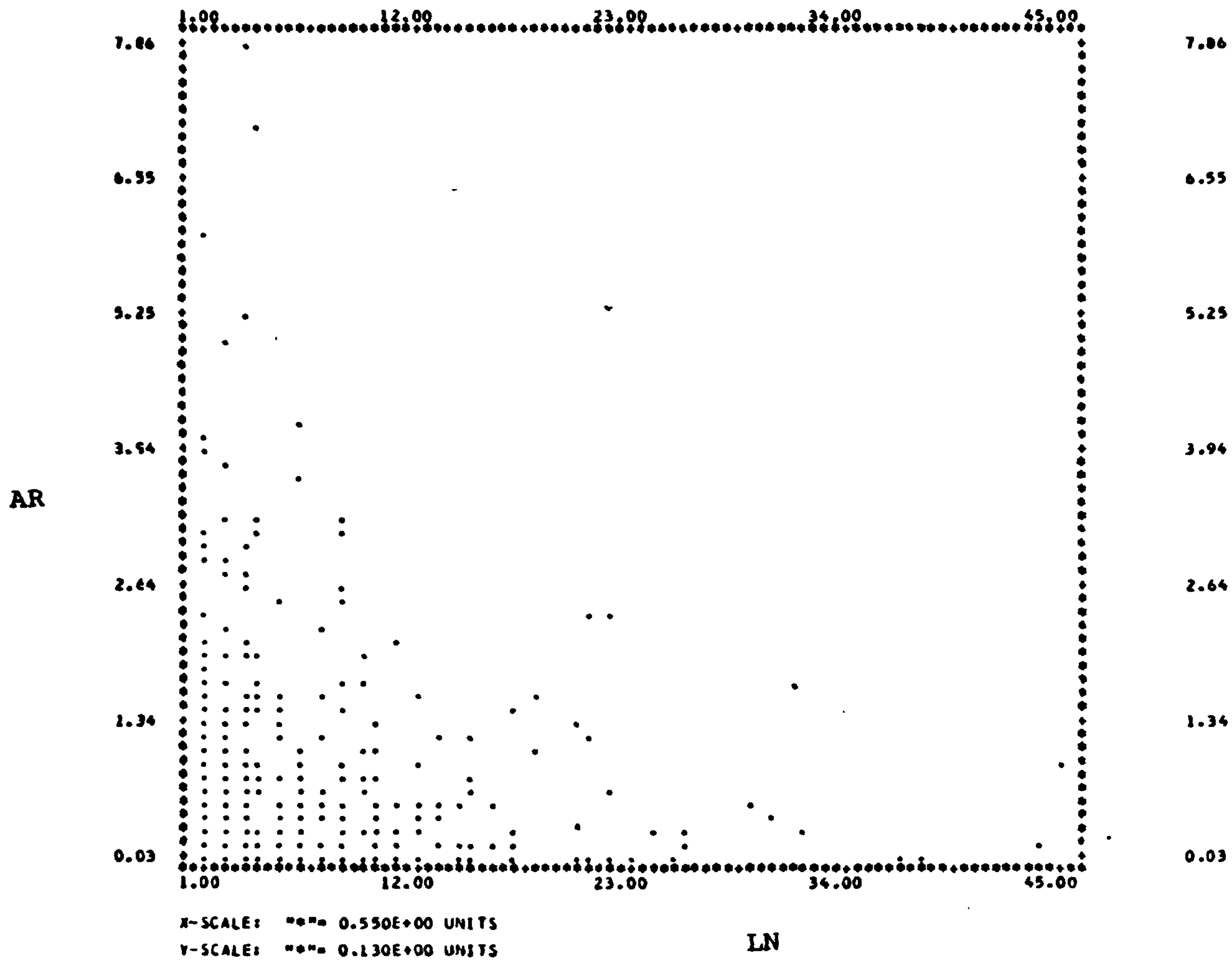


Figure 11. Plot of the LN against AR for December-February

Table 3: MEAN OF LENGTH OF THE NON-RAINY PERIOD FOLLOWING EXACTLY N DAYS LASTING STORMS IN THE 36-YEAR PERIOD.

	OCT-APR	DEC-FEB
STORM IN DAYS	MEAN OF LN IN DAYS	MEAN OF LN IN DAYS
LS=1	7.33	6.04
LS=2	6.71	5.92
LS=3	6.47	5.34
LS=4	6.66	3.83
LS=5	6.44	6.17
LS≥6	5.91	3.76

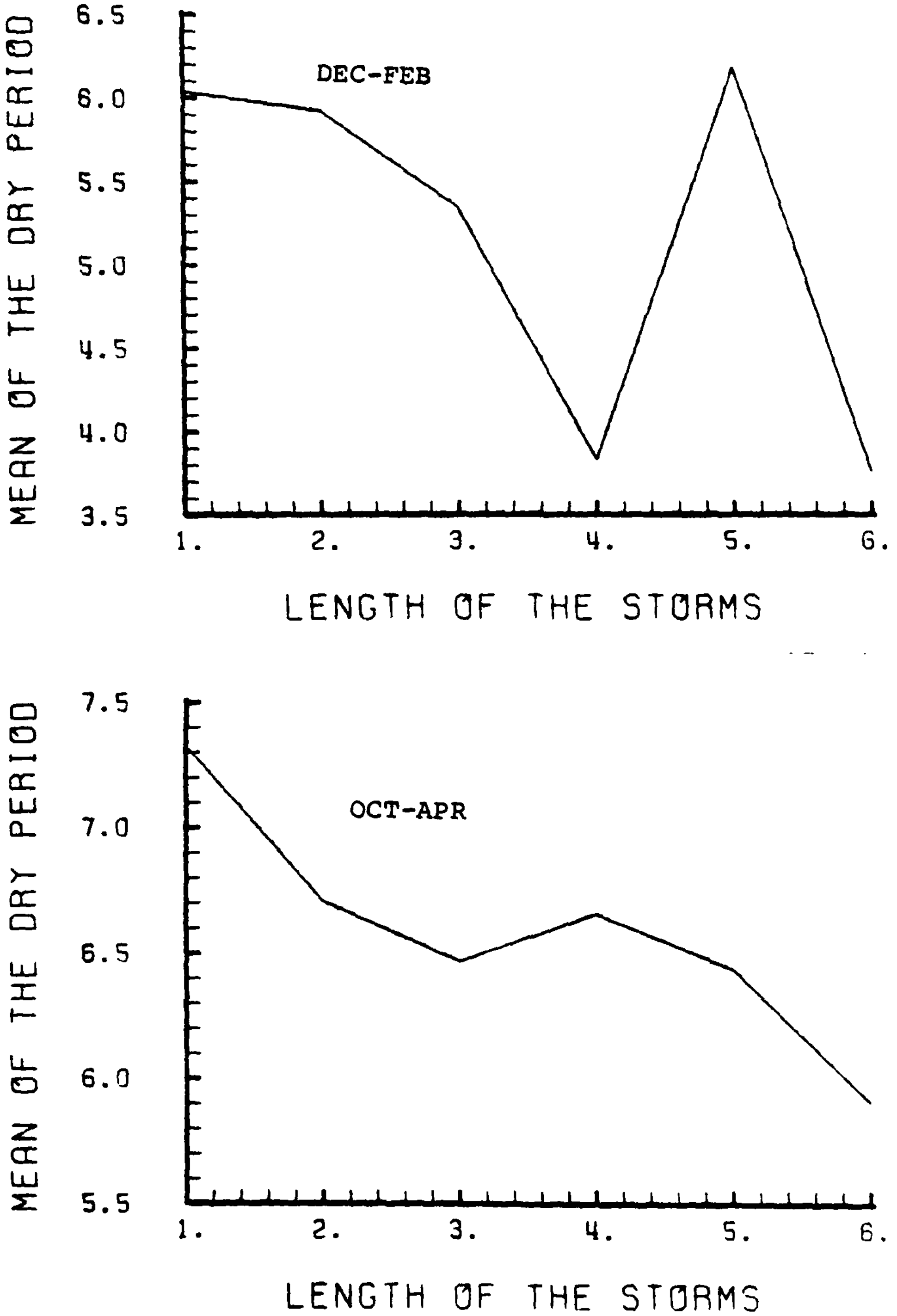


Figure 12. Plot of the LS against mean of the non-rainy period for October-April and December-February

Table 4: SOME STATISTICS FOR THE LS, AR, AND LN

	OCTOBER-APRIL			DECEMBER-FEBRUARY		
	Min.	Mean	Max.	Min.	Mean	Max.
LS in days	1.	2.09	14.	1.	2.31	14.
AR in inches	0.03	0.71	7.86	0.03	0.83	7.86
LN in days	1.	6.86	57.	1.	5.64	45.

n = 1, 2, 3, 4 days in the 36-year period for October through April and December through February.

From the total number of occurrences for each exactly n days lasting storms estimated of occurrences for a year were computed in the following way and are shown in Table 5.

This suggests that many of the small storms, especially exactly one day lasting storms, occur during the months of October, November, March, and April and many ofthe large storms occur during the months of December, January, February.

Table 5: ESTIMATED # OF OCCURRENCES/YEAR FOR THE EXACTLY N DAYS LASTING STORMS IN THE 36-YEAR PERIOD.

	OCT,NOV,MAR,APR	DEC,JAN,FEB
STORMS (EXACTLY)	ESTIMATED OCCURRENCE/YEAR	ESTIMATED OCCURRENCE/YEAR
LS=1	6.52	4.64
LS=2	2.97	3.17
LS=3	1.06	1.31
LS=4	0.78	0.84
LS=5	0.28	0.47
LS≥6	0.36	0.58

IV. ANALYSIS OF WEEKLY RAINFALL

A. DISTRIBUTION OF POSITIVE WEEKLY RAINFALL

1. Theory

In this section we will explore the distribution of positive weekly amounts of rainfall. A week is said to have a positive amount of rainfall if the amount of rain exceeds 0.02 inches. Table 6 is a listing of estimates of means and variances for positive weekly rainfalls. They were computed by using the program "HISTG". Figure 13 shows a plot of the weekly means and variances respectively. The pattern of weekly means again indicates nonstationarity of rainfall with more rain on the average falling during the weeks D4, J2, J3, JF, F3, FM, M4 where the average amount of rainfall in these weeks is more than 1.00 inches.

2. Empirical Distribution of Positive Weekly Rainfall

In order to fit a theoretical distribution to the positive weekly rainfall it is necessary to use some statistics computed from the data such as the mean, median, variance, standard deviation, quartiles, coefficients of variation, and skewness and kurtosis coefficients. Agreement of these statistics with the theoretical values for the exponential model (or some others) helps to identify and support that model.

Table 7 shows a listing of means, standard deviations, and coefficients of variation of the non-zero (positive)

Table 6: MEANS AND VARIANCES FOR POSITIVE WEEKLY RAINFALL

WEEK	MEAN	VARIANCE
O1	0.29	0.11
O2	0.42	0.22
O3	0.36	0.18
O4	0.37	0.15
ON	0.58	0.53
N1	0.79	0.45
N2	0.99	1.18
N3	0.94	1.22
N4	0.89	1.88
D1	0.91	0.65
D2	0.63	0.45
D3	0.73	0.34
D4	1.55	2.00
J1	0.83	0.92
J2	1.13	1.02
J3	1.46	1.17
J4	0.97	0.74
JF	1.14	1.13
F1	0.98	0.89
F2	0.67	0.36
F3	1.15	0.83
FM	1.03	1.36
M1	0.61	0.38
M2	0.86	0.69
M3	0.67	0.40
M4	1.13	1.65
A1	0.90	0.78
A2	0.42	0.18
A3	0.61	0.42
A4	0.50	0.12
AM	0.26	0.03

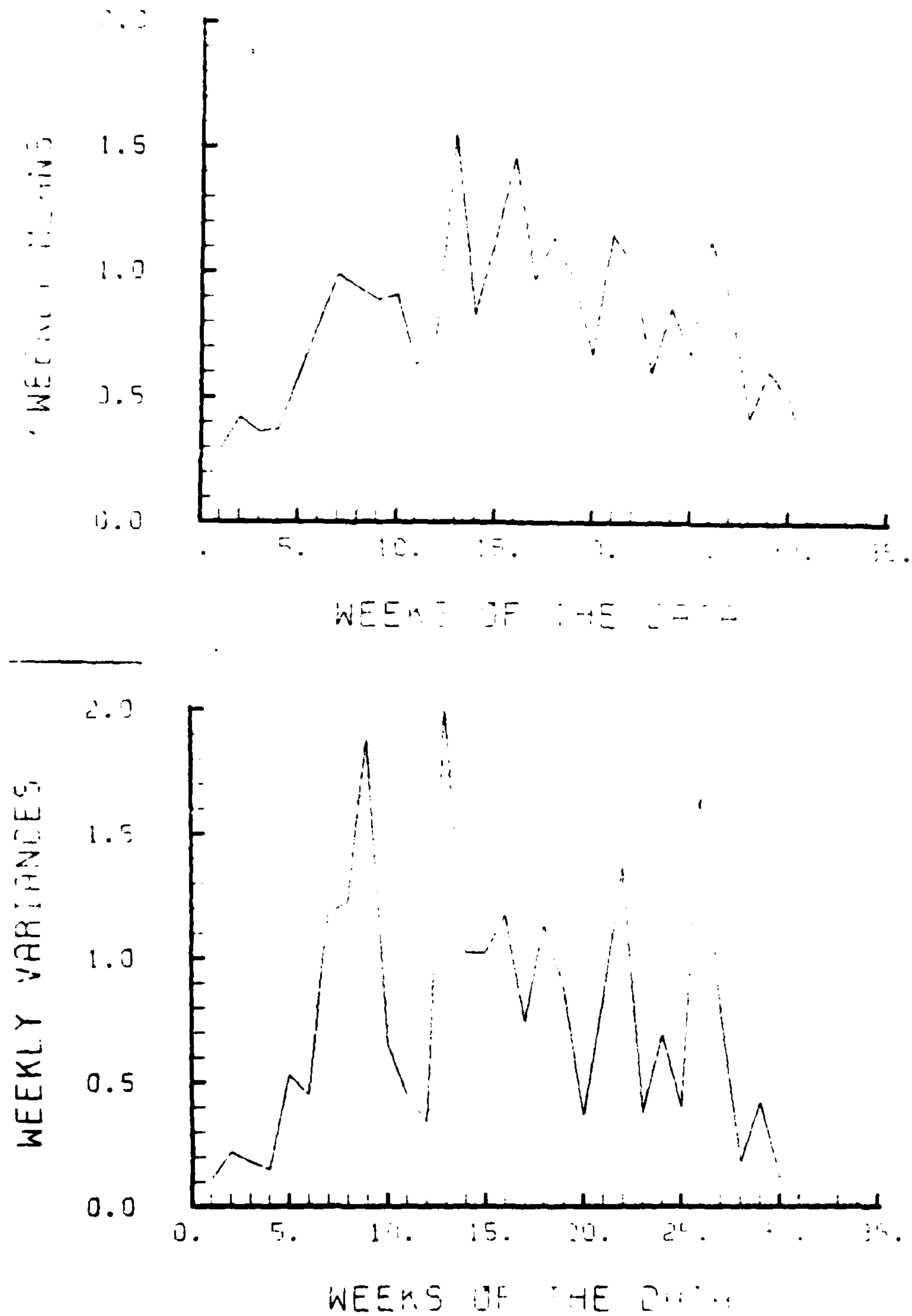


Figure 13. Weekly means and variances for the positive weekly rainfall data in the 36-year period

Table 7: MEANS, STANDARD DEVIATIONS, AND COEFFICIENTS OF VARIATION FOR POSITIVE WEEKLY RAINFALL.

WEEK	MEAN	STANDARD DEVIATIONS	COEFFICIENT OF VARIATIONS
O1	0.29	0.33	1.14
O2	0.42	0.47	1.11
O3	0.36	0.43	1.16
O4	0.37	0.39	1.04
ON	0.58	0.73	1.24
N1	0.79	0.67	0.85
N2	0.99	1.08	1.08
N3	0.94	1.10	1.17
N4	0.89	1.37	1.54
D1	0.91	0.81	0.90
D2	0.63	0.67	1.06
D3	0.73	0.58	0.81
D4	1.55	1.41	0.91
J1	0.83	0.96	1.15
J2	1.13	1.01	0.90
J3	1.46	1.08	0.74
J4	0.97	0.86	0.88
JF	1.14	1.06	0.93
F1	0.98	0.94	0.96
F2	0.67	0.60	0.90
F3	1.15	0.91	0.90
FM	1.03	1.17	1.13
M1	0.61	0.61	1.01
M2	0.86	0.83	0.96
M3	0.67	0.64	0.95
M4	1.13	1.28	1.13
A1	0.90	0.89	0.99
A2	0.42	0.43	1.02
A3	0.61	0.65	1.05
A4	0.50	0.35	0.71
AM	0.26	0.18	0.70

weekly rainfalls. Figure 14 shows the weekly coefficients of variation for the positive weekly rainfalls.

As can be seen, the means and standard deviations of the data are approximately equal to each other, and the coefficients of variation of the data are close to one. These facts indicate that the distribution of the data may be approximately exponential. This is suggested since for data from an exponential distribution, the mean of the data equal the standard deviation of the data, and the coefficient of variation is one.

The fit of an exponential model for the positive weekly data will not be explored in more detail.

A plot of the means against standard deviations of the positive weekly rainfall is shown in Figure 15. These data appear to have a linear relationship. By using the median method (McNeil [Ref. 3]) the slope of the means versus standard deviations was computed as 0.84. This indicates that the means of the data are little higher than the standard deviations of the data.

Next, by using the subroutine EXPLT (which is a NONIMSL subroutine at the Naval Postgraduate School computer library), a plot exponential scores versus observed scores of the data can be examined. If the data is distributed exponentially, the the plot should be a straight line. Appendix E shows the exponential scores versus observed scores for the positive weekly rainfall. Most of the weeks seem to fit the exponential.

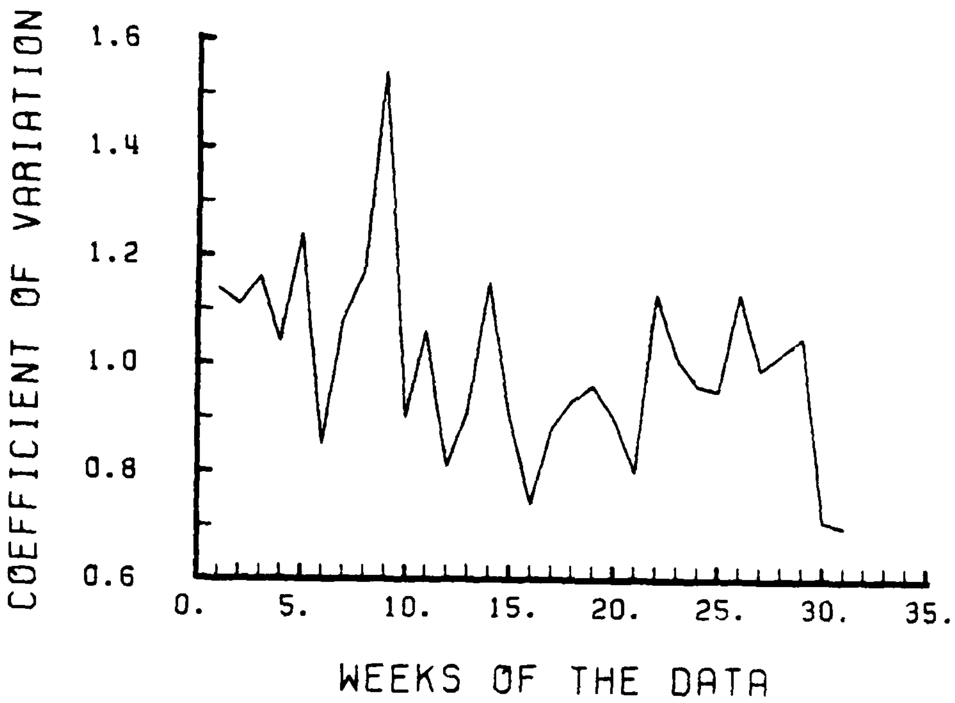


Figure 14. Weekly coefficients of variation for the positive weekly rainfalls in the 36-year period

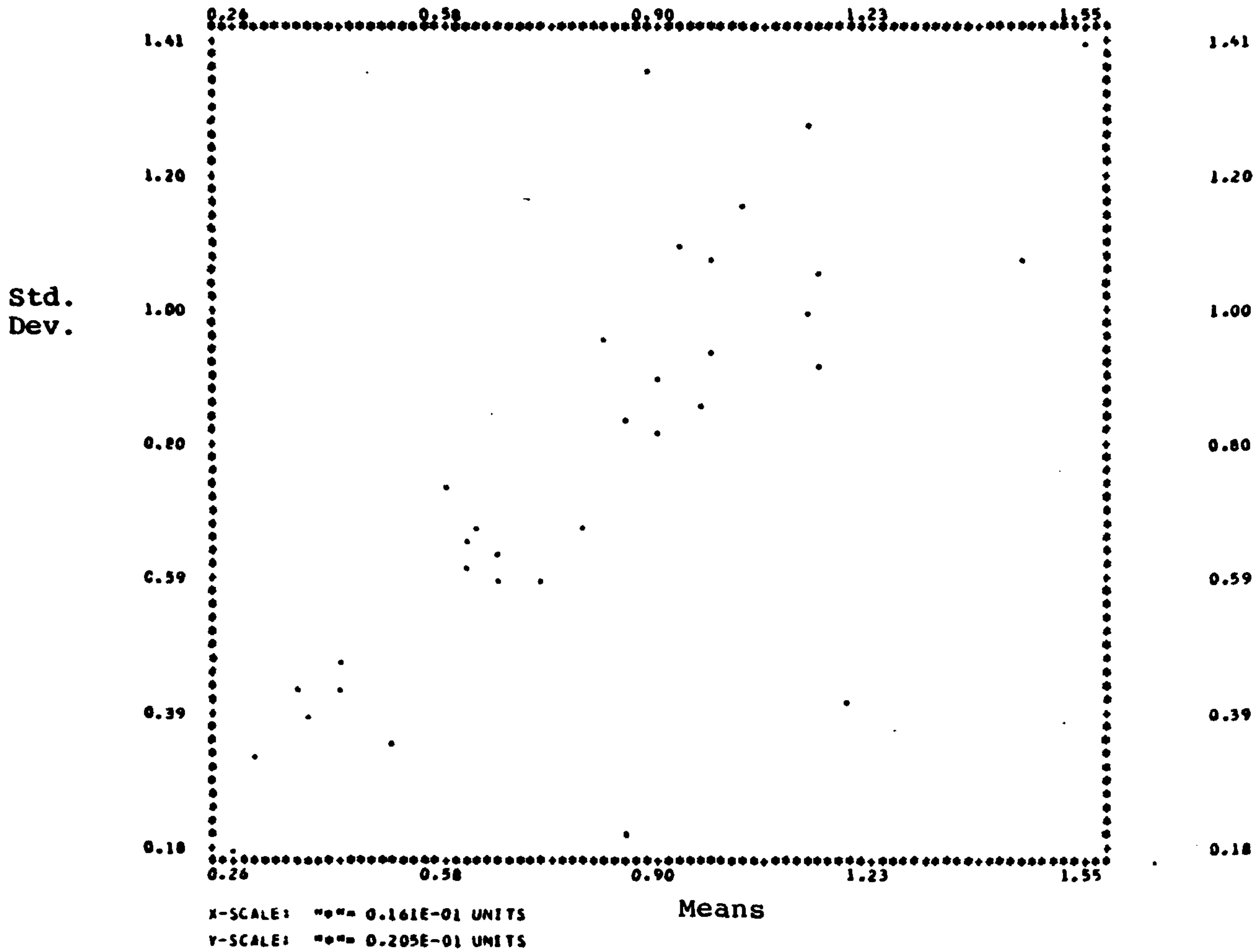


Figure 15. Plot of means against standard deviations for the positive weekly rainfall in the 36-year period

Also, estimated and theoretical values of median, lower and upper quartiles were examined against each other. Table 8 shows the estimated and theoretical values of the median, and lower and upper quartiles for the positive weekly rainfalls. Figures 16 through 18 show the plot of estimated values against theoretical values. They seem to support the exponential model for the positive weekly rainfall. Again using the median method the slope of estimated values against theoretical values were computed and are shown in Table 9.

A 90% confidence interval for the average positive weekly rainfall can be computed by assuming exponential distribution for the weeks which are shown in Table 10. Let $\bar{x}$ be average positive weekly rainfall with n observations, then the formula for $(1-\alpha)\%$ confidence interval for the mean with $\alpha = 0.10$ is

$$\bar{x}\left[\frac{\chi^2_{2n}(1-\alpha/2)}{2n}\right]^{-1} \leq E[x] = \frac{1}{\lambda} \leq \bar{x}\left[\frac{\chi^2_{2n}(\alpha/2)}{2n}\right]^{-1}$$

B. SKEWNESS AND KURTOSIS ANALYSIS FOR POSITIVE WEEKLY RAINFALL

1. Theory

In general the third moment of a distribution is considered to be a measure of skewness. If the distribution of a sample is symmetric, its third moment about the mean will be zero. If the distribution is skewed to the right, the third moment about the mean will have a positive value, because the large size of observations on the long tail will

Table 8 : ESTIMATED AND THEORETICAL VALUES OF MEDIAN, LOWER AND UPPER QUARTILE FOR THE POSITIVE WEEKLY RAINFALL

WEEK	MEAN	ESTIM. MEDIAN	THEOR. MEDIAN	ESTIM. LOWER QUARTILE	THEOR. LOWER QUARTILE	ESTIM. UPPER QUARTILE	THEOR. UPPER QUARTILE
O1	0.29	0.12	0.20	0.08	0.08	0.28	0.40
O2	0.42	0.15	0.29	0.07	0.12	0.77	0.58
O3	0.36	0.21	0.25	0.08	0.10	0.41	0.50
O4	0.37	0.29	0.26	0.06	0.11	0.57	0.51
ON	0.58	0.28	0.40	0.19	0.17	0.62	0.80
N1	0.79	0.70	0.55	0.15	0.23	1.52	1.10
N2	0.99	0.74	0.69	0.23	0.28	1.24	1.37
N3	0.94	0.39	0.65	0.20	0.27	1.37	1.30
N4	0.89	0.35	0.62	0.11	0.26	1.27	1.23
D1	0.91	0.63	0.63	0.33	0.26	1.18	1.26
D2	0.63	0.38	0.44	0.20	0.18	0.91	0.87
D3	0.73	0.66	0.51	0.17	0.21	1.19	1.01
D4	1.55	1.01	1.07	0.63	0.45	2.32	2.15
J1	0.83	0.50	0.57	0.12	0.24	1.31	1.15
J2	1.13	0.83	0.78	0.23	0.32	1.88	1.57
J3	1.46	1.39	1.01	0.37	0.42	2.14	2.02
J4	0.97	0.68	0.67	0.31	0.28	1.77	1.34
JF	1.14	0.83	0.79	0.27	0.33	1.65	1.58
F1	0.98	0.60	0.68	0.25	0.28	1.44	1.36
F2	0.67	0.53	0.46	0.14	0.19	1.00	0.93
F3	1.15	0.98	0.80	0.49	0.33	1.55	1.59
FM	1.03	0.42	0.71	0.18	0.30	1.99	1.43
M1	0.61	0.45	0.42	0.07	0.18	0.96	0.85
M2	0.86	0.58	0.60	0.17	0.25	1.45	1.19
M3	0.67	0.54	0.46	0.14	0.19	1.06	0.93
M4	1.13	0.46	0.78	0.19	0.32	1.73	1.57
A1	0.90	0.33	0.62	0.18	0.26	1.63	1.25
A2	0.42	0.27	0.29	0.08	0.12	0.53	0.58
A3	0.61	0.38	0.42	0.12	0.18	1.02	0.85
A4	0.50	0.42	0.35	0.17	0.14	0.77	0.69
AM	0.26	0.23	0.18	0.13	0.07	0.37	0.36

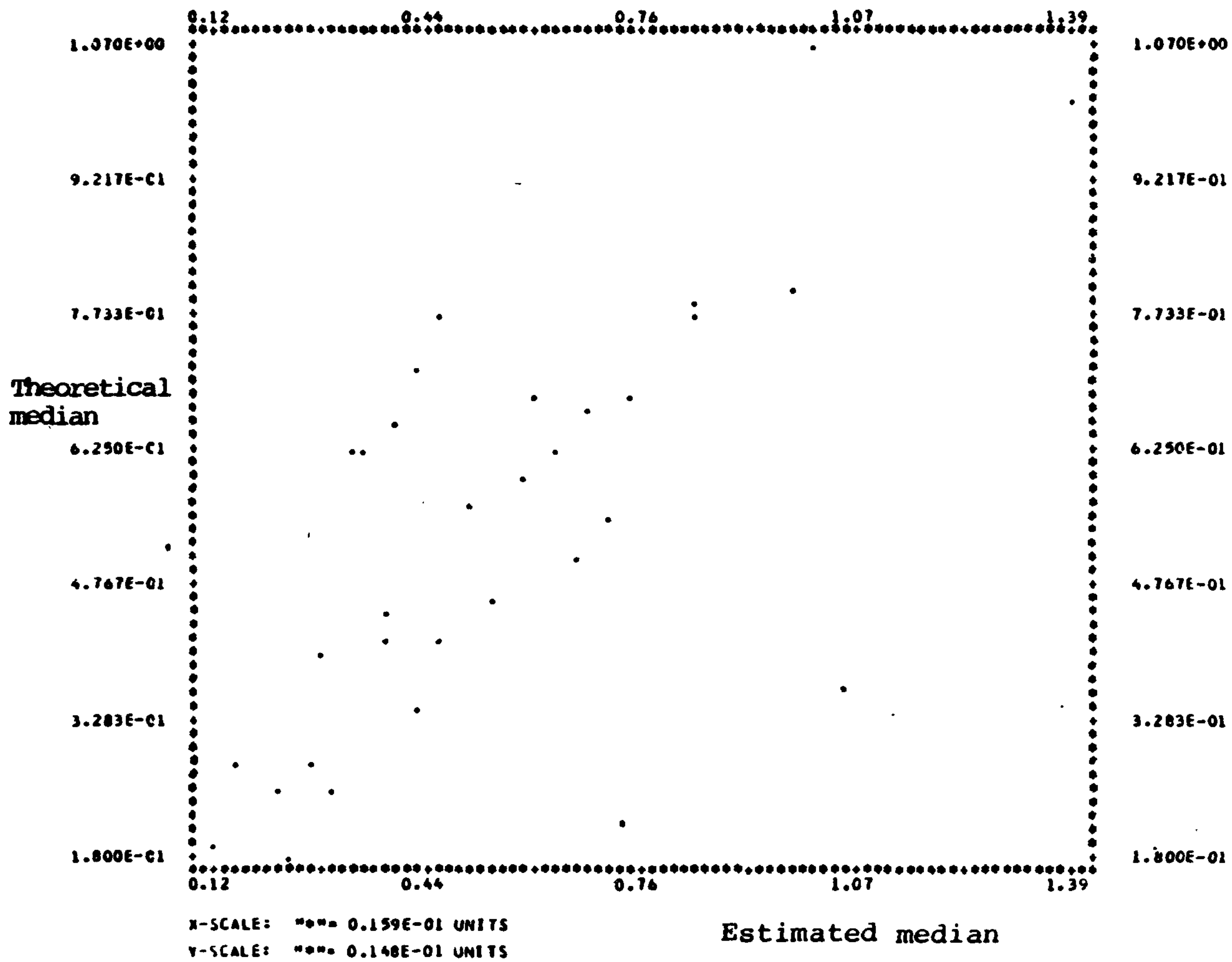


Figure 16. Plot of estimated median against theoretical median for positive weekly rainfall

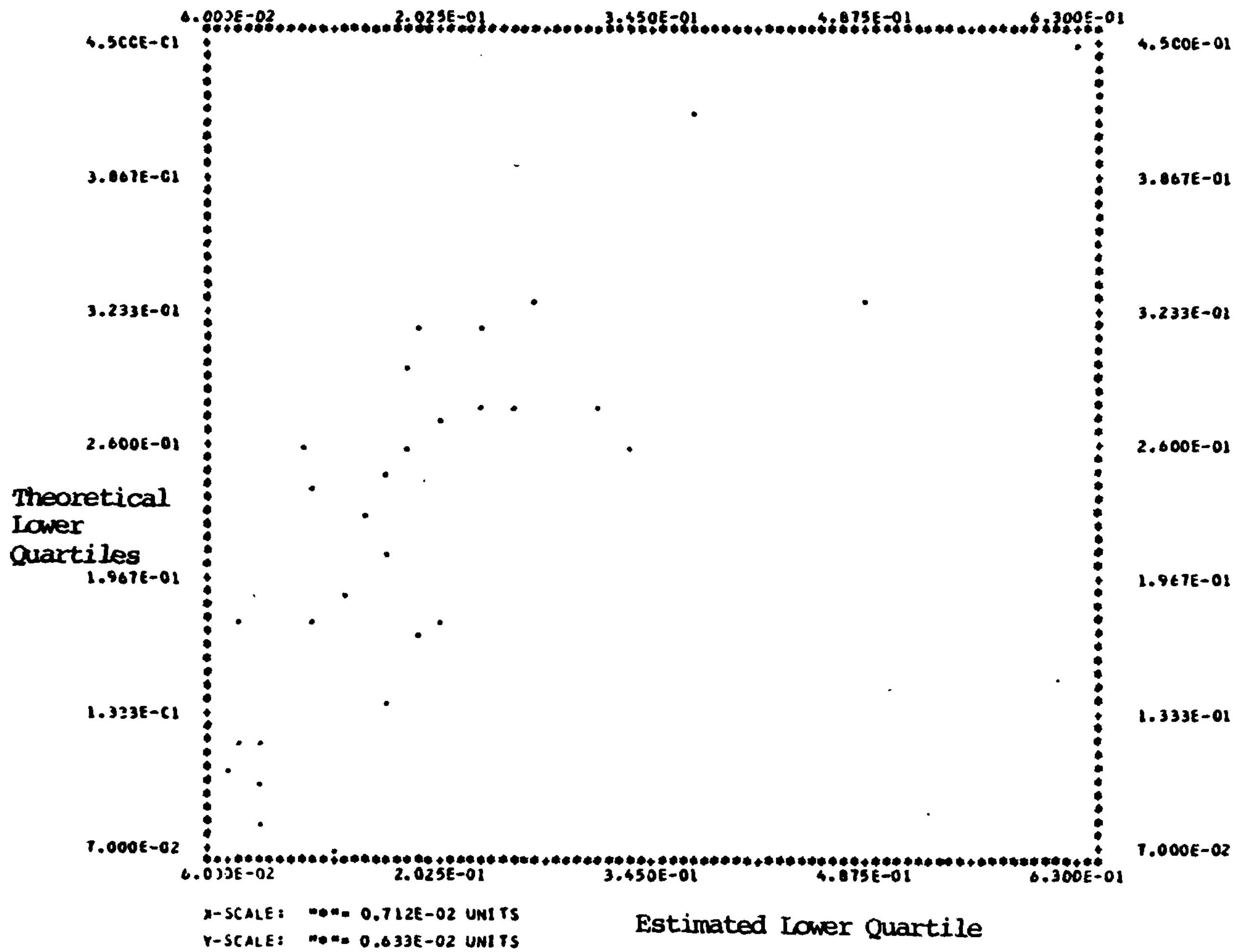


Figure 17. Plot of estimated L-quartile against theoretical L-quartile for positive weekly rainfall

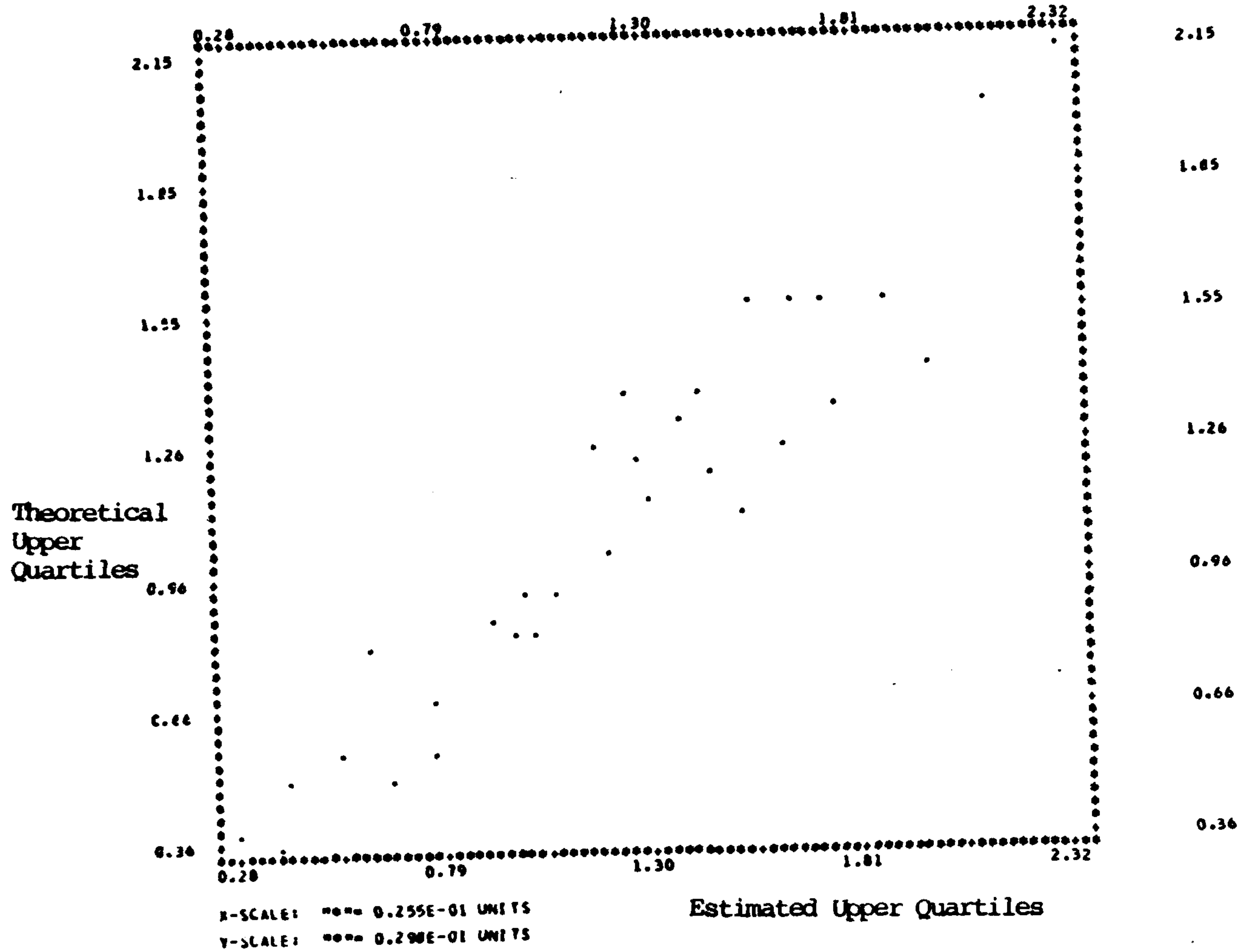


Figure 18. Plot of estimated U-quartile against theoretical U-quartile for positive weekly rainfall

Table 9 : SLOPES OF THE ESTIMATED VALUES AGAINST THEORETICAL VALUES FOR MEDIAN AND LOWER AND UPPER QUARTILES.

	SLOPE	INTERCEPT
EST. MEDIAN VS THEO. MEDIAN	0.96	0.03
EST. L.QUAR. VS THEO. L.QUAR.	0.95	0.04
EST. U.QUAR. VS THEO. U.QUAR.	0.88	0.01

Table 10: 90% CONFIDENCE INTERVAL FOR AVERAGE POSTIVE WEEKLY RAINFALL WITH EXPONENTIAL DISTRIBUTION

WEEK	MEAN	STD DEV	LOWER LIMIT	UPPER LIMIT
O1	0.29	0.33	0.18	0.56
O2	0.42	0.47	0.29	0.66
O3	0.36	0.43	0.25	0.58
O4	0.37	0.39	0.25	0.60
ON	0.58	0.73	0.39	0.96
N1	0.79	0.67	0.57	1.19
N2	0.99	1.08	0.74	1.40
N3	0.94	1.10	0.67	1.44
N4	0.89	1.37	0.65	1.31
D1	0.91	0.81	0.68	1.29
D2	0.63	0.67	0.46	0.93
D3	0.73	0.58	0.55	1.03
D4	1.55	1.41	1.14	2.25
J1	0.83	0.96	0.62	1.19
J2	1.13	1.01	0.84	1.63
J3	1.46	1.08	1.06	2.18
J4	0.97	0.86	0.73	1.38
JF	1.14	1.06	0.88	1.55
F1	0.98	0.94	0.74	1.39
F2	0.67	0.60	0.50	0.95
F3	1.15	0.91	0.83	1.72
FM	1.03	1.17	0.78	1.43
M1	0.61	0.61	0.47	0.84
M2	0.86	0.83	0.65	1.22
M3	0.67	0.64	0.50	0.96
M4	1.13	1.28	0.82	1.66
A1	0.90	0.89	0.65	1.34
A2	0.42	0.43	0.31	0.62
A3	0.61	0.65	0.42	1.00
A4	0.50	0.35	0.36	0.74
AM	0.26	0.18	0.18	0.40

more than offset the greater number of smaller observations on the shorter tail of the distribution. Hence for a positively skewed distribution (i.e., one with the long tail to the right), the third moment (μ_3) will be positive. For these reasons the third moment around the mean is taken as a measure of the absolute skewness of a distribution. The theoretical skewness for a random variable X is given by

$$\gamma_1 = \frac{E[(X-E(X))^3]}{(Var[X])^{3/2}}$$

The empirical skewness for data $\{x_i, i = 1,\ldots,n\}$ having average $\bar{x}$ is given by

$$g_1 = \frac{\frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^3}{[\frac{1}{n-1}(\sum_{i=1}^{n}(x_i-\bar{x})^2]^{3/2}}$$

If a distribution is symmetric, γ_1 will be zero. If the distribution of X is exponential with parameter $\lambda = 1$, then γ_1 has the value 2 (see Appendix D for the algebraic computation).

The kurtosis for a random variable X is given by

$$\gamma_2 = \frac{E[(X-E(X))^4]}{[Var(X)]^2} - 3$$

The empirical kurtosis for data $\{x_i, i = 1,\ldots,n\}$ having average $\bar{x}$ is given by

$$g_2 = \frac{\frac{1}{n}\left(\sum_{i=1}^{n}(x_i-\bar{x})^4\right)}{\left[\frac{1}{n-1}\left(\sum_{i=1}^{n}(x_i-\bar{x})^2\right]^2\right.} - 3$$

If the fourth moment (μ_4) about the mean of the random variable X is large relative to the variance (σ^2), it indicates relatively large tails.

For the normal distribution, μ_4/σ^4 has the value 3. Since the normal distribution arises very frequently and is often used as a basis of reference for distributions that are not normal, the quantity γ_2 is defined so that it will be 0 when a distribution has the kurtosis of a normal distribution. Thus $\gamma_2 > 0$ means that a distribution has a sharper peak, thinner shoulder, and fatter tails than the normal distribution. $\gamma_2 < 0$ means that a distribution has a flatter peak, fatter shoulders, and thinner tails than the normal distribution. Cramer [Ref. 5] and Duncan [Ref. 6] contain a discussion of the skewness and kurtosis coefficients.

If the distribution of X is exponential, then γ_2 has the value 6 (see Appendix D for algebraic computations). Appendix D also contains a discussion of the sample properties of the skewness and kurtosis coefficients.

It is suspected that the sample size has some effect on the values of sample skewness and sample kurtosis. To study this effect a simulation study was done as described below.

By using the random number generator (LLRANDOM) N independent unit exponential random numbers were generated as a sample. Then the sample skewness and kurtosis were computed from the sample. M independent replications of the procedure were done and sample means and standard deviations were computed for the skewness and kurtosis.

Appendix D shows the simulation results for sample skewness and sample kurtosis of a unit exponential distribution with various sample size (standard deviations of them are given in parentheses).

As can be seen in Appendix D if the sample size is small, then the sample skewness and kurtosis values are smaller than their theoretical values. When sample size is between 2000-3000 they reach the theoretical values 2 and 6 for the skewness and kurtosis respectively.

2. Skewness and Kurtosis Analysis for Positive Weekly Rainfall

Histograms, and plots of exponential scores versus observed values of positive weekly rainfalls are given in Appendix F; they suggest that the distribution of weekly positive rainfall is approximately exponential. The examination of classical skewness and kurtosis coefficients of positive weekly rainfall can be used to further examine the fit of this exponential model.

Table 11 shows a listing of the values of skewness and kurtosis for the positive weekly rainfall.

Table 11: SKEWNESS AND KURTOSIS FOR WEEKLY RAINFALL DATA

WEEK	SKEWNESS	KURTOSIS	NUMBER OF YEARS POSITIVE RAINFALL
O1	1.577	0.438	9
O2	1.231	0.101	17
O3	2.051	3.164	16
O4	1.499	1.652	15
ON	2.616	5.815	14
N1	0.390	-1.576	20
N2	1.781	2.257	28
N3	1.637	1.645	19
N4	3.387	11.390	22
D1	1.448	1.076	28
D2	1.835	3.028	22
D3	0.696	0.170	28
D4	1.340	1.099	24
J1	1.733	2.657	26
J2	0.834	-0.733	25
J3	0.756	0.441	21
J4	1.038	-0.009	27
JF	1.002	-0.108	29
F1	1.450	1.238	27
F2	1.099	0.471	27
F3	1.053	0.651	21
FM	1.306	0.455	30
M1	1.248	0.842	32
M2	0.531	-0.813	28
M3	1.073	0.170	25
M4	1.342	0.388	23
A1	0.805	-0.940	21
A2	1.341	0.593	22
A3	0.147	1.486	14
A4	0.561	-0.721	22
AM	1.032	0.554	18

Figure 19 shows the skewness and kurtosis of the positive weekly rainfall, and a plot of skewness against kurtosis values is shown in Figure 20.

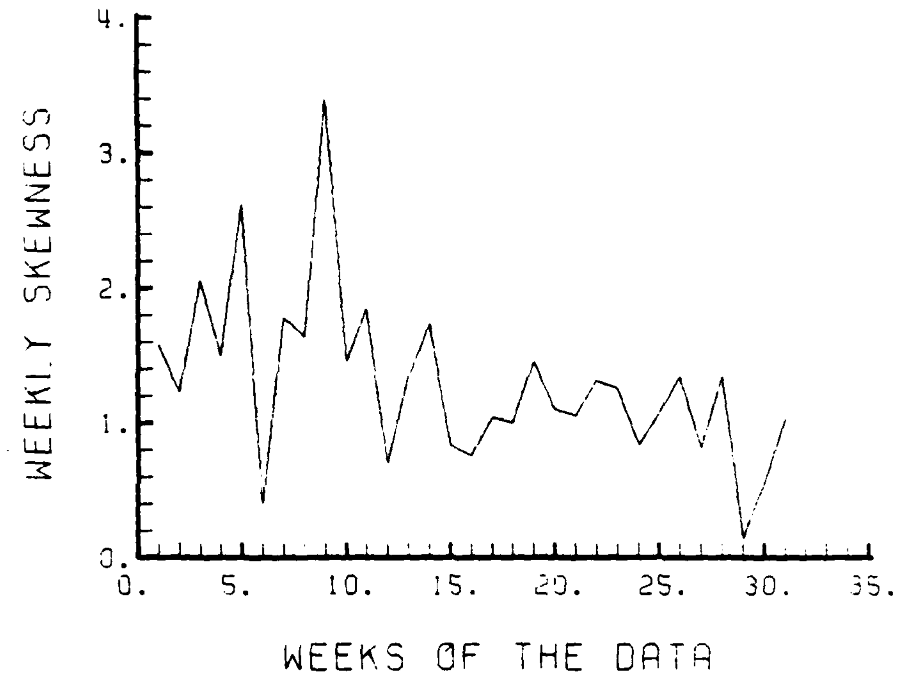
Figure 19 shows that the skewness and kurtosis values are reasonably stable. But relatively high values occur early in the year. There is some tendency for the distribution to change throughout the rainy season. Average skewness and kurtosis values of the positive weekly rainfall are shown in Table 12.

Table 12: ESTIMATED AND SIMULATED MEANS FOR THE SKEWNESS AND KURTOSIS COEFFICIENTS

	SKEWNESS	KURTOSIS
ESTIMATED MEAN	1.29	1.19
SIMULATED MEAN	1.45	1.84

The estimated kurtosis is somewhat lower than its simulated value. This might suggest that the distribution of positive weekly rainfall has a shorter right tail than the exponential. Perhaps a Gamma or Weibull distribution would fit these data slightly better.

Table 14 shows the estimated and simulated values of the skewness and kurtosis coefficients for the actual sample sizes observation. By using the median method the slopes of estimated values against simulated values were computed for skewness and kurtosis and are shown in Table 13.



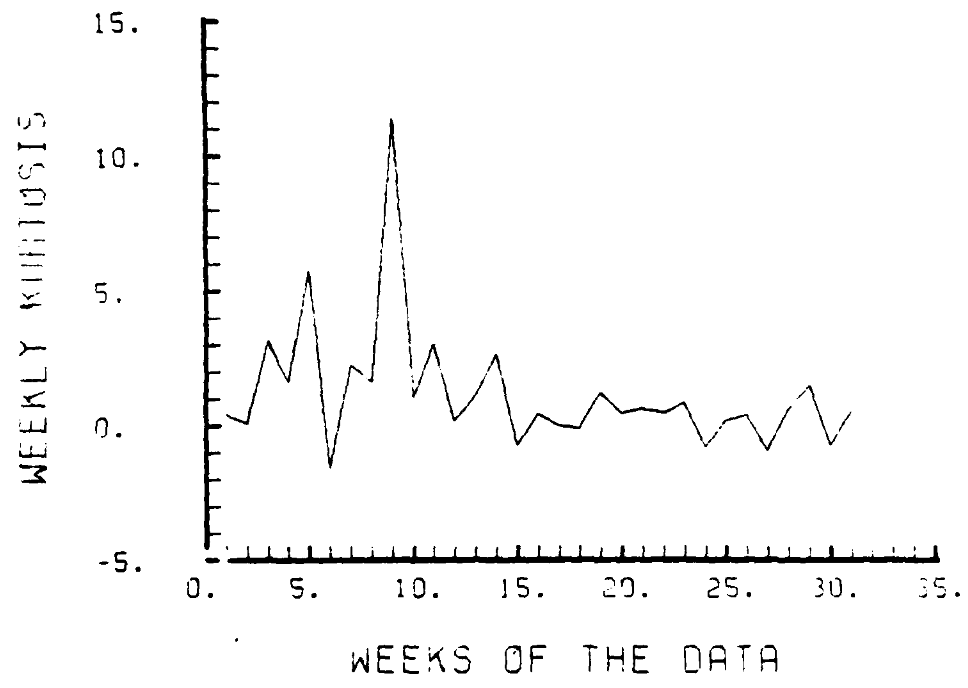


Figure 19. Weekly skewness and kurtosis coefficients for the positive weekly rainfall

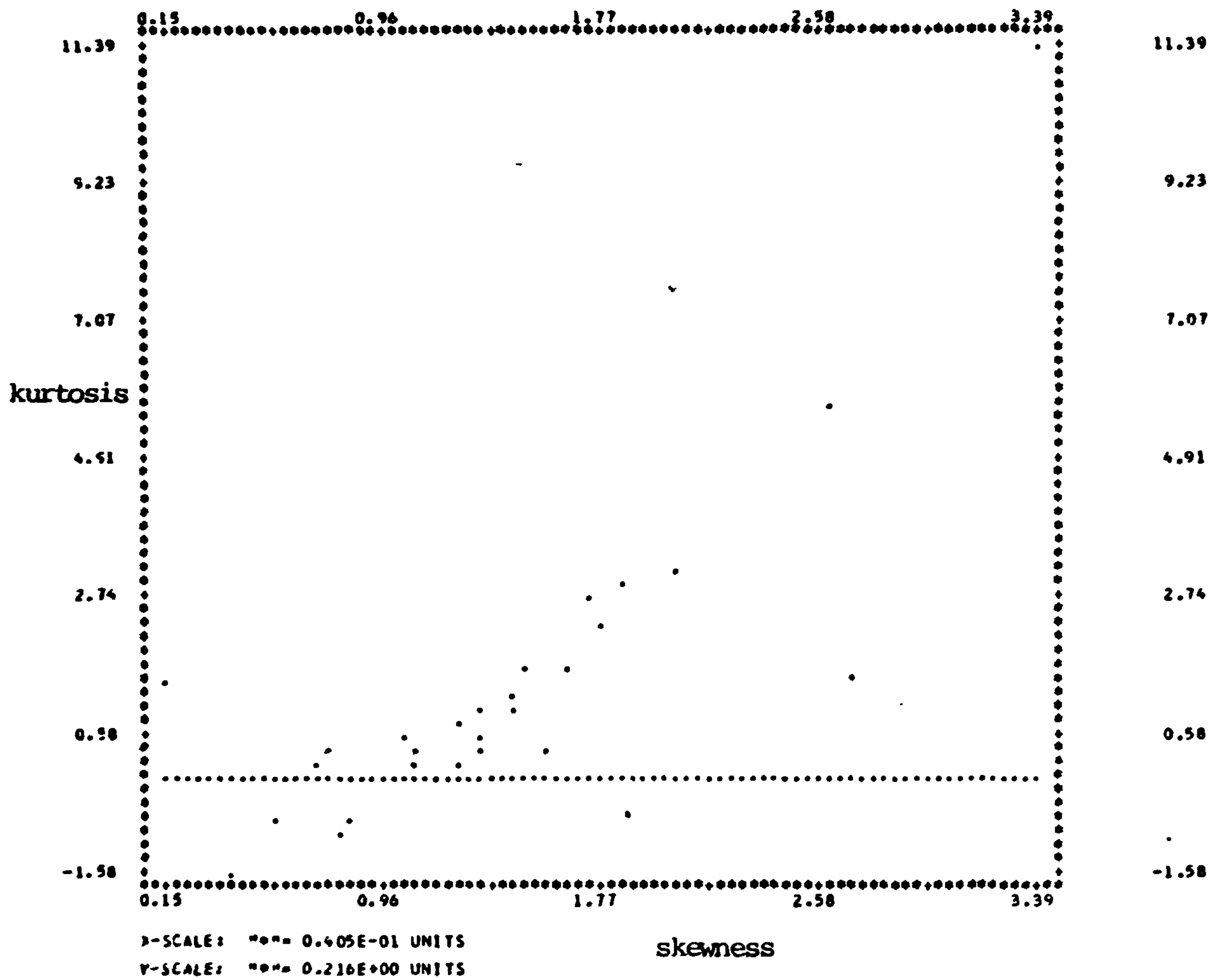


Figure 20. Plot of weekly skewness against weekly kurtosis for positive weekly rainfall

Table 13: SLOPES FOR SKEWNESS AND KURTOSIS

	SLOPE	INTERCEPT
EST. SKEWNESS VS SIM. SKEWNESS	0.19	1.20
EST. KURTOSIS VS SIM. KURTOSIS	0.40	1.32

Table 14: ESTIMATED AND SIMULATED VALUES FOR SKEWNESS AND KURTOSIS FOR SAME SAMPLE SIZES.

WEEK	# OF YEARS POS. RAINFALL	ESTIM. SKEWNESS	SIMULATED SKEWNESS	ESTIM. KURTOSIS	SIMULATED KURTOSIS
O1	9	1.57	1.11	0.43	0.24
O2	17	1.23	1.37	0.10	1.36
O3	16	2.05	1.34	3.16	1.25
O4	15	1.50	1.33	1.65	1.17
ON	14	2.62	1.29	5.82	1.02
N1	20	0.39	1.43	-1.58	1.70
N2	28	1.78	1.54	2.26	2.31
N3	19	1.64	1.41	1.65	1.57
N4	22	3.39	1.45	11.39	1.83
D1	28	1.45	1.54	1.08	2.31
D2	22	1.84	1.45	3.03	1.83
D3	28	0.70	1.54	0.17	2.31
D4	24	1.34	1.49	1.10	2.02
J1	26	1.73	1.52	2.66	2.19
J2	25	0.83	1.50	-0.73	2.09
J3	21	0.76	1.44	0.44	1.76
J4	27	1.04	1.52	-0.01	2.22
JF	29	1.00	1.55	-0.11	2.37
F1	27	1.45	1.52	1.24	2.22
F2	27	1.10	1.52	0.47	2.22
F3	21	1.05	1.44	0.65	1.76
FM	30	1.31	1.55	0.46	2.40
M1	32	1.25	1.57	0.84	2.50
M2	28	0.83	1.54	-0.81	2.31
M3	25	1.07	1.50	0.17	2.09
M4	23	1.34	1.47	0.39	1.94
A1	21	0.81	1.44	-0.94	1.76
A2	22	1.34	1.45	0.59	1.83
A3	14	0.15	1.29	1.49	1.02
A4	22	0.56	1.45	-0.72	1.83
AM	18	1.03	1.39	0.55	1.50

As can be seen they are not fitted very well. Estimated values are lower than the simulated values for the skewness and kurtosis. Figures 21 and 22 show the estimated values against simulated values for the skewness and kurtosis.

C. 2X2 CONTINGENCY TABLES

1. Summary

The idea to be explored in this section is whether or not some weeks of the weekly rainfall, to be called the control, may be used to predict in some way the behavior of another weeks of the weekly rainfall, to be called the complement.

Let X be a week of a month, to be called the control, and let Y be a week of a month, which is different from X, to be called the complement. It is necessary that $X \cap Y = 0$; that is, the intersection of these two weeks is empty. The weeks are then compared for some quality in X and for some quality in Y. The question is then; does the presence (or absence) of quality in X affect the presence (or absence) of quality in Y? An example of a typical table is shown below in Figure 23.

The elements, a typical one of which is n_{ij}, represent the number of years which display quality i in the control and quality j in the complement. The marginal entries $n_{i.}$ and $n_{.j}$ represent the number of years for which the control has quality i and the number of years the complement has quality j respectively. The overall number of years, N, appear in the lower right of the table.

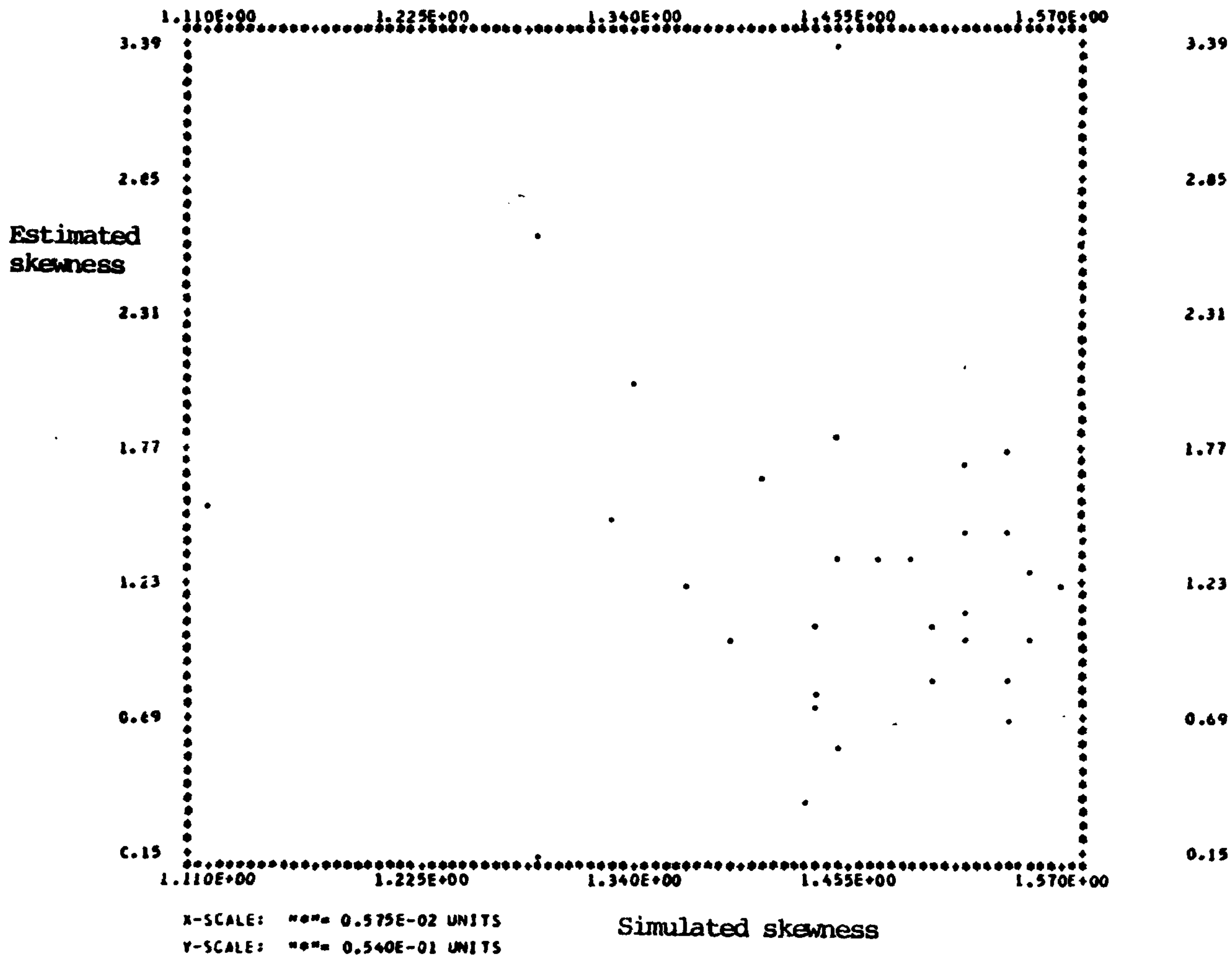


Figure 21. Plot of estimated skewness against simulated skewness for the positive weekly rainfall

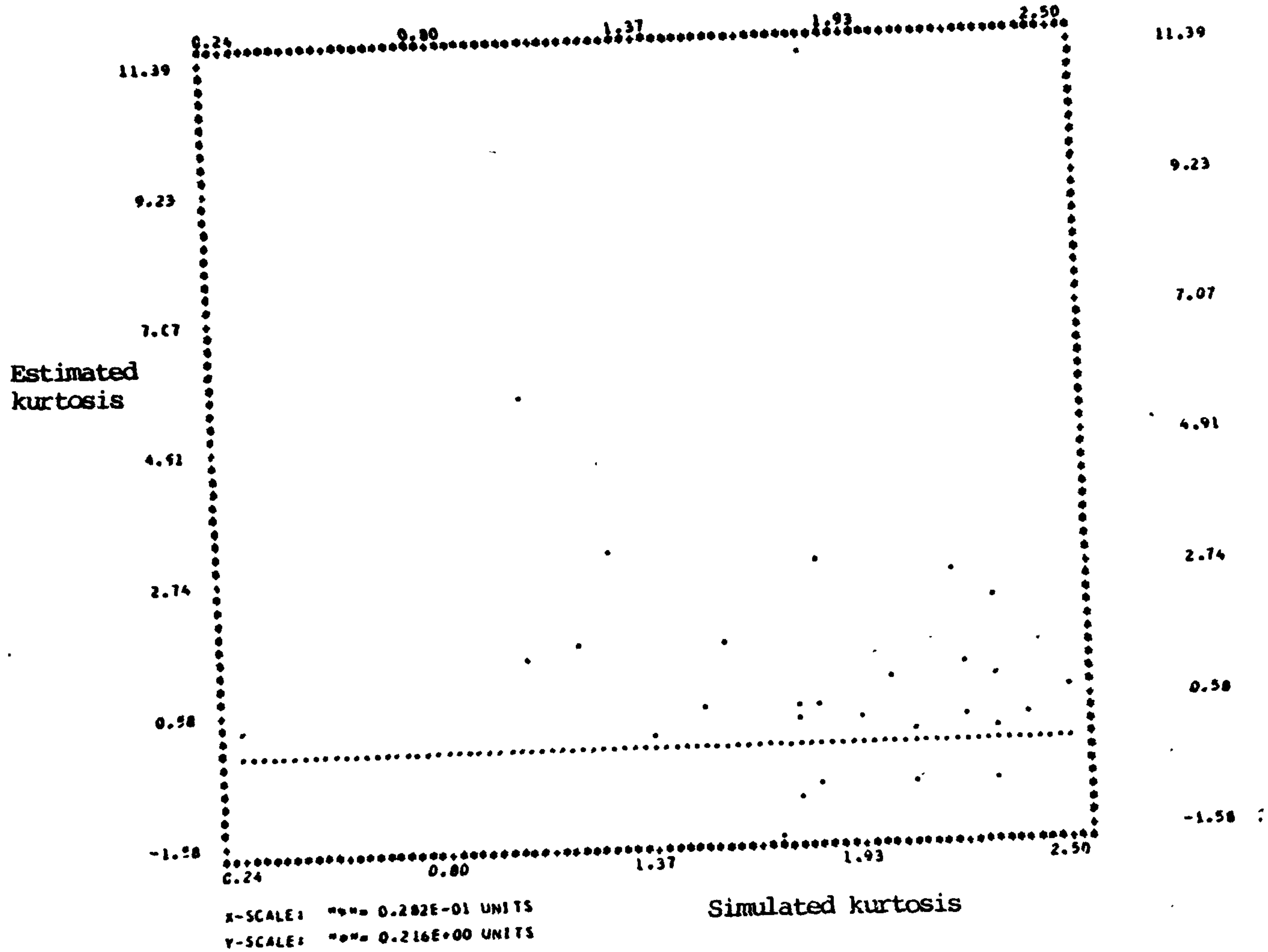


Figure 22. Plot of estimated kurtosis against simulated kurtosis for the positive weekly rainfall

n_{11}	n_{12}	$n_{1.}$
n_{21}	n_{22}	$n_{2.}$
$n_{.1}$	$n_{.2}$	N

Figure 23. Typical 2X2 contingency table

Conover [Ref. 2] gives a discussion of the theory and use of contingency tables. Let θ_{ij} be the probability that any given year will have a control quality i and a complement quality j. Then estimates of the θ_{ij}'s are

$$\hat{\theta}_{ij} = n_{ij}/N$$

$$\hat{\theta}_{i.} = n_{i.}/N$$

$$\hat{\theta}_{.j} = n_{.j}/N$$

If the control and complement are independent,

$$\theta_{ij} = \theta_{i.}\ \theta_{.j}\ , \quad \text{for all } i,j.$$

These simple assumptions allow for an investigation of the possible interrelationships between the weekly rainfalls.

The question of independence may be approached in the was as described below.

2. <u>Chi-Squared Test for Independence</u>

Let E_{ij} equal $n_{i.}n_{.j}/N$. Then for a 2x2 contingency table the test statistics are given by

$$Q = \sum_{i=1}^{2} \sum_{j=1}^{2} \frac{(n_{ij}-E_{ij})^2}{E_{ij}}$$

or simplifying for the calculation

$$Q = \sum_{i=1}^{2} \sum_{j=1}^{2} \frac{n_{ij}^2}{E_{ij}} - N$$

The exact distribution of Q is difficult to tabulate because of all the different combinations of values possible for n_{11}, n_{12}, n_{21}, n_{22}. Therefore the large sample approximation is used for the distribution of Q; this turns out to be chi-square distribution with one degree of freedom.

Hypothesis

H_0: $\theta_{ii} = \theta_{i.}\theta_{.j}$, for all i,j

H_1: $\theta_{ij} = \theta_{i.}\theta_{.j}$, for some i,j

Decision Rule: Reject H_0 is Q exceeds the $(1-\alpha)$ quantile of a chi-square random variable with one degree of freedom. The approximate level of significance is then α.

Figures 24 through 28 show 2x2 contingency tables for the weekly rainfall. In these tables, X = 1 occurs when the week i falls below its mean of weekly rainfall and X = 2

O1 VS O2

	1	2	
1	22	7	29
2	6	1	7
	28	8	36

Q=0.32
(a)

O2 VS O3

	1	2	
1	21	7	28
2	4	4	8
	25	11	36

Q=1.83
(b)

O3 VS O4

	1	2	
1	18	7	25
2	9	2	11
	27	9	36

Q=0.39

(c)

O4 VS ON

	1	2	
1	21	6	27
2	5	4	9
	26	10	36

Q=1.66

(d)

ON VS N1

	1	2	
1	17	10	27
2	7	2	9
	24	12	36

Q=0.67

(e)

N1 VS N2

	1	2	
1	17	7	24
2	5	7	12
	22	14	36

Q=2.86

(f)

Figure 24: 2x2 contingency tables for weeks O1,O2,O3,O4,ON,N1.

N2 VS N3

	1	2	
1	19	3	22
2	9	5	14
	28	8	36

Q=2.41

(a)

N3 VS N4

	1	2	
1	22	6	28
2	5	3	8
	27	9	36

Q=0.86

(b)

N4 VS D1

	1	2	
1	16	11	27
2	7	2	9
	23	13	36

Q=1.00

(c)

D1 VS D2

	1	2	
1	15	8	23
2	10	3	13
	25	11	36

Q=0.54

(d)

D2 VS D3

	1	2	
1	16	9	25
2	4	7	11
	20	16	36

Q=2.36

(e)

D3 VS D4

	1	2	
1	16	4	20
2	8	8	16
	24	12	36

Q=3.60

(f)

Figure 25: 2x2 contingency tables for weeks N2,N3,N4,D1,D2,D3,D4.

D4 VS J1

	1	2	
1	18	6	24
2	5	7	12
	23	13	36

Q=3.85

(a)

J1 VS J2

	1	2	
1	16	7	23
2	7	6	13
	23	13	36

Q=0.89

(b)

J2 VS J3

	1	2	
1	15	8	23
2	7	6	13
	22	14	36

Q=0.45

(c)

J3 VS J4

	1	2	
1	18	4	22
2	6	8	14
	24	12	36

Q=5.84

(d)

J4 VS JF

	1	2	
1	14	10	24
2	9	3	12
	23	13	36

Q=0.96

(e)

JF VS F1

	1	2	
1	16	7	23
2	9	4	13
	25	11	36

Q=0.01

(f)

Figure 26: 2x2 Contingency tables for weeks D4,J1,J2,J3,J4,JF,F1.

F1 VS F2

	1	2	
1	17	8	25
2	5	6	11
	22	14	36

Q=1.63

(a)

F2 VS F3

	1	2	
1	16	6	22
2	7	7	14
	23	13	36

Q=1.92

(b)

F3 VS FM

	1	2	
1	17	6	23
2	8	5	13
	25	11	36

Q=0.60

(c)

FM VS M1

	1	2	
1	17	8	25
2	5	6	11
	22	14	36

Q=1.63

(d)

M1 VS M2

	1	2	
1	14	8	22
2	9	5	14
	23	13	36

Q=0.01

(e)

M2 VS M3

	1	2	
1	17	6	23
2	6	7	13
	23	13	36

Q=2.77

(f)

Figure 27: 2x2 Contingency tables for weeks F1,F2,F3,FM,M1,M2,M3.

M3 VS M4

	1	2	
1	16	7	23
2	11	2	13
	27	9	36

Q=1.00

(a)

M4 VS A1

	1	2	
1	22	5	27
2	4	5	9
	26	10	36

Q=4.62

(b)

A1 VS A2

	1	2	
1	20	6	26
2	5	5	10
	25	11	36

Q=2.47

(c)

A2 VS A3

	1	2	
1	21	4	25
2	7	4	11
	28	8	36

Q=1.83

(d)

A3 VS A4

	1	2	
1	17	11	28
2	6	2	8
	23	13	36

Q=0.55

(e)

A4 VS AM

	1	2	
1	16	7	23
2	8	5	13
	24	12	36

Q=0.24

(f)

Figure 28: 2x2 Contingency tables for weeks M3,M4,A1,A2,A3,A4,AM.

occurs when week i falls above its mean of weekly rainfall. Similarly, Y = 1 occurs when the week i+1 falls below its mean of weekly rainfall and Y = 2 occurs when the week i+1 falls above its mean of weekly rainfall.

The control consists of the binary category of rainfall for week i and the complement consists of the binary category of rainfall for week i+1 in the 36-year period.

Results of the test statistics suggest that the weeks N1 vs N2, D4 vs J1, J3 vs J4, M2 vs M3, and M4 vs A1 are not independent with α = 0.10 significance level. The rest of the weeks appeared independent of each other at α = 0.10 significance level. Table 15 shows the test statistics and their chi-square values with α significance levels.

The expected number of 30 χ^2 random variables that would be over .10 is 3. So it seems that the result could be explained by random sampling.

Figures 29 through 33 show the 2x2 contingency tables for which the weekly X and Y values are determined differently from those shown above. On these figures, X = 1 occurs when the week i has no rainfall (no rainfall means rainfall of less than 0.02") in year t and X = 2 occurs when week i has rainfall in year t. Similarly, Y = 1 occurs when the week i+1 has no rainfall in year t and Y = 2 occurs when the week i+1 has rainfall in year t.

The control consists of the binary category of rainfall for week i and the complement consists of the binary category of rainfall for week i+1 in the 36-year period.

Table 15: TEST STATISTICS, APPROXIMATED CHI-SQUARED AND SIGNIFICANCE LEVEL FOR THE WEEKS.

WEEK	TEST STATISTICS	APPROXIMATED $\chi^2_{1-\alpha}$ VALUE	SIGNIFICANCE LEVEL
O1 VS O2	0.32	$\chi^2_{.40}$	0.60
O2 VS O3	1.83	$\chi^2_{.82}$	0.18
O3 VS O4	0.39	$\chi^2_{.47}$	0.53
O4 VS ON	1.66	$\chi^2_{.80}$	0.20
ON VS N1	0.67	$\chi^2_{.57}$	0.43
N1 VS N2	2.86	$\chi^2_{.91}$	0.09
N2 VS N3	2.41	$\chi^2_{.88}$	0.12
N3 VS N4	0.86	$\chi^2_{.63}$	0.37
N4 VS D1	1.00	$\chi^2_{.68}$	0.32
D1 VS D2	0.54	$\chi^2_{.52}$	0.48
D2 VS D3	2.36	$\chi^2_{.87}$	0.13
D3 VS D4	3.60	$\chi^2_{.94}$	0.06
D4 VS J1	3.85	$\chi^2_{.95}$	0.05
J1 VS J2	0.89	$\chi^2_{.65}$	0.35
J2 VS J3	0.45	$\chi^2_{.49}$	0.51
J3 VS J4	5.84	$\chi^2_{.98}$	0.02

J4 VS JF	0.96	$\chi^2_{.67}$	0.33
JF VS F1	0.01	$\chi^2_{.12}$	0.88
F1 VS F2	1.63	$\chi^2_{.80}$	0.20
F2 VS F3	1.92	$\chi^2_{.84}$	0.16
F3 VS FM	0.60	$\chi^2_{.55}$	0.45
FM VS M1	1.63	$\chi^2_{.79}$	0.21
M1 VS M2	0.01	$\chi^2_{.12}$	0.88
M2 VS M3	2.77	$\chi^2_{.90}$	0.10
M3 VS M4	1.00	$\chi^2_{.79}$	0.21
M4 VS A1	4.62	$\chi^2_{.97}$	0.03
A1 VS A2	2.47	$\chi^2_{.88}$	0.12
A2 VS A3	1.83	$\chi^2_{.82}$	0.18
A3 VS A4	0.55	$\chi^2_{.52}$	0.48
A4 VS AM	0.24	$\chi^2_{.38}$	0.62

O1 VS O2

	1	2	
1	13	14	27
2	6	3	9
	19	17	36

Q=0.93
(a)

O2 VS O3

	1	2	
1	11	8	19
2	9	8	17
	20	16	36

Q=0.09
(b)

O3 VS O4

	1	2	
1	12	8	20
2	9	7	16
	21	15	36

Q=0.05
(c)

O4 VS ON

	1	2	
1	15	6	21
2	7	8	15
	22	14	36

Q=2.26
(d)

ON VS N1

	1	2	
1	11	11	22
2	5	9	14
	16	20	36

Q=0.71
(e)

N1 VS N2

	1	2	
1	5	11	16
2	3	17	20
	8	28	36

Q=1.36
(f)

Figure 29: 2x2 contingency tables for weeks O1,O2,O3,O4,ON,N1.

N2 VS N3

	1	2	
1	5	3	8
2	12	16	28
	17	19	36

Q=0.96

(a)

N3 VS N4

	1	2	
1	8	9	17
2	6	13	19
	14	22	36

Q=0.91

(b)

N4 VS D1

	1	2	
1	4	10	14
2	4	18	22
	8	28	36

Q=0.54

(c)

D1 VS D2

	1	2	
1	3	5	8
2	11	17	28
	14	22	36

Q=0.01

(d)

D2 VS D3

	1	2	
1	4	10	14
2	4	18	22
	8	28	36

Q=0.54

(e)

D3 VS D4

	1	2	
1	5	3	8
2	7	21	28
	12	24	36

Q=3.94

(f)

Figure 30: 2x2 contingency tables for weeks N2,N3,N4,D1,D2,D3,D4.

D4 VS J1

	1	2	
1	3	9	12
2	7	17	24
	10	26	36

Q=0.07

(a)

J1 VS J2

	1	2	
1	6	4	10
2	5	21	26
	11	21	36

Q=5.66

(b)

J2 VS J3

	1	2	
1	8	3	11
2	7	18	25
	15	21	36

Q=6.29

(c)

J3 VS J4

	1	2	
1	5	10	15
2	4	17	21
	9	27	36

Q=0.95

(d)

J4 VS JF

	1	2	
1	3	6	9
2	4	23	27
	7	29	36

Q=1.48

(e)

JF VS F1

	1	2	
1	5	2	7
2	4	25	29
	9	27	36

Q=9.99

(f)

Figure 31: 2x2 Contingency tables for weeks D4,J1,J2,J3,J4,JF,F1.

F1 VS F2

	1	2	
1	2	7	9
2	7	20	27
	9	27	36

Q=0.05

(a)

F2 VS F3

	1	2	
1	4	5	9
2	11	16	27
	15	21	36

Q=0.04

(b)

F3 VS FM

	1	2	
1	4	11	15
2	2	19	21
	6	30	36

Q=1.85

(c)

FM VS M1

	1	2	
1	1	5	6
2	3	27	30
	4	32	36

Q=0.23

(d)

M1 VS M2

	1	2	
1	0	8	8
2	4	24	28
	4	32	36

Q=1.29

(e)

M2 VS M3

	1	2	
1	3	5	8
2	8	20	28
	11	25	36

Q=0.23

(f)

Figure 32: 2x2 Contingency tables for weeks F1,F2,F3,FM,M1,M2,M3.

M3 VS M4

	1	2	
1	6	5	11
2	7	18	25
	13	23	36

Q=2.33

(a)

M4 VS A1

	1	2	
1	6	7	13
2	9	14	23
	15	21	36

Q=0.17

(b)

A1 VS A2

	1	2	
1	7	8	15
2	7	14	21
	14	22	36

Q=0.65

(c)

A2 VS A3

	1	2	
1	11	3	14
2	11	11	22
	22	14	36

Q=2.94

(d)

A3 VS A4

	1	2	
1	10	12	22
2	4	10	14
	14	22	36

Q=1.03

(e)

A4 VS AM

	1	2	
1	9	5	14
2	9	13	22
	18	18	36

Q=1.87

(f)

Figure 33: 2x2 Contingency tables for weeks M3,M4,A1,A2,A3,A4,AM.

Table 16 shows the test statistics and their approximated chi-square value with α significance level.

Results of the test statistics showed that the weeks D3 vs D4, J1 vs J2, J2 vs J3, JF vs F1, and A2 vs A3 are not independent with $\alpha = 0.10$ significance level. The rest of the weeks appeared independent of each other at $\alpha = 0.10$ significance level. According to this procedure, the overall association among the weeks is not strong.

D. 4X4 CONTINGENCY TABLES

1. General

Figure 34 shows a typical 4x4 contingency table. The table element, n_{ij}, represents the number of years which display quality i in the control and quality j in the complement. The marginal entries $n_{i.}$ and $n_{.j}$ represent the number of years

COMPLEMENT

WEEK_{i+1}(Y)

	n_{11}	n_{12}	n_{13}	n_{14}	$n_{1.}$
CONTROL	n_{21}	n_{22}	n_{23}	n_{24}	$n_{2.}$
WEEK_i	n_{31}	n_{32}	n_{33}	n_{34}	$n_{3.}$
	n_{41}	n_{42}	n_{43}	n_{44}	$n_{4.}$
	$n_{.1}$	$n_{.2}$	$n_{.3}$	$n_{.4}$	N

Figure 34. Typical 4x4 contingency table

Table 16: TEST STATISTICS, APPROXIMATED CHI-SQUARED AND SIGNIFICANCE LEVEL FOR THE WEEKS.

WEEK	TEST STATISTICS	APPROXIMATED $\chi^2_{1-\alpha}$ VALUE	SIGNIFICANCE LEVEL
O1 VS O2	0.93	$\chi^2_{.66}$	0.34
O2 VS O3	0.09	$\chi^2_{.25}$	0.75
O3 VS O4	0.05	$\chi^2_{.21}$	0.79
O4 VS ON	2.26	$\chi^2_{.87}$	0.13
ON VS N1	0.71	$\chi^2_{.59}$	0.41
N1 VS N2	1.36	$\chi^2_{.75}$	0.25
N2 VS N3	0.96	$\chi^2_{.67}$	0.33
N3 VS N4	0.91	$\chi^2_{.66}$	0.34
N4 VS D1	0.54	$\chi^2_{.52}$	0.48
D1 VS D2	0.01	$\chi^2_{.12}$	0.88
D2 VS D3	0.54	$\chi^2_{.52}$	0.48
D3 VS D4	3.94	$\chi^2_{.95}$	0.05
D4 VS J1	0.07	$\chi^2_{.24}$	0.76
J1 VS J2	5.66	$\chi^2_{.98}$	0.02
J2 VS J3	6.29	$\chi^2_{.99}$	0.01
J3 VS J4	0.95	$\chi^2_{.67}$	0.33
J4 VS JF	1.48	$\chi^2_{.77}$	0.23
JF VS F1	9.99	$\chi^2_{.99}$	0.01

F1 VS F2	0.05	$\chi^2_{.21}$	0.79
F2 VS F3	0.04	$\chi^2_{.18}$	0.82
F3 VS FM	1.85	$\chi^2_{.88}$	0.18
FM VS M1	0.23	$\chi^2_{.38}$	0.62
M1 VS M2	1.29	$\chi^2_{.74}$	0.26
M2 VS M3	0.23	$\chi^2_{.38}$	0.62
M3 VS M4	2.33	$\chi^2_{.87}$	0.13
M4 VS A1	0.17	$\chi^2_{.33}$	0.67
A1 VS A2	0.65	$\chi^2_{.56}$	0.44
A2 VS A3	2.94	$\chi^2_{.91}$	0.09
A3 VS A4	1.03	$\chi^2_{.69}$	0.31
A4 VS AM	1.87	$\chi^2_{.83}$	0.17

for which control has quality i and the numbers of years the complement has quality j respectively. The overall number of years, N, is in the lower right of the table.

Conover [Ref. 2] discusses the theory and use of rxc contingency tables.

2. Classification of Rainfall

The National Weather Association classifies the daily positive rainfall in 3 categories, as light rainfall, moderate rainfall, and heavy rainfall. Any rainfall amount less than 0.02 inches is defined as zero rainfall. The observed positive rainfall data is ordered from least to highest for a given year. Then, the first 1/3 of the ordered positive rainfall data is called light rainfall, the second 1/3 of the ordered positive rainfall data is called moderate rainfall, and the remaining 1/3 of the ordered positive rainfall data is called heavy rainfall.

To construct a 4x4 contingency table using the weekly rainfall data, a similar procedure was used and is described below.

The weekly positive rainfall data was ordered from least to highest for a given month in the 36-year period; then 3 categories of rainfall were defined as described above. Additionally, a weekly rainfall of less than 0.02" inches is called zero rainfall and is considered as one category so that weekly rainfall data was broken down to 4 categories. Thus $X = 1$ occurs when the week i has zero rainfall in year t, X = 2 occurs when week i has light rainfall in year t, X = 3 occurs when week i has moderate rainfall in year t, and X = 4 occurs when week i has heavy rainfall in year t for a given month.

Table 17 shows the amount of rainfall limits of 3 categories of rainfall for the 7-month rainy period.

Table 17: AMOUNT OF RAINFALL LIMITS FOR THE WEEKLY RAINFALL IN INCHES

MONTH	LIGHT RAINFALL	MODERATE RAINFALL	HEAVY RAINFALL
OCTOBER	0.03-0.12	0.13-0.34	0.35-over
NOVEMBER	0.03-0.31	0.32-1.00	1.01-over
DECEMBER	0.03-0.37	0.38-1.07	1.08-over
JANUARY	0.03-0.38	0.39-1.34	1.35-over
FEBRUARY	0.03-0.40	0.41-1.19	1.20-over
MARCH	0.03-0.26	0.27-0.86	0.87-over
APRIL	0.03-0.17	0.18-0.60	0.61-over

3. Chi-Squared Test for Independence

A 4x4 contingency table was constructed the category or rainfall in week i and the category of rainfall in week i+1 by grouping all weeks in a month together. Table 18 shows the name of the weeks which were included to construct the contingency table for each month. Each month was analyzed separately since the rainfall data is seasonal. Each paired week contains 36 observations so that the total 144 (4x36 = 144) observations are formed in each contingency table. For example in the December contingency table the paired weeks used are (D1,D2), (D2,D3), (D3,D4), (D4,J1). The chi-square test was used to explore possible relationships between rainfall in successive weeks for a given month.

Table 18: WEEK NAMES FOR CONSTRUCTING 4x4 CONTINGENCY TABLES

MONTH	WEEKS
OCTOBER	O1,O2,O3,O4,ON
NOVEMBER	N1,N2,N3,N4,D1
DECEMBER	D1,D2,D3,D4,J1
JANUARY	J1,J2,J3,J4,JF
FEBRUARY	JF,F1,F2,F3,FM
MARCH	FM,M1,M2,M3,M4
APRIL	A1,A2,A3,A4,AM

Let E_{ij} equal $n_{i.}n_{.j}/N$. Then for a 4x4 contingency table the test statistic is given by:

$$Q = \sum_{i=1}^{4} \sum_{j=1}^{4} \frac{(n_{ij}-E_{ij})^2}{E_{ij}}$$

or simplifying for the calculation

$$Q = \sum_{i=1}^{4} \sum_{j=1}^{4} \frac{n_{ij}^2}{E_{ij}} - N$$

The exact distribution of Q is difficult to tabulate because of all the combinations of values possible for n_{ij}. Therefore the large sample approximateion, the chi-square distribution with 9 degrees of freedom is used for the distribution of Q.

Figures 35 through 41 show the 4x4 contingency tables for the weekly rainfall. The control consists of the category of rainfall for week i and the complement consists of category of rainfall for week i+1 for a given month, where the categories are given in Table 14.

The results of the test statistics suggest that the weeks of January, the weeks of February, and the weeks of April are not independent at $\alpha = .10$ significance level ($\chi^2_{.90}(9) = 14.7$ with $\alpha = .10$). The rest of the months, October, November, December, and March appear independent at the $\alpha = .10$ significance level.

Table 19 shows the test statistics, approximate chi-squared values, and the achieved significance level α.

OCTOBER

	1	2	3	4	
1	51	11	10	15	87
2	14	3	3	3	23
3	10	2	4	0	16
4	7	3	4	4	18
	82	19	21	22	144

Figure 35: 4x4 contingency table for OCTOBER.

NOVEMBER

	1	2	3	4	
1	22	11	12	10	55
2	9	7	9	6	31
3	7	9	3	8	27
4	9	3	10	9	31
	47	30	34	33	144

Figure 36: 4x4 contingency table for NOVEMBER.

DECEMBER

	1	2	3	4	
1	15	11	7	9	42
2	7	10	10	4	31
3	11	7	7	11	36
4	11	8	5	11	35
	44	36	29	35	144

Figure 37: 4x4 contingency table for DECEMBER

JANUARY

	1	2	3	4	
1	22	9	5	9	45
2	8	9	10	7	34
3	6	4	12	10	32
4	6	8	8	11	33
	42	30	35	37	144

Figure 38 4x4 contingency table for JANUARY

FEBRUARY

	1	2	3	4	
1	15	11	6	8	40
2	5	9	12	4	30
3	13	11	7	8	39
4	6	6	10	13	35
	39	37	35	33	144

Figure 39: 4x4 contingency table for FEBRUARY

MARCH

	1	2	3	4	
1	10	10	5	4	29
2	9	8	12	11	40
3	13	9	6	10	38
4	4	11	12	10	37
	36	38	35	35	144

Figure 40: 4x4 contingency table for MARCH

APRIL

	1	2	3	4	
1	37	13	9	6	65
2	10	9	3	4	26
3	10	4	6	2	22
4	11	2	8	10	31
	68	28	26	22	144

Figure 41: 4x4 contingency table for APRIL

Table 19: TEST STATISTIC, APPROXIMATE CHI-SQUARED VALUES, SIGNIFICANCE LEVEL FOR THE MONTH.

MONTHS	TEST STATISTIC	APPROXIMATED CHI-SQUARED $\chi^2_{1-\alpha}(9)$	SIGNIFICANCE LEVEL α
OCTOBER	7.24	$\chi^2_{.40}(9)$	0.60
NOVEMBER	10.45	$\chi^2_{.68}(9)$	0.32
DECEMBER	8.43	$\chi^2_{.50}(9)$	0.50
JANUARY	18.64	$\chi^2_{.97}(9)$	0.03
FEBRUARY	15.92	$\chi^2_{.93}(9)$	0.07
MARCH	11.94	$\chi^2_{.77}(9)$	0.23
APRIL	19.71	$\chi^2_{.98}(9)$	0.02

E. LOGISTIC ANALYSIS

1. Theory

The logistic analysis to be described in this section was developed from Cox [Ref. 1].

The basic approach is to view the complement as having a binary representation, with success being defined to mean that a complement has rainfall, while failure means that the complement has no rainfall for week t+1. The problem then is to find the conditional probability of a success given that the control takes on a particular value.

Let X_t be the rainfall in week t. If the probability of "success" = rainfall in week t+1, given X_t, is written as

$$\theta_t = P(\text{rainfall in week } t+1 \mid X_t),$$

the logistic model is

$$\theta_t = \frac{e^{\alpha+\beta X_t}}{1+e^{\alpha+\beta X_t}},$$

where the X_t are the explanatory variables.

The likelihood function is then

$$L(X,Y;\alpha,\beta) = \prod_{t=1}^{N} \left(\frac{e^{\alpha+\beta X_t}}{1+e^{\alpha+\beta X_t}}\right)^{Y_{t+1}} \left(\frac{1}{1+e^{\alpha+\beta X_t}}\right)^{1-Y_{t+1}}$$

where:

$$Y_{t+1} = \begin{cases} 1 & \text{if week t+1 has rainfall} \\ 0 & \text{if week t+1 has no rainfall} \end{cases}$$

and the log-likelihood is

$$L(X,Y;\alpha,\beta) = \alpha \sum_{t=1}^{N} Y_t + \beta \sum_{t=1}^{N} X_t Y_t - \sum_{t=1}^{N} \ln(1+e^{\alpha+\beta X_t})$$

The gradient, and Hessians are:

$$\frac{\partial \text{Log } L}{\partial \alpha} = \sum_{t=1}^{N} Y_t - \sum_{t=1}^{N} \left(\frac{e^{\alpha+\beta X_t}}{1+e^{\alpha+\beta X_t}}\right)$$

$$\frac{\partial \text{Log } L}{\partial \beta} = \sum_{t=1}^{N} X_t Y_t - \sum_{t=1}^{N} X_t \left(\frac{e^{\alpha+\beta X_t}}{1+e^{\alpha+\beta X_t}}\right)$$

Hessian:

$$H_L = \begin{bmatrix} -\sum_{t=1}^{N} \frac{e^{\alpha+\beta X_t}}{(1+e^{\alpha+\beta X_t})^2} & -\sum_{t=1}^{N} \frac{X_t e^{\alpha+\beta X_t}}{(1+e^{\alpha+\beta X_t})^2} \\ -\sum_{t=1}^{N} \frac{X_t e^{\alpha+\beta X_t}}{(1+e^{\alpha+\beta X_t})^2} & -\sum_{t=1}^{N} \frac{X_t^2 e^{\alpha+\beta X_t}}{(1+e^{\alpha+\beta X_t})^2} \end{bmatrix}$$

Information Matrix:

$$I_{s_1 s_2} = -H_L$$

to solve for α and β use of Newton's method as follows;

$$\binom{\alpha}{\beta}_{k+1} = \binom{\alpha}{\beta}_{k} - H_L \nabla t_L$$

All necessary elements may be calculated in one pass of the computer algorithm.

One beneficial byproduct of the maximum likelihood approach is the asymptotic covariance matrix, $(I_{s_1 s_2})^{-1}$. Cos [Ref. 3] states that the diagonal elements of this matrix provide good estimates of Var(α) and Var($\hat{\beta}$) under assumptions of normality.

Next, by using the diagonal elements of the asymptotic covariance matrix to put approximately symmetric confidence limits on α and β; for 90%

$$\hat{\alpha} - 1.64\sqrt{I^{s,s}(\hat{\alpha})} < \alpha < \hat{\alpha} + 1.64\sqrt{I^{s,s}(\hat{\alpha})}$$

$$\beta - 1.64\sqrt{I^{s,s}(\hat{\beta})} < \beta < \hat{\beta} + 1.64\sqrt{I^{s,s}(\hat{\beta})}$$

2. Analysis

In this analysis, given week i has rainfall/no rainfall in year t is considered as a control X, then conditional probability of success which week i+1 has rainfall in year t is considered as a complement Y. Let

$$Y_{i+1} = \begin{cases} 1 & \text{if week i+1 has rainfall} \\ 0 & \text{if week i+1 has no rainfall} \end{cases}$$

and

$$X_i = \begin{cases} 1 & \text{if week i has rainfall} \\ 0 & \text{if week i has no rainfall} \end{cases}$$

Then, the model

$$P\{Y_{i+1} = 1 | X_i\} = \theta = \frac{e^{\alpha+\beta X_i}}{1+e^{\alpha+\beta X_i}}$$

and

$$\text{log Odds} = \Psi = \ln(\frac{\theta}{1-\theta}) = \alpha + \beta X_i$$

Using the computer package "BMDPLR" estimates of α and β were obtained using maximum likelihood. Other quantities computed were conditional observed and predicted. These values are shown in Table 20. Also the number of successes, number of failures, predicted log odds and parameters α and β and their 90% confidence interval are shown in the same tables for the weeks. In the tables weeks are shown with their names which are indicated in the glossary of symbols tables.

In the 2x2 tables, the χ^2 test results have suggested that the weeks O2 vs O3, D3 vs D4, J1 vs J2, J2 vs J3, JF vs F1, and A2 vs A3 are not independent with $\alpha = 0.10$ significance level. Logistic model also indicates that these weeks

AD-A109 525 NAVAL POSTGRADUATE SCHOOL MONTEREY CA F/G 4/2

A STATISTICAL ANALYSIS OF DAILY AND WEEKLY RAINFALL FOR THE MON--ETC(U)

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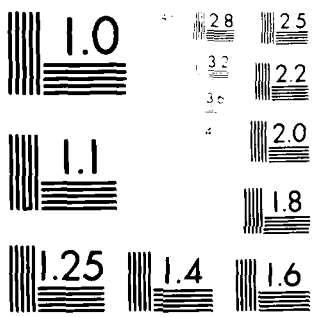


MICROCOPY RESOLUTION TEST CHART

Table 20: RESULTS OF THE LOGISTIC ANALYSIS FOR THE WEEKS

MODEL : P(02=1|01=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	01
8	7	0.5333	0.5333	0.134	0
14	7	0.6667	0.6667	0.693	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.133	0.518	0.258
Beta	0.560	0.694	0.806

Var[α]=0.15 Var[β]=0.65

90% Confidence limits

	Lower	Upper
Alpha	-0.502	0.768
Beta	-0.762	1.882

MODEL : P(03=1|02=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	02
3	11	0.2143	0.2143	-1.299	0
11	11	0.5000	0.5000	0.0	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-1.299	0.651	-1.995
Beta	1.299	0.778	1.669

Var[α]=0.31 Var[β]=0.55

90% Confidence limits

	Lower	Upper
Alpha	-2.212	-0.386
Beta	0.083	2.515

MODEL : P(O4=1|O3=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	O3
12	10	0.5455	0.5455	0.182	0
10	4	0.7143	0.7143	0.916	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.182	0.428	0.426
Beta	0.734	0.730	1.005

Var[α]=0.20 Var[β]=0.51

90% Confidence limits

	Lower	Upper
Alpha	-0.551	0.915
Beta	-0.437	1.905

MODEL : P(ON=1|O4=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	O4
5	9	0.3571	0.3571	-0.588	0
13	9	0.5909	0.5909	0.368	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.588	0.558	-1.054
Beta	0.956	0.707	1.352

Var[α]=0.21 Var[β]=0.48

90% Confidence limits

	Lower	Upper
Alpha	-1.340	0.164
Beta	-0.180	2.092

MODEL : P(N2=1|N1=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	N1
11	5	0.6875	0.6875	0.788	0
17	3	0.8500	0.8500	1.735	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.788	0.539	1.462
Beta	0.947	0.826	1.145

Var[α]=0.29 Var[β]=0.68

90% Confidence limits

	Lower	Upper
Alpha	-0.095	1.671
Beta	-0.405	2.299

MODEL : P(N3=1|N2=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	N2
3	5	0.3750	0.3750	-0.511	0
16	12	0.5714	0.5714	0.288	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.511	0.730	-0.699
Beta	0.799	0.824	0.969

Var[α]=0.53 Var[β]=0.68

90% Confidence limits	Lower	Upper
Alpha	-1.705	0.693
Beta	-0.553	2.151

MODEL : P(N4=1|N3=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	N3
9	8	0.5294	0.5294	0.118	0
13	6	0.6842	0.6842	0.773	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.118	0.486	0.242
Beta	0.655	0.693	0.946

Var[α]=0.24 Var[β]=0.48

90% Confidence limits	Lower	Upper
Alpha	-0.685	0.921
Beta	-0.481	1.791

MODEL : P(D1=1|N4=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	N4
10	4	0.7143	0.7143	0.916	0
18	4	0.8182	0.8182	1.504	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.916	0.592	1.549
Beta	0.588	0.810	0.726

Var[α]=0.35 Var[β]=0.66

90% Confidence limits	Lower	Upper
Alpha	-0.054	1.886
Beta	-0.744	1.920

MODEL : P(D2=1|D1=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	D1
5	3	0.6250	0.6250	0.511	0
17	11	0.6071	0.6071	0.435	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.511	0.730	0.699
Beta	-0.076	0.826	-0.091

Var[α]=0.53 Var[β]=0.68

90% Confidence limits

	Lower	Upper
Alpha	-0.683	1.705
Beta	-1.428	1.276

MODEL : P(D3=1|D2=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	D2
10	4	0.7143	0.7143	0.916	0
18	4	0.8182	0.8182	1.504	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.916	0.592	1.549
Beta	0.588	0.810	0.726

Var[α]=0.31 Var[β]=0.52

90% Confidence limits

	Lower	Upper
Alpha	0.003	1.829
Beta	-0.595	1.771

MODEL : P(D4=1|D3=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	D3
3	5	0.3750	0.3750	-0.511	0
21	7	0.7500	0.7500	1.099	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.511	0.730	-0.699
Beta	1.609	0.851	1.892

Var[α]=0.53 Var[β]=0.72

90% Confidence limits

	Lower	Upper
Alpha	-1.705	0.683
Beta	0.217	3.001

MODEL : P(J1=1|D4=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	D4
4	4	0.5000	0.5000	0.000	0
22	6	0.7857	0.7857	1.299	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.000	0.707	0.000
Beta	1.299	0.844	1.540

Var[α]=0.44   Var[β]=0.65

90% Confidence limits

	Lower	Upper
Alpha	-1.088	1.088
Beta	-0.023	2.621

MODEL : P(J2=1|J1=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	J1
4	6	0.4000	0.4000	-0.405	0
21	5	0.8077	0.8077	1.435	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.405	0.645	-0.628
Beta	1.840	0.815	2.258

Var[α]=0.42   Var[β]=0.66

90% Confidence limits

	Lower	Upper
Alpha	-1.468	0.658
Beta	0.508	3.172

MODEL : P(J3=1|J2=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	J2
3	8	0.2727	0.2727	-0.981	0
18	7	0.7200	0.7200	0.944	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.981	0.677	-1.449
Beta	1.925	0.810	2.376

Var[α]=0.46   Var[β]=0.65

90% Confidence limits

	Lower	Upper
Alpha	-2.093	0.131
Beta	0.603	3.247

MODEL : P(J4=1|J3=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	J3
10	5	0.6667	0.6667	0.693	0
17	4	0.8095	0.8095	1.447	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.693	0.548	1.266
Beta	0.754	0.780	0.966

Var[α]=0.30 Var[β]=0.61

90% Confidence limits

	Lower	Upper
Alpha	-0.205	1.591
Beta	-0.527	2.035

MODEL : P(JF=1|J4=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	J4
6	3	0.6667	0.6667	0.694	0
23	4	0.8519	0.8519	1.749	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.694	0.707	0.980
Beta	1.056	0.891	1.186

Var[α]=0.50 Var[β]=0.80

90% Confidence limits

	Lower	Upper
Alpha	-0.466	1.854
Beta	-0.411	2.523

MODEL : P(F1=1|JF=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	JF
2	5	0.2857	0.2857	-0.916	0
25	4	0.8621	0.8621	1.833	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.916	0.837	-1.095
Beta	2.749	0.995	2.763

Var[α]=0.70 Var[β]=1.00

90% Confidence limits

	Lower	Upper
Alpha	-2.288	0.456
Beta	1.109	4.389

MODEL : P(F2=1|F1=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	F1
7	2	0.7778	0.7778	1.050	0
20	7	0.7407	0.7407	1.253	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.253	0.802	1.562
Beta	-0.203	0.914	-0.222

Var[α]=0.64 Var[β]=0.84

90% Confidence limits

	Lower	Upper
Alpha	-0.059	2.565
Beta	-1.706	1.300

MODEL : P(F3=1|F2=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	F2
5	4	0.5556	0.5556	0.223	0
16	11	0.5926	0.5926	0.375	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.223	0.671	0.333
Beta	0.152	0.777	0.195

Var[α]=0.45 Var[β]=0.60

90% Confidence limits

	Lower	Upper
Alpha	-0.877	1.323
Beta	-1.118	1.422

MODEL : P(FM=1|F3=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	F3
11	4	0.7333	0.7333	1.012	0
19	2	0.9048	0.9048	2.251	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.011	0.584	1.733
Beta	1.241	0.945	1.311

Var[α]=0.34 Var[β]=0.89

90% Confidence limits

	Lower	Upper
Alpha	0.055	1.967
Beta	-0.306	2.788

MODEL : P(M1=1|FM=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	FM
5	1	0.8333	0.8333	1.609	0
27	3	0.9000	0.9000	2.197	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.609	1.095	1.469
Beta	0.588	1.253	0.469

Var[α]=1.19　　Var[β]=1.57

90% Confidence limits	Lower	Upper
Alpha	-0.180	3.398
Beta	-1.467	2.643

MODEL : P(M2=1|M1=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	M1
4	0	1.0000	0.9999	2.197	0
24	8	0.7500	0.7500	1.009	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	2.197	0.000	0.000
Beta	-1.098	0.408	-2.691

Var[α]=2.78　　Var[β]=2.94

90% Confidence limits	Lower	Upper
Alpha	-0.537	4.931
Beta	-3.910	1.714

MODEL : P(M3=1|M2=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	M2
5	3	0.6250	0.6250	0.511	0
20	8	0.7143	0.7143	0.916	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.511	0.730	0.699
Beta	0.405	0.842	0.482

Var[α]=0.53　　Var[β]=0.71

90% Confidence limits	Lower	Upper
Alpha	-0.683	1.705
Beta	-0.977	1.787

MODEL : P(M4=1|M3=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	M3
5	6	0.4545	0.4545	-0.182	0
18	7	0.7200	0.7200	0.944	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.182	0.606	-0.301
Beta	1.127	0.752	1.499

Var[α]=0.37 Var[β]=0.57

90% Confidence limits

	Lower	Upper
Alpha	-1.180	0.816
Beta	-0.111	2.365

MODEL : P(A1=1|M4=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	M4
7	6	0.5385	0.5385	0.154	0
14	9	0.6087	0.6087	0.442	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.154	0.556	0.277
Beta	0.288	0.701	0.410

Var[α]=0.31 Var[β]=0.49

90% Confidence limits

	Lower	Upper
Alpha	-0.759	1.067
Beta	-0.860	1.436

MODEL : P(A2=1|A1=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	A1
8	7	0.5333	0.5333	0.134	0
14	7	0.6667	0.6667	0.693	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.134	0.518	0.258
Beta	0.560	0.694	0.806

Var[α]=0.27 Var[β]=0.48

90% Confidence limits

	Lower	Upper
Alpha	-0.718	0.986
Beta	-0.576	1.696

MODEL : P(A3=1|A2=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	A2
3	11	0.2143	0.2143	-1.299	0
11	11	0.5000	0.5000	0.000	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-1.299	0.651	-1.995
Beta	1.299	0.778	1.669

Var[α]=0.42 Var[β]=0.61

90% Confidence limits

	Lower	Upper
Alpha	-2.362	-0.236
Beta	0.018	2.580

MODEL : P(A4=1|A3=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	A3
12	10	0.5455	0.5455	0.182	0
10	4	0.7143	0.7143	0.916	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.182	0.428	0.426
Beta	0.733	0.730	1.005

Var[α]=0.18 Var[β]=0.53

90% Confidence limits

	Lower	Upper
Alpha	-0.514	0.878
Beta	-0.461	1.927

MODEL : P(AM=1|A4=x)

# OF SUCCESS	# OF FAIL	OBSERVED PROBABILITY	PREDICTED PROBABILITY	LOG ODDS	A4
5	9	0.3571	0.3571	-0.588	0
13	9	0.5909	0.5909	0.368	1

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.588	0.558	-1.054
Beta	0.956	0.707	1.352

Var[α]=0.30 Var[β]=0.50

90% Confidence limits

	Lower	Upper
Alpha	-1.486	0.310
Beta	-0.204	2.116

are dependent on each other at the 10% significance level since the 90% confidence interval for beta does not cover zero.

The following logistic model was also considered.

$$P\{Y_{t+1} = 1 | R_t\} = \frac{e^{\alpha+\beta R_t}}{1+e^{\alpha+\beta R_t}} ,$$

where R_t is the amount of rainfall in week t and Y_{t+1} is a binary random variable taking the value 1 if week t+1 has positive rainfall. Tabel 21 shows the alpha and beta coefficients, standard errors (ss) and the 90% confidence limits for the alpha and beta coefficients. These numbers were computed using computer package "BMDPLR".

The 90% confidence intervals for do not cover zero only for the weeks D3 vs D4, JF vs F1, and M2 vs M3. This suggests that for these weeks the amount of rainfall in the previous weeks exceeds the amount of rainfall in the current week. Figures 42 and 43 show the plots of estimated alpha and beta coefficients by week.

Table 21: RESULT OF LOGISTIC ANALYSIS FOR THE WEEKS

MODEL : P(O2=1|O1=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.438	0.409	1.071
Beta	0.027	0.432	0.062

Var[α]=0.13   Var[β]=2.91

90% Confidence limits	Lower	Upper
Alpha	-0.153	1.029
Beta	-2.771	2.825

MODEL : P(O3=1|O2=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.735	0.424	-1.735
Beta	1.067	1.175	1.173

Var[α]=0.16   Var[β]=0.87

90% Confidence limits	Lower	Upper
Alpha	-1.391	-0.079
Beta	-0.463	2.597

MODEL : P(O4=1|O3=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.380	0.379	1.002
Beta	0.317	0.748	0.424

Var[α]=0.14   Var[β]=1.18

90% Confidence limits	Lower	Upper
Alpha	-0.334	0.994
Beta	-1.464	2.098

MODEL : P(ON=1|O4=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.192	0.438	-0.439
Beta	0.636	0.942	0.675

Var[α]=0.14   Var[β]=1.29

90% Confidence limits	Lower	Upper
Alpha	-0.806	0.422
Beta	-1.227	2.499

MODEL : P(N2=1|N1=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.986	0.466	2.115
Beta	0.743	0.807	0.921

Var[α]=0.22   Var[β]=0.65

90% Confidence limits

	Lower	Upper
Alpha	0.217	1.755
Beta	-0.579	2.065

MODEL : P(N3=1|N2=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.102	0.422	-0.243
Beta	0.284	0.351	0.807

Var[α]=0.18   Var[β]=0.12

90% Confidence limits

	Lower	Upper
Alpha	-0.798	0.576
Beta	-0.384	0.852

MODEL : P(N4=1|N3=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.595	0.395	1.507
Beta	-0.280	0.375	-0.748

Var[α]=0.16   Var[β]=0.14

90% Confidence limits

	Lower	Upper
Alpha	-0.061	1.251
Beta	-0.894	0.334

MODEL : P(D1=1|N4=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.106	0.454	2.434
Beta	0.336	0.589	0.570

Var[α]=0.21   Var[β]=0.35

90% Confidence limits

	Lower	Upper
Alpha	0.354	1.858
Beta	-0.634	1.306

MODEL : P(D2=1|D1=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.294	0.456	0.644
Beta	0.230	0.450	0.509

Var[α]=0.21 Var[β]=0.20

90% Confidence limits

	Lower	Upper
Alpha	-0.458	1.046
Beta	-0.503	0.963

MODEL : P(D3=1|D2=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.378	0.485	2.838
Beta	-0.301	0.614	-0.490

Var[α]=0.24 Var[β]=0.38

90% Confidence limits

	Lower	Upper
Alpha	0.575	2.181
Beta	-1.312	0.710

MODEL : P(D4=1|D3=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.396	0.482	0.822
Beta	0.560	0.653	0.858

Var[α]=0.23 Var[β]=0.43

90% Confidence limits

	Lower	Upper
Alpha	-0.391	1.183
Beta	-0.515	1.635

MODEL : P(J1=1|D4=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.132	0.499	0.265
Beta	1.952	0.988	1.976

Var[α]=0.25 Var[β]=1.07

90% Confidence limits

	Lower	Upper
Alpha	-0.688	0.952
Beta	0.256	3.648

MODEL : P(J2=1|J1=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.299	0.445	0.671
Beta	1.232	0.801	1.538

Var[α]=0.20   Var[β]=0.64

90% Confidence limits

	Lower	Upper
Alpha	-0.434	1.032
Beta	-0.080	2.544

MODEL : P(J3=1|J2=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.045	0.434	-0.104
Beta	0.526	0.402	1.310

Var[α]=0.19   Var[β]=0.16

90% Confidence limits

	Lower	Upper
Alpha	-0.760	0.670
Beta	-0.130	1.182

MODEL : P(J4=1|J3=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.809	0.472	1.712
Beta	0.394	0.428	0.922

Var[α]=0.22   Var[β]=0.18

90% Confidence limits

	Lower	Upper
Alpha	0.040	1.578
Beta	-0.302	1.090

MODEL : P(JF=1|J4=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.525	0.567	2.690
Beta	-0.137	0.482	-0.285

Var[α]=0.32   Var[β]=0.23

90% Confidence limits

	Lower	Upper
Alpha	0.597	2.448
Beta	-0.924	0.650

MODEL : P(F1=1|JF=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.356	0.505	0.706
Beta	1.162	0.691	1.680

Var[α]=0.26 Var[β]=0.48

90% Confidence limits

	Lower	Upper
Alpha	-0.480	1.192
Beta	0.026	2.298

MODEL : P(F2=1|F1=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.986	0.491	2.008
Beta	0.161	0.454	0.354

Var[α]=0.24 Var[β]=0.21

90% Confidence limits

	Lower	Upper
Alpha	0.183	1.699
Beta	-0.591	0.913

MODEL : P(F3=1|F2=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.135	0.444	0.304
Beta	0.412	0.606	0.679

Var[α]=0.20 Var[β]=0.37

90% Confidence limits

	Lower	Upper
Alpha	-0.598	0.868
Beta	-0.586	1.410

MODEL : P(FM=1|F3=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.445	0.546	2.647
Beta	0.272	0.578	0.471

Var[α]=0.30 Var[β]=0.33

90% Confidence limits

	Lower	Upper
Alpha	0.547	2.343
Beta	-0.670	1.214

MODEL : P(M1=1|FM=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.613	0.634	2.545
Beta	0.837	0.940	0.890

Var[α]=0.40 Var[β]=0.88

90% Confidence limits

	Lower	Upper
Alpha	0.576	2.650
Beta	-0.701	2.375

MODEL : P(M2=1|M1=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	1.209	0.535	2.258
Beta	0.083	0.681	0.122

Var[α]=0.29 Var[β]=0.46

90% Confidence limits

	Lower	Upper
Alpha	0.326	2.092
Beta	-1.029	1.195

MODEL : P(M3=1|M2=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.143	0.467	0.307
Beta	1.377	0.776	1.774

Var[α]=0.22 Var[β]=0.60

90% Confidence limits

	Lower	Upper
Alpha	-0.626	0.912
Beta	0.107	2.647

MODEL : P(M4=1|M3=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.237	0.435	0.546
Beta	0.800	0.694	1.154

Var[α]=0.19 Var[β]=0.48

90% Confidence limits

	Lower	Upper
Alpha	-0.478	0.952
Beta	-0.336	1.936

MODEL : P(A1=1|M4=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.087	0.407	-0.213
Beta	0.728	0.466	1.563

Var[α]=0.17 Var[β]=0.22

	90% Confidence limits	
	Lower	Upper
Alpha	-0.763	0.589
Beta	-0.041	1.497

MODEL : P(A2=1|A1=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.438	0.409	1.071
Beta	0.027	0.432	0.062

Var[α]=0.17 Var[β]=0.19

	90% Confidence limits	
	Lower	Upper
Alpha	-0.238	1.114
Beta	-0.688	0.742

MODEL : P(A3=1|A2=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.735	0.424	-1.735
Beta	1.067	0.909	1.173

Var[α]=0.18 Var[β]=0.83

	90% Confidence limits	
	Lower	Upper
Alpha	-1.431	-0.039
Beta	-0.427	2.561

MODEL : P(A4=1|A3=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	0.380	0.379	1.002
Beta	0.317	0.748	0.424

Var[α]=0.14 Var[β]=0.56

	90% Confidence limits	
	Lower	Upper
Alpha	-0.234	0.994
Beta	-0.910	1.544

MODEL : P(AH=1|A4=x)

PARAMETER	COEFFICIENT	SE	COEF/SE
Alpha	-0.192	0.438	-0.439
Beta	0.636	0.942	0.675

Var[α]=0.19 Var[β]=0.89

	90% Confidence limits	
	Lower	Upper
Alpha	-0.907	0.523
Beta	-0.911	2.183

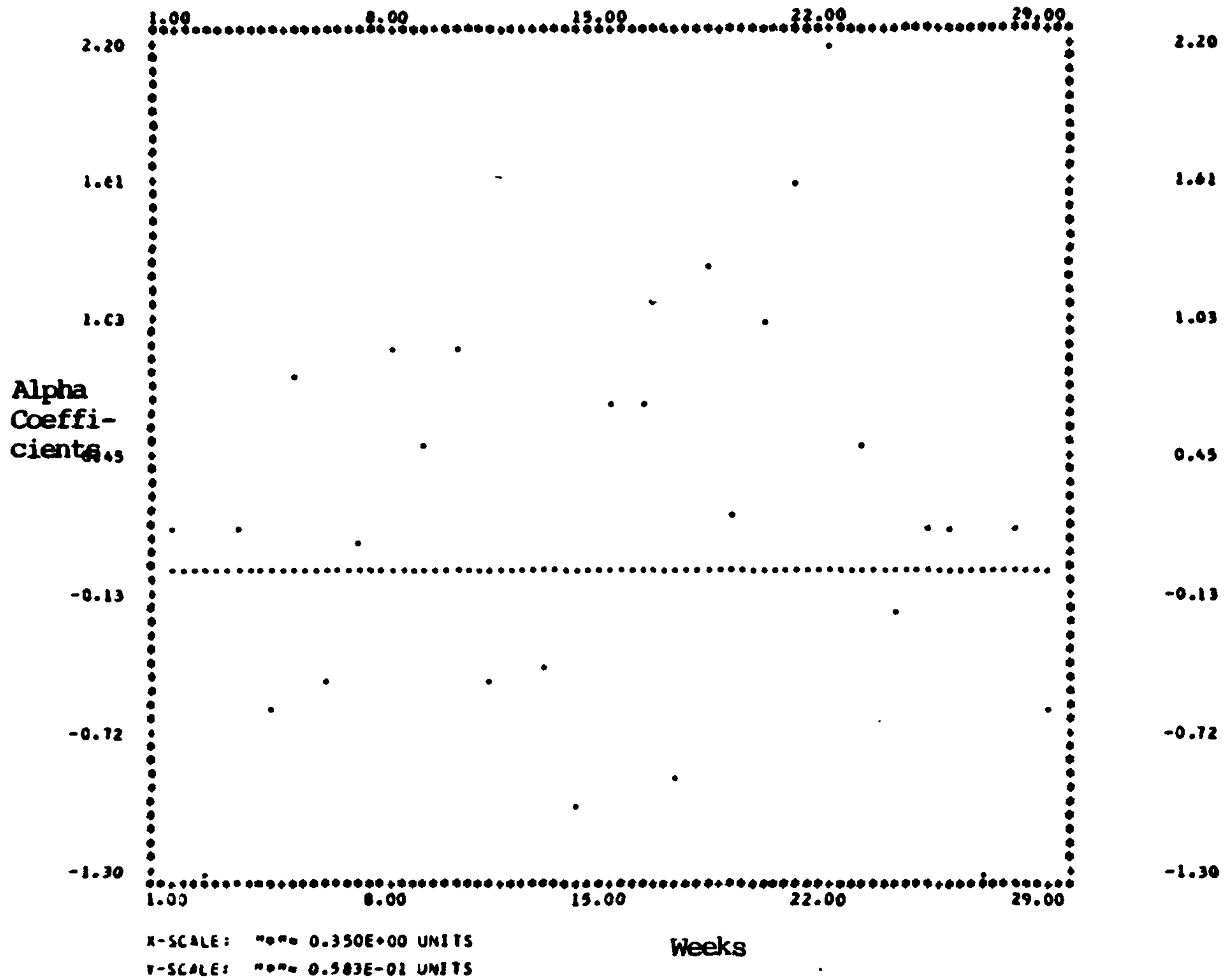


Figure 42. Plot of alpha coefficient for the weeks

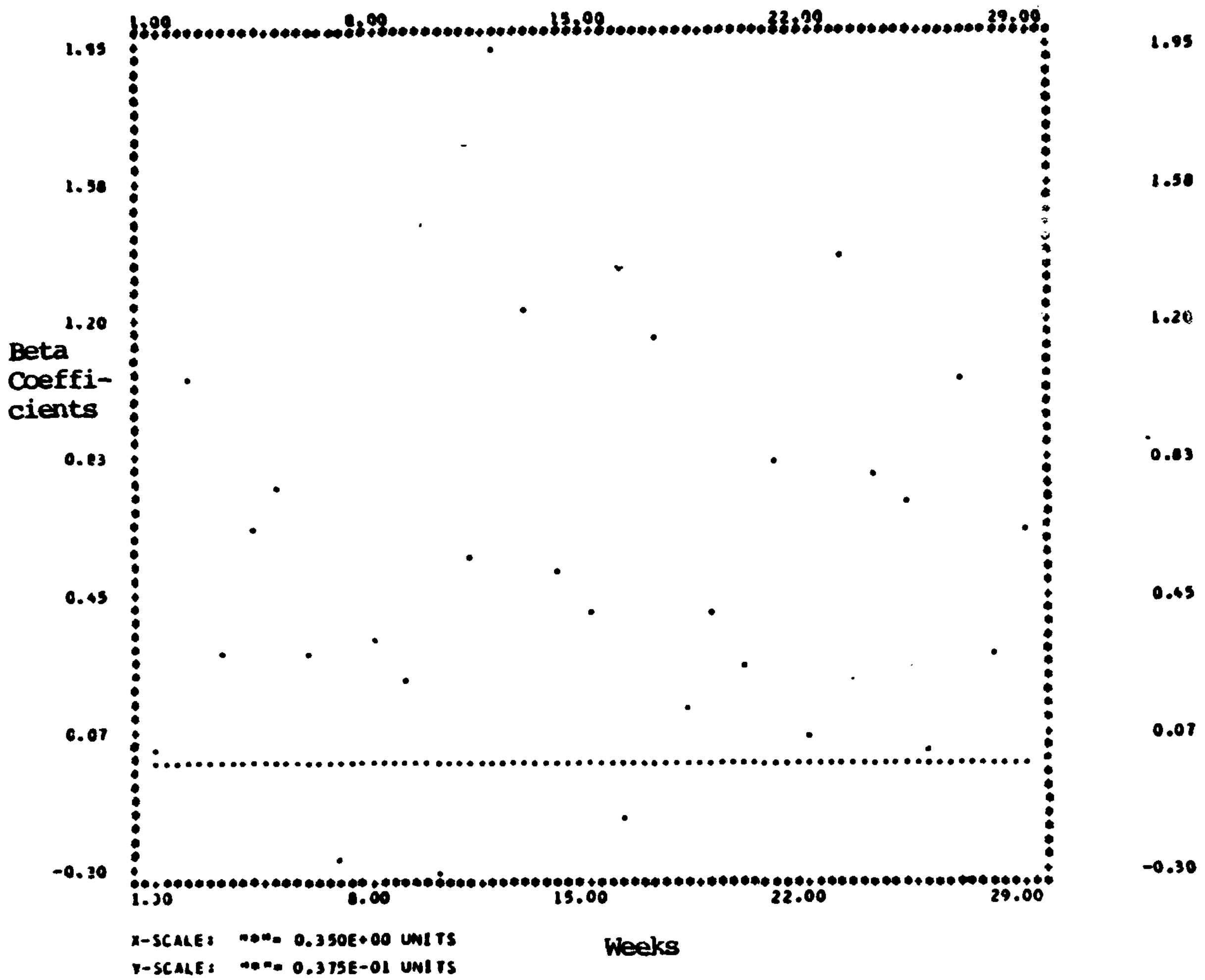


Figure 43. Plot of beta coefficient for the weeks

APPENDIX A. DAILY RAINFALL DATA

JULIAN DATE

YEAR	1	2	3	4	5	6	7	8	9	10	11
1938	0.0	0.15	0.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.04	0.0	0.78	0.36	0.0	0.0	0.0	0.0	0.0
1940	0.16	2.13	0.10	0.72	0.07	0.45	0.19	0.72	0.25	0.79	1.34
1941	0.0	0.0	0.0	0.44	0.42	0.07	0.28	0.10	0.03	0.0	0.0
1942	0.14	0.0	0.0	0.0	0.0	0.0	0.0	0.20	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.53	0.24	0.25	0.08	0.49	0.0	0.0	0.0	0.74	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.04	0.23	0.17	0.56	0.0	0.0	0.08	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.02	0.0	0.02	0.05	0.0	0.0	0.0	0.0
1949	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.18	0.05	0.0	0.02	0.0	0.0	0.44	0.12	0.0	0.61	0.31
1951	0.0	0.0	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.49	0.15
1952	0.0	0.0	0.0	0.0	0.0	0.24	1.20	0.49	0.0	0.0	0.15
1953	0.0	0.02	0.0	0.0	0.0	0.10	0.10	0.67	0.02	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.37
1955	1.23	0.03	0.0	0.0	0.05	0.0	0.0	0.0	0.01	0.74	0.0
1956	0.0	0.0	0.0	0.0	0.66	0.15	0.0	0.42	0.0	0.19	0.04
1957	0.0	0.0	0.0	0.0	0.22	0.40	0.0	0.0	0.14	0.0	0.0
1958	0.0	0.14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.26	0.01
1959	0.0	0.0	0.0	0.0	0.36	1.02	0.0	0.0	0.56	1.58	0.11
1960	0.0	0.03	0.0	0.0	0.0	0.0	0.07	0.22	0.83	0.26	0.73
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
1963	0.0	0.0	0.02	0.0	0.0	0.0	0.12	0.0	0.0	0.0	0.0
1964	0.02	0.0	0.0	0.0	0.0	0.05	0.0	0.0	0.04	0.0	0.0
1965	0.0	0.51	0.01	0.02	0.58	0.59	0.0	0.0	0.0	0.0	0.03
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.89	0.02	0.0
1969	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.02	0.02
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.12	0.05	0.66	0.94	0.06
1971	0.24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.23
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.06	0.10	0.0	0.0	0.0	0.21	0.45	0.35	0.03	0.0

JULIAN DATE

YEAR	12	13	14	15	16	17	18	19	20	21	22
1938	0.0	0.0	0.0	0.22	0.0	0.47	0.0	0.72	0.11	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.72	0.05	0.80	0.0	0.0	0.36	0.75	0.0	0.75
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.51
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.57	0.49
1944	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.02	0.02	0.0	0.01	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.22	0.34	0.0	0.82	0.20
1950	0.0	0.58	0.0	0.04	0.06	0.03	0.0	0.0	0.0	0.0	0.0
1951	0.26	0.0	0.0	0.0	0.56	0.0	0.05	0.20	0.0	0.0	0.07
1952	1.49	0.45	0.16	1.01	0.23	0.46	0.01	0.0	0.21	0.11	0.04
1953	0.02	0.12	0.35	0.10	0.0	0.07	0.04	0.0	0.0	0.10	0.0
1954	0.61	0.0	0.0	0.0	0.0	0.61	0.01	0.06	0.31	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.73	0.01	1.05	0.16	0.17	0.0	0.0
1956	0.0	0.0	0.12	0.31	0.46	0.0	0.02	0.0	0.38	0.10	0.04
1957	0.02	1.52	0.48	0.0	0.0	0.0	0.0	0.0	0.82	0.11	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.05	0.48	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.01	0.37	0.44	0.0	0.0	0.0	0.0	0.0	0.09	0.19	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.11	0.0	0.0	0.0	0.0	0.0	0.02	1.47	0.32	0.38	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.12	0.0	0.0	0.05	0.36	0.10	0.48	0.88	0.83	0.24
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.15	0.0	0.13	0.01
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08
1967	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.49	1.88	0.02
1968	0.0	0.09	0.53	0.06	0.0	0.0	0.0	0.0	0.01	0.0	0.0
1969	0.10	0.41	0.0	0.0	0.02	0.18	2.39	0.31	1.39	0.07	0.03
1970	0.0	0.13	0.63	1.22	0.05	0.02	0.0	0.32	0.42	0.06	0.02
1971	0.32	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.01	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.02	0.0	0.63	0.74	0.33	0.65	0.0	0.10	0.0	0.0

JULIAN DATE

YEAR	23	24	25	26	27	28	29	30	31	32	33
1938	0.0	0.0	0.0	0.0	0.0	0.90	0.0	1.12	1.00	1.10	0.15
1939	0.0	0.0	0.0	0.0	0.02	0.31	0.0	1.26	0.42	0.14	0.0
1940	0.07	0.26	0.09	0.47	0.0	0.0	0.0	0.0	0.46	0.48	0.07
1941	0.15	0.63	0.29	0.31	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.03	1.16	0.74	0.03	0.40	0.10	0.0	0.13	0.04	0.04	0.17
1943	0.13	0.02	0.0	0.11	0.14	0.0	0.18	0.33	0.08	0.0	0.0
1944	0.40	0.25	0.0	0.0	0.07	0.0	0.0	0.62	0.0	0.42	0.08
1945	0.0	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.89	0.0	2.37
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.01
1947	0.0	0.0	0.0	0.0	0.0	0.38	0.03	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.23
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.35
1950	0.15	0.18	0.0	0.0	0.35	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.16	0.0	0.0	0.0	0.0
1952	0.0	0.75	0.88	0.13	0.0	0.0	0.0	0.0	0.0	0.0	0.37
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.06	0.23	1.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.33	0.05	0.05	0.0
1956	0.20	0.0	0.58	0.26	0.61	0.27	0.01	0.0	0.0	0.0	0.0
1957	0.03	0.0	0.0	0.55	0.0	0.01	0.02	0.0	0.0	0.0	0.08
1958	0.0	1.11	0.27	0.36	0.03	0.0	0.0	0.38	0.36	0.0	0.94
1959	0.0	0.0	0.15	0.02	0.0	0.02	0.0	0.05	0.0	0.0	0.0
1960	0.30	0.19	0.04	0.0	0.0	0.0	0.0	0.03	0.19	0.36	0.12
1961	0.18	0.0	1.28	0.0	0.0	0.03	0.13	0.22	0.0	0.45	0.03
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.49	1.97	1.23	0.03	0.0
1964	0.02	0.0	0.01	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.32	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.03	0.0	0.0	2.11	0.13	0.0	0.0	0.0
1967	1.06	0.24	0.0	0.0	0.0	0.48	1.19	0.37	0.02	0.0	0.0
1968	0.0	0.0	0.0	0.11	0.20	0.10	0.14	0.96	0.0	0.02	0.02
1969	0.62	1.10	0.49	0.32	0.30	0.12	0.54	0.01	0.03	0.0	0.01
1970	0.46	0.01	0.0	0.34	0.0	0.0	0.03	0.0	0.01	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.16	0.17	0.0	0.0	0.34	1.05	0.16	0.0	0.0	0.01

JULIAN DATE

YEAR	34	35	36	37	38	39	40	41	42	43	44
1938	0.87	0.59	0.23	0.13	0.0	0.0	0.23	0.43	1.75	0.63	0.10
1939	0.29	0.24	0.0	0.07	0.20	0.38	0.0	0.17	0.0	0.0	0.0
1940	0.29	0.0	0.06	0.0	0.19	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.91	0.0	0.60	1.36	0.65	0.22	0.32	0.0
1942	0.16	0.02	0.78	0.45	0.02	0.01	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.36	0.20	0.0	0.0	0.0	0.0
1944	1.42	0.09	0.0	0.0	0.0	0.52	0.19	0.0	0.0	0.0	0.0
1945	0.13	0.0	0.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.34	0.0	0.0	0.02	0.0	0.0	0.11	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.59	0.0	0.17	0.06
1948	0.02	0.86	0.45	0.10	0.0	0.0	0.04	0.0	0.0	0.0	0.0
1949	0.13	0.30	0.48	0.35	0.0	0.0	0.0	0.41	0.02	0.0	0.0
1950	0.55	0.16	0.42	0.0	0.0	0.0	0.58	0.03	0.0	0.0	0.0
1951	0.0	0.0	0.51	0.0	0.0	0.0	0.0	0.0	0.02	0.11	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.30	0.10	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.29
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.25	0.01	0.0	0.0	0.0	0.04
1958	1.14	0.02	0.20	0.0	0.0	0.0	0.12	0.03	0.01	0.32	0.07
1959	0.0	0.0	0.0	0.0	0.0	0.18	0.07	0.52	1.14	0.50	0.0
1960	0.04	0.62	0.28	0.02	0.25	0.40	0.40	0.11	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.03	0.01	0.0	0.0	0.28	0.10	0.0	0.0
1962	0.0	0.0	0.01	0.25	0.14	1.07	0.82	0.17	0.07	0.11	0.58
1963	0.0	0.0	0.0	0.0	0.10	0.02	1.21	0.14	0.01	0.67	0.07
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.50	0.05	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.04
1966	0.08	0.22	0.60	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0
1967	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03
1968	0.0	0.02	0.0	0.0	0.0	0.0	0.01	0.02	0.02	0.0	0.0
1969	0.01	0.07	0.50	0.10	0.0	0.02	0.01	0.11	1.69	0.01	0.0
1970	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.09	0.15	0.66	0.12
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.04	0.04	0.17	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0
1973	0.53	0.0	0.70	0.30	0.02	0.0	0.64	0.98	0.15	0.54	0.34

JULIAN DATE

YEAR	45	46	47	48	49	50	51	52	53	54	55
1938	0.75	0.05	0.0	0.0	0.08	0.24	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.52	0.05	0.0	0.69	0.10	0.0	0.0	0.0	0.33	0.43	0.0
1941	0.0	0.42	0.0	0.36	0.06	0.0	0.13	0.42	0.51	0.0	0.97
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	1.00	0.0	0.06
1943	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.24	0.44	0.10	0.03
1944	0.0	0.0	0.0	0.0	0.0	0.69	0.18	0.57	0.91	0.61	0.0
1945	0.21	0.09	0.0	0.0	0.17	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.31	0.56	0.0	0.0	0.0	0.07	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.08	0.14	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.01	0.32	0.01
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.28	0.13	0.03	0.04
1952	0.0	0.0	0.04	0.25	0.15	0.29	0.01	0.41	0.0	0.19	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.80	0.03	0.10	0.05	0.31	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.07	0.56	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.0	0.0	1.20	0.26
1957	0.0	0.0	0.02	0.04	0.0	0.03	0.05	0.25	0.21	0.52	0.08
1958	0.0	0.03	0.0	0.0	0.18	0.94	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	1.11	0.07	0.21	0.14	1.66	0.03	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.10	0.04	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.42	0.18	0.21	0.11	0.68	0.49	0.0	0.0	0.01	0.16	0.28
1963	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.15	0.13	0.0
1967	0.01	0.01	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.41
1968	0.0	0.12	0.25	0.03	0.02	0.40	0.37	0.01	0.02	0.01	0.01
1969	0.45	0.04	0.0	0.41	0.38	0.14	0.01	0.76	0.79	0.89	0.28
1970	0.0	0.05	0.17	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.03	0.0	0.18	0.0	0.22	0.0	0.0	0.0	0.02	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.0	0.0	0.0
1973	0.06	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.17	0.0

JULIAN DATE

YEAR	56	57	58	59	60	61	62	63	64	65	66
1938	0.0	0.0	0.0	0.26	0.61	1.10	0.62	0.11	0.0	0.0	0.65
1939	0.0	0.0	0.0	0.13	0.0	0.0	0.0	0.01	0.0	0.0	0.01
1940	0.79	1.56	0.66	0.77	1.21	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.31	0.03	0.46	1.05	0.61	0.09	0.76	0.04	0.0	0.0
1942	0.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.39	0.76	0.18	0.0	0.0	0.0	0.02	0.67	0.54	0.25	0.0
1944	0.0	0.05	0.0	0.02	2.33	0.0	0.09	0.0	0.41	0.20	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.33	0.0	0.08	0.0
1946	0.0	0.0	0.14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.02	0.12	0.21	0.13	0.0	0.0	0.0	0.04
1948	0.0	0.0	0.34	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.17	0.17	0.01	0.0	0.36	1.06	0.58	0.15	0.0	0.0	0.03
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.0	0.0
1951	0.0	0.07	0.94	0.04	0.98	0.06	0.0	0.0	0.18	0.05	0.17
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.16	0.0	0.47
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.06	0.81	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.04
1957	0.38	0.0	0.19	0.46	0.26	0.02	0.0	0.23	0.09	0.07	0.0
1958	0.59	0.03	0.0	0.0	0.0	0.0	0.06	0.38	0.0	0.02	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.03	0.01	0.05	0.43	0.01	0.01	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.15	0.0	0.23	0.06	0.0
1962	0.05	0.0	0.0	0.02	0.12	0.16	0.0	0.01	1.16	0.13	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.0	0.40
1964	0.0	0.0	0.0	0.10	0.0	0.27	0.0	0.01	0.0	0.02	0.01
1965	0.0	0.32	0.0	0.0	0.0	0.0	0.0	0.06	0.34	0.03	0.0
1966	0.25	0.0	0.0	0.0	0.35	0.0	0.0	0.01	0.0	0.04	0.0
1967	0.01	0.0	0.01	0.0	0.0	0.0	0.07	0.0	0.0	0.01	0.01
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.03	0.0	0.02	0.48
1969	0.62	0.0	0.34	0.32	0.02	0.08	0.0	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.69	1.05	0.28	0.03	0.15	1.17	0.0	0.0	0.04
1971	0.0	0.11	0.07	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.32	0.38	0.91	0.0	0.0	0.0	0.76	0.11	0.23	0.05	0.59

JULIAN DATE

YEAR	67	68	69	70	71	72	73	74	75	76	77
1938	0.21	0.0	0.0	0.16	0.62	0.41	0.03	0.0	0.50	0.0	0.0
1939	0.09	1.58	0.23	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.04	0.07	0.0	0.0	0.0	0.0	0.30	0.0
1941	0.0	0.0	0.0	0.0	0.10	0.40	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	1.42	0.02	0.18	0.45	0.36	0.0	0.0	0.0
1943	0.48	0.72	0.32	0.09	0.01	0.0	0.0	0.08	0.0	0.15	0.47
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.47	0.02	0.16	0.09
1946	0.0	0.0	0.05	0.0	0.0	0.47	0.0	0.0	0.0	0.0	0.38
1947	0.06	0.30	0.26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
1948	0.0	0.0	0.23	0.0	0.0	0.15	1.16	0.14	0.16	0.38	0.02
1949	0.08	0.05	0.70	0.22	0.03	0.0	0.0	0.01	0.0	0.0	0.56
1950	0.0	0.0	0.0	0.05	0.0	0.0	0.04	0.0	0.0	0.0	0.02
1951	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.75	0.02	0.0	0.16	0.07	0.24	0.25	0.07	1.27	0.33	0.0
1953	0.0	0.0	0.08	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.27	0.32	0.06	0.0	0.0	0.0	0.0	0.79	0.84	0.51
1955	0.0	0.0	0.01	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.38	0.04	0.02	0.16	0.06	0.0	0.35	0.0	0.0	0.0
1958	0.06	0.01	0.0	0.0	0.02	0.12	0.27	0.55	1.66	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0
1960	0.03	0.0	0.0	0.0	0.17	0.16	0.0	0.0	0.0	0.0	0.0
1961	0.13	0.0	0.0	0.0	0.0	0.0	1.26	0.05	0.25	0.01	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.26	0.01	0.0	0.01	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.16	1.00	0.18	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.27	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.04	0.28	0.21	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.02	0.0	0.0	0.02	0.02	0.0	0.04	0.0	0.0	0.04
1967	0.0	0.02	1.22	0.11	0.81	0.20	0.01	1.05	0.24	0.0	0.03
1968	0.0	0.02	0.0	0.0	0.88	0.19	0.02	0.52	0.47	0.01	0.0
1969	0.01	0.49	0.0	0.35	0.02	0.0	0.0	0.01	0.01	0.0	0.0
1970	0.0	0.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.03	0.96	0.0	0.0	0.02	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.01	0.0	0.0
1973	0.0	0.0	0.26	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	78	79	80	81	82	83	84	85	86	87	88
1938	0.0	0.10	0.10	0.0	0.0	0.35	0.0	0.0	0.0	0.06	0.0
1939	0.0	0.0	0.0	0.04	0.0	0.0	0.02	0.23	0.13	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.83	0.15
1941	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.33	0.29	0.06
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.40	0.17	0.39	0.0	0.0	0.58	0.07	0.0	0.0
1946	0.03	0.11	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.88	0.86
1947	0.0	0.0	0.0	0.10	0.0	0.0	0.0	0.06	0.38	0.02	0.24
1948	0.34	0.0	0.0	0.04	0.0	1.43	0.31	0.0	0.0	0.0	0.04
1949	0.15	0.0	0.01	0.57	0.17	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.04	0.07	0.0	0.09	0.79	0.47	0.01	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.02	0.61	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.12	0.36	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.09	0.35	0.44	0.0	0.06	0.22	0.0	0.0	0.0	0.0	0.03
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09	0.07
1958	0.0	0.20	0.14	1.07	0.0	0.68	0.11	0.02	0.85	0.06	0.01
1959	0.0	0.0	0.0	0.03	0.18	0.0	0.06	0.0	0.0	0.0	0.02
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.15	0.0
1961	0.04	0.0	0.0	0.07	0.02	0.10	0.01	0.01	0.01	0.0	0.0
1962	0.12	0.0	0.32	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.78	0.0	0.0	0.0	0.0	1.66	0.07	0.0	0.0
1964	0.0	0.0	0.13	0.41	0.60	0.19	0.03	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.05	0.0	0.0	0.32	0.0	0.0	0.0	1.07
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.04	0.01	0.10	0.0	0.0	0.01	0.01	0.0	0.31	0.03
1968	0.0	0.0	0.0	0.08	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.02	0.05	0.03	0.73	0.10	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1973	1.06	0.10	0.16	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.17

JULIAN DATE

YEAR	89	90	91	92	93	94	95	96	97	98	99
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.47	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.04	1.06	1.72	0.0	0.0	0.0	0.09	0.0	0.0	0.0	0.0
1941	1.75	1.32	0.48	0.02	0.64	1.78	0.0	0.05	0.0	0.0	0.54
1942	0.0	0.0	0.0	0.0	0.16	0.35	0.90	0.55	0.0	0.0	0.01
1943	0.40	0.0	0.0	0.0	0.0	0.0	0.12	0.0	0.0	0.19	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.23	0.0	0.0	0.0	0.01
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.43
1946	0.06	0.13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.01	0.0	0.0	0.25	0.0	0.0	0.0	0.0	0.0	0.08	0.0
1948	0.21	0.0	0.0	0.0	0.36	0.06	0.47	0.16	0.0	0.05	0.03
1949	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.27	0.13	0.54	0.52	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.70	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.13	0.0
1954	0.43	0.0	0.0	0.0	0.0	0.0	0.04	0.06	0.0	0.0	0.0
1955	0.02	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.07	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.03	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.36	0.11	1.26	0.16	0.88	0.26	0.25	0.84	0.33	0.0	0.0
1959	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0
1961	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.02	0.0	0.0	0.0	0.0	0.06	0.50	0.04	0.14	0.20	0.01
1964	0.01	0.07	0.28	0.0	0.0	0.0	0.01	0.0	0.01	0.0	0.0
1965	0.03	0.16	0.01	0.0	0.0	0.15	0.02	0.51	0.50	0.59	0.08
1966	0.0	0.0	0.01	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.17
1967	0.57	0.21	0.47	0.01	0.14	0.02	0.64	0.72	0.0	0.0	0.09
1968	0.0	0.44	0.72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.0	0.0	0.44	0.0	0.77	0.67	0.0	0.02	0.30	0.02
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.25	0.0	0.0	0.05
1972	0.0	0.0	0.02	0.0	0.02	0.0	0.0	0.25	0.01	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	100	101	102	103	104	105	106	107	108	109	110
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.76	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.03	0.0	0.0	0.0	0.67	0.0	0.0	0.73	0.07	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.05	0.0	0.35	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.02	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.42	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
1950	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.03	0.02	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.14	0.0	0.0	0.0	0.0	0.0
1953	0.07	0.0	0.0	0.02	0.0	0.0	0.0	0.03	0.0	0.0	0.12
1954	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.37	0.12
1956	0.0	0.05	0.42	0.59	0.0	0.09	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.02	0.0	0.08	0.0	0.0	0.0	0.88	0.0	0.28	0.03
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.05	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09	0.03	0.0
1963	0.0	0.0	0.61	0.19	0.03	0.02	0.04	0.33	0.18	0.60	0.0
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.01	0.15	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.94	0.10	0.0	0.06	0.27	0.04	0.03	0.74	0.66	0.0	0.44
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
1970	0.01	0.08	0.02	0.0	0.0	0.0	0.08	0.0	0.0	0.02	0.0
1971	0.0	0.0	0.0	0.48	0.0	0.0	0.33	0.0	0.0	0.0	0.06
1972	0.0	0.05	0.14	0.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.20	0.01	0.0	0.10	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	111	112	113	114	115	116	117	118	119	120	121
1938	0.0	0.0	0.0	0.12	0.23	0.0	0.0	0.80	0.10	0.53	0.0
1939	0.0	0.0	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.63	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.17	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.19	0.0	0.0	0.28
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.99	0.0	0.0	0.0
1944	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.34	0.0	0.0	0.02
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.03	0.02	0.0	0.0	0.0	0.03	0.02	1.26	0.27	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03
1951	0.0	0.0	0.0	0.02	0.27	0.0	0.0	0.34	0.27	0.11	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.26	0.0	0.0	0.0	0.0
1953	0.01	0.0	0.0	0.0	0.0	0.0	0.38	0.25	0.02	0.22	0.08
1954	0.0	0.0	0.02	0.0	0.0	0.0	0.16	0.42	0.07	0.0	0.0
1955	0.0	0.17	0.25	0.0	0.0	0.0	0.36	0.0	0.0	0.06	0.26
1956	0.0	0.0	0.0	0.0	0.03	0.0	0.10	0.25	0.0	0.0	0.0
1957	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.30
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.05	0.41	0.0	0.0	0.0	0.0	0.01	0.0
1960	0.0	0.0	0.07	0.26	0.0	0.0	0.30	0.15	0.0	0.0	0.0
1961	0.74	0.28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.15	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.07	0.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.04	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.13	0.30	0.89	0.02	0.0	0.04	0.0	0.0	0.06	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.09	0.17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.0	0.02	0.0	0.02	0.0	0.0	0.01	0.0	0.0
1971	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08
1972	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	122	123	124	125	126	127	128	129	130	131	132
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.13	0.0	0.0
1940	0.0	0.0	0.0	0.13	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.15	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.27	0.04
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.01
1950	0.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.01	0.05	0.21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.06	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.03	0.01	0.24	0.11	0.0	0.0
1955	0.35	0.05	0.0	0.0	0.0	0.0	0.07	0.46	0.0	0.0	0.0
1956	0.0	0.0	0.19	0.0	0.0	0.10	0.0	0.26	0.0	0.04	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.27	0.0	0.0	0.0	0.10	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04
1960	0.0	0.21	0.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04
1961	0.0	0.0	0.0	0.20	0.26	0.0	0.0	0.04	0.0	0.01	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.02	0.08	0.0	0.39	0.0	0.0	0.0
1964	0.0	0.22	0.07	0.03	0.21	0.0	0.07	0.0	0.0	0.0	0.01
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0
1966	0.01	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.0
1967	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.43	0.02	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.01
1969	0.0	0.08	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.04	0.0	0.0
1971	0.01	0.06	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.02
1972	0.0	0.0	0.0	0.05	0.0	0.06	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.02

JULIAN DATE

YEAR	133	134	135	136	137	138	139	140	141	142	143
1938	0.0	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.31	0.19	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.21	0.0	0.39	0.08	0.0	0.0	0.0
1945	0.02	0.03	0.0	0.0	0.0	0.0	0.08	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.12	0.10	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.12	0.0	0.0	0.0
1949	0.0	0.02	0.05	0.02	0.02	0.01	0.23	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.07	0.02	0.0	0.02
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.29	0.02	0.0	0.0	0.37	0.90	0.31	0.08	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.20	0.28
1959	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.02	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.12	0.07	0.0	0.0	0.0	0.0
1962	0.03	0.01	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.03	0.01	0.01	0.01	0.0	0.0	0.01
1964	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.04	0.0	0.0	0.0
1966	0.0	0.0	0.01	0.0	0.02	0.0	0.01	0.0	0.0	0.0	0.0
1967	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.01
1968	0.06	0.0	0.0	0.0	0.0	0.0	0.01	0.04	0.03	0.01	0.06
1969	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.02	0.0	0.03	0.0
1970	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.01	0.0	0.0	0.0
1971	0.01	0.01	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.01	0.0	0.0	0.0	0.01	0.03	0.0	0.02	0.0
1973	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.02	0.03

JULIAN DATE

YEAR	144	145	146	147	148	149	150	151	152	153	154
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.01	0.0	0.06	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.06	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.02	0.02	0.0	0.0	0.0	0.0
1946	0.0	0.39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.03	0.0	0.0	0.0	0.0	0.0	0.12	0.12	0.0	0.03	0.03
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.01	0.0	0.01	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.13	0.16	0.04	0.0	0.0	0.0	0.01	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.01	0.0	0.0
1962	0.0	0.02	0.03	0.04	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.02
1965	0.0	0.0	0.0	0.0	0.0	0.03	0.02	0.0	0.0	0.03	0.0
1966	0.0	0.0	0.0	0.0	0.03	0.02	0.0	0.0	0.0	0.0	0.0
1967	0.01	0.0	0.0	0.0	0.01	0.0	0.02	0.26	0.49	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.01	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.0
1971	0.0	0.05	0.03	0.25	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.01	0.05	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	155	156	157	158	159	160	161	162	163	164	165
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.01	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0
1945	0.11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.02	0.0	0.08	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.04	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.06	0.12	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.04	0.0	0.0	0.0	0.02	0.25	0.02	0.0	0.04	0.14	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.02
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.01	0.0	0.0	0.0	0.01	0.11	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.01	0.06	0.0	0.07	0.05	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.0	0.12	0.02	0.01	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.08	0.0	0.01	0.0	0.0	0.01	0.0	0.0	0.0	0.03
1967	0.02	0.0	0.0	0.0	0.01	0.01	0.0	0.09	0.08	0.01	0.03
1968	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.01	0.03	0.07	0.06	0.02	0.0	0.0	0.0	0.0	0.03
1970	0.0	0.01	0.12	0.0	0.0	0.01	0.0	0.05	0.0	0.01	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.01	0.0	0.0	0.0	0.0	0.16	0.03	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02

JULIAN DATE

YEAR	166	167	168	169	170	171	172	173	174	175	176
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.03	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.02	0.01	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05
1950	0.03	0.0	0.0	0.0	0.0	0.0	0.02	0.04	0.0	0.0	0.0
1951	0.0	0.03	0.04	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.0
1953	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0
1966	0.0	0.0	0.01	0.0	0.0	0.0	0.04	0.0	0.0	0.01	0.0
1967	0.0	0.0	0.04	0.02	0.0	0.01	0.0	0.0	0.0	0.01	0.03
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0
1969	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.01	0.03	0.02	0.0	0.02	0.0	0.0	0.02	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.02	0.01	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.04	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	177	178	179	180	181	182	183	184	185	186	187
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.04	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.02	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.06	0.01	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.06	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.01	0.01	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1965	0.0	0.0	0.01	0.0	0.0	0.01	0.0	0.0	0.0	0.01	0.01
1966	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.02	0.0	0.0
1967	0.01	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.02	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0

JULIAN DATE

YEAR	188	189	190	191	192	193	194	195	196	197	198
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.03	0.03	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.01
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.03	0.0
1956	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
1958	0.0	0.02	0.01	0.0	0.01	0.01	0.03	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.0	0.0
1960	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.01
1961	0.0	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.01	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.06	0.01	0.0	0.0	0.0	0.0
1964	0.02	0.01	0.0	0.0	0.01	0.0	0.02	0.02	0.01	0.01	0.02
1965	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.02	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.02	0.01	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01
1970	0.0	0.0	0.0	0.0	0.01	0.0	0.01	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.02	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.01	0.01
1973	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	199	200	201	202	203	204	205	206	207	208	209
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.02	0.02	0.03	0.03
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.01	0.0
1952	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.01	0.01	0.0	0.0	0.0	0.01	0.0	0.01	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.02	0.01	0.01	0.02
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04
1964	0.0	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.01	0.0	0.01	0.17
1967	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.01	0.0	0.01	0.0	0.0	0.02	0.0	0.0	0.02	0.01	0.0
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.01
1971	0.0	0.0	0.0	0.03	0.01	0.02	0.02	0.0	0.0	0.0	0.0
1972	0.0	0.03	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.03	0.01	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	210	211	212	213	214	215	216	217	218	219	220
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.01	0.0	0.0	0.0	0.0	0.0	0.01	0.02	0.0	0.0	0.03
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.03	0.01	0.0	0.01
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.01
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0
1957	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.01	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.02	0.0	0.01
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.01	0.0	0.0	0.0	0.0	0.07	0.01	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1964	0.02	0.01	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
1966	0.08	0.0	0.0	0.01	0.02	0.0	0.01	0.02	0.01	0.01	0.01
1967	0.0	0.0	0.02	0.01	0.01	0.0	0.0	0.0	0.0	0.01	0.01
1968	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.02	0.0	0.0
1969	0.01	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.02	0.0	0.0
1970	0.0	0.0	0.0	0.01	0.01	0.01	0.01	0.01	0.0	0.0	0.01
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.01	0.0	0.0	0.01	0.01	0.0	0.01	0.0	0.0	0.0
1973	0.0	0.0	0.02	0.03	0.01	0.01	0.01	0.03	0.0	0.0	0.0

JULIAN DATE

YEAR	221	222	223	224	225	226	227	228	229	230	231
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0
1943	0.0	0.0	0.02	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.04
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.01	0.02	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.02	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.01	0.0	0.0	0.0	0.06	0.0	0.0	0.0	0.06	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.01	0.02
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.01	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.02	0.01
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.01	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03
1962	0.14	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.02
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.01	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1965	0.0	0.14	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0
1966	0.02	0.02	0.01	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.01	0.01	0.01	0.0	0.0	0.02	0.0	0.0	0.0	0.02
1968	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.03	0.13
1969	0.0	0.0	0.0	0.01	0.01	0.01	0.01	0.01	0.0	0.02	0.02
1970	0.0	0.0	0.0	0.01	0.0	0.05	0.0	0.0	0.0	0.01	0.0
1971	0.0	0.01	0.0	0.01	0.03	0.0	0.0	0.0	0.01	0.0	0.01
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.01	0.01	0.01	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	232	233	234	235	236	237	238	239	240	241	242
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.04	0.0	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.09	0.0
1950	0.0	0.0	0.0	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
1954	0.0	0.01	0.0	0.02	0.0	0.0	0.02	0.0	0.0	0.0	0.0
1955	0.01	0.01	0.0	0.01	0.0	0.0	0.0	0.0	0.01	0.0	0.01
1956	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0
1957	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.02	0.01	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.04	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.04	0.0	0.02	0.0
1962	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.02	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.02
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.01	0.02
1967	0.0	0.03	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1968	0.01	0.0	0.0	0.01	0.0	0.01	0.0	0.01	0.0	0.0	0.0
1969	0.01	0.01	0.03	0.0	0.03	0.0	0.02	0.0	0.0	0.01	0.01
1970	0.0	0.0	0.01	0.01	0.01	0.0	0.0	0.0	0.0	0.02	0.01
1971	0.0	0.02	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.07
1972	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01
1973	0.0	0.0	0.01	0.01	0.0	0.0	0.01	0.0	0.02	0.03	0.0

JULIAN DATE

YEAR	243	244	245	246	247	248	249	250	251	252	253
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0
1944	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0
1953	0.0	0.02	0.0	0.0	0.04	0.0	0.01	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.32	0.0	0.0	0.0
1959	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0
1961	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01	0.0
1963	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0
1964	0.04	0.22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.01	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.03	0.0
1967	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1968	0.0	0.0	0.0	0.03	0.02	0.01	0.0	0.0	0.0	0.01	0.01
1969	0.0	0.02	0.0	0.0	0.0	0.08	0.0	0.0	0.01	0.01	0.01
1970	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.01	0.01	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.02
1973	0.01	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	254	255	256	257	258	259	260	261	262	263	264
1938	0.0	0.0	0.0	0.0	0.0	0.13	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.07	0.0	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03
1946	0.0	0.0	0.0	0.0	0.12	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.09	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.03	0.0	0.02	0.0	0.0	0.0	0.0
1952	0.0	0.15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0
1955	0.02	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.19	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.02	0.03	2.09	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.14	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.50	0.0	0.0	0.0	0.01	0.03	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.01	0.01	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.0	0.02	0.06	0.24	0.0	0.0	0.0
1967	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.16
1968	0.01	0.0	0.0	0.0	0.01	0.04	0.01	0.0	0.01	0.0	0.0
1969	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.01	0.01	0.0
1970	0.0	0.01	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.01	0.02	0.01	0.04	0.0	0.01	0.08	0.07	0.0	0.10

JULIAN DATE

YEAR	265	266	267	268	269	270	271	272	273	274	275
1938	0.0	0.0	0.0	0.0	0.0	0.04	0.0	0.0	0.0	0.0	0.65
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.05	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.03
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.20	0.0	0.0	0.0	0.0
1958	0.0	0.23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.01	0.0	0.04	0.02	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.02	0.0	0.01	0.0	0.0	0.0	0.0	0.02	0.08	0.0
1967	0.0	0.0	0.0	0.0	0.03	0.01	0.0	0.0	0.0	0.0	0.23
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0
1969	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.07	0.0	0.0	0.28	0.0	0.0	0.0
1972	0.0	0.01	0.0	0.0	0.04	0.0	0.01	0.0	0.01	0.0	0.01
1973	0.02	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JULIAN DATE

YEAR	276	277	278	279	280	281	282	283	284	285	286
1938	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.23	0.12	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.34	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.01	0.04	0.0	0.0	0.0	0.11	0.0	0.0
1946	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.15	0.0	0.56	0.03	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.24	0.29
1949	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.0
1956	0.0	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.0	0.0
1957	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.74	0.10	0.0	0.06
1958	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.08	0.05	0.18	1.01
1963	0.0	0.0	0.0	0.0	0.01	0.0	0.80	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.01	0.01	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.13
1966	0.0	0.01	0.0	0.0	0.02	0.01	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.01	0.02
1969	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.05
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.02	0.0	0.0	0.0
1972	0.01	0.01	0.0	0.0	0.0	0.0	0.0	0.28	0.0	0.48	0.75
1973	0.0	0.0	0.50	0.48	0.24	0.10	0.0	0.01	0.0	0.0	0.0

JULIAN DATE

YEAR	287	288	289	290	291	292	293	294	295	296	297
1938	0.16	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.32
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.36	0.0	0.0	0.04
1942	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.19	0.0	0.14	0.06	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09	0.0	0.0
1945	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.02	0.02	0.0	0.0	0.0	0.06	0.0	0.0	0.0	0.0
1948	0.78	0.82	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.08	0.03	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.59	0.0
1952	0.0	0.0	0.0	0.0	0.09	0.0	0.0	0.0	0.0	0.0	0.02
1953	0.0	0.0	0.0	0.0	0.09	0.12	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0
1955	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.11
1957	0.01	0.0	0.0	0.0	0.0	0.0	1.04	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.01	0.01	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0
1963	0.48	0.0	0.0	0.0	0.0	0.0	0.0	0.06	0.0	0.0	0.0
1964	0.02	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1968	0.0	0.21	0.02	0.01	0.0	0.0	0.01	0.0	0.0	0.01	0.0
1969	0.26	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.0	0.0	0.01	0.15	0.06	0.15	0.09	0.08	0.0
1971	0.0	0.08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.11	0.60	0.01	0.0	0.02	0.0	0.0	0.0	0.02	0.0	0.01
1973	0.0	0.01	0.0	0.0	0.02	0.01	0.0	0.57	0.0	0.0	0.02

JULIAN DATE

YEAR	298	299	300	301	302	303	304	305	306	307	308
1938	0.0	0.0	0.0	0.0	0.0	0.25	0.09	0.10	0.17	0.0	0.0
1939	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.62	0.12
1941	0.0	0.28	0.0	0.10	0.0	0.0	0.0	0.0	0.09	0.0	0.0
1942	0.0	0.0	0.76	0.0	0.0	0.0	0.0	0.0	0.23	0.0	0.0
1943	0.0	0.0	0.23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.96	0.0	0.0	0.0
1945	0.0	0.0	0.02	0.14	0.74	0.31	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.06	0.04	0.0	0.22	0.0	0.03	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.22
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.06	1.24	0.0	0.0	0.0	0.27	0.0	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1956	0.0	0.0	0.05	0.0	0.0	0.01	0.28	0.0	0.0	0.0	0.0
1957	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0
1961	0.0	0.0	0.07	0.0	0.0	0.0	0.03	0.01	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.13	0.05	1.82
1964	0.0	0.0	0.0	0.15	1.20	0.50	0.02	0.65	0.20	0.14	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1968	0.0	0.0	0.0	0.0	0.0	0.01	0.09	0.0	0.02	0.05	0.78
1969	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.87
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.28	0.26
1971	0.0	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.75
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.21

JULIAN DATE

YEAR	309	310	311	312	313	314	315	316	317	318	319
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.18	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.48	0.16	0.0	0.12	0.0	0.01	0.84	1.40	0.80	0.22	0.02
1945	0.0	0.13	0.06	0.0	0.12	0.17	0.0	0.03	0.0	0.02	0.04
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.14	0.12	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.31	0.11
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.98	0.08	0.01	0.62	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.80	0.23	0.09
1951	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.16	0.07	0.03	0.03
1952	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.10	0.57
1953	0.15	0.0	0.0	0.0	0.0	0.0	0.02	0.01	0.0	0.14	1.38
1954	0.0	0.0	0.0	0.0	1.06	0.06	0.11	0.26	0.0	0.0	0.02
1955	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.26
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.25	0.0
1958	0.0	0.01	0.01	0.0	0.0	0.14	0.0	0.0	0.0	0.05	0.18
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.16	0.0	0.0	0.0	0.0	0.0	0.21	0.07	0.10	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.09	0.83	0.09	0.0
1964	0.0	0.0	0.0	0.03	0.89	0.58	0.42	0.50	0.30	0.0	0.0
1965	0.0	0.07	0.01	0.01	0.01	0.0	0.19	0.82	0.08	0.43	1.50
1966	1.65	0.0	0.0	0.0	0.01	0.0	0.0	0.01	0.12	0.83	0.01
1967	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.07	0.15	0.0	0.01
1968	0.0	0.02	0.02	0.01	0.0	0.01	0.25	0.01	0.0	0.37	0.06
1969	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09	0.02	0.0
1970	0.04	0.35	0.0	0.0	0.02	0.0	0.03	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.13	0.72	0.26	0.03	0.0	0.0
1972	0.03	0.0	0.13	0.14	0.0	0.48	1.35	0.07	0.02	1.15	0.78
1973	0.33	0.05	0.0	0.04	0.11	0.95	0.01	0.04	0.01	0.35	0.02

JULIAN DATE

YEAR	320	321	322	323	324	325	326	327	328	329	330
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.48	0.0
1940	0.0	0.0	0.0	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942	0.14	0.49	0.32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.07
1943	0.0	0.10	0.0	0.06	0.02	0.19	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.18	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.04	0.35	0.0	0.0
1946	0.0	0.0	0.22	2.57	0.0	0.0	1.26	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.01	0.0	0.03	0.0	0.0	0.0	0.0	0.0	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.02	0.14	0.26	0.64	0.32	0.11	0.04	0.0	0.0	0.0	0.0
1951	0.0	0.0	0.0	0.0	0.57	1.81	0.30	0.04	0.0	0.0	0.0
1952	1.23	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.02	0.0	0.12	0.0	0.21	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.03	0.0	0.22	0.0	0.0	0.0	0.10	0.0	0.0	0.05	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.32	0.06	0.01	0.20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.80	0.06
1961	0.0	0.0	0.0	0.65	0.07	0.0	0.0	0.0	0.0	0.23	0.0
1962	0.05	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.33
1963	0.0	0.0	1.78	0.03	0.0	0.0	0.35	0.0	0.0	0.0	0.0
1964	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.03	0.02
1965	0.83	0.10	0.0	0.0	0.0	0.60	0.40	1.07	0.13	0.0	0.0
1966	0.0	0.0	0.35	0.58	0.36	0.0	0.0	0.0	0.0	0.44	0.31
1967	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1968	0.0	0.02	0.0	0.02	0.0	0.0	0.0	0.07	0.05	0.0	0.0
1969	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.43	0.48	0.03
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01	0.0	0.02
1972	0.34	0.23	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.02	0.0
1973	0.61	0.03	0.0	0.06	0.25	0.25	0.05	0.0	0.14	0.0	0.01

JULIAN DATE

YEAR	331	332	333	334	335	336	337	338	339	340	341
1938	0.0	0.0	0.50	0.0	0.38	0.0	0.20	0.08	0.01	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1941	0.0	0.0	0.07	0.0	0.02	0.79	0.0	0.0	0.0	0.0	0.0
1942	0.04	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.20	0.0
1943	0.0	0.0	0.0	0.05	0.03	0.0	0.0	0.0	0.11	0.41	0.0
1944	0.0	0.11	0.0	0.04	0.17	0.0	0.16	0.0	0.0	0.0	0.0
1945	0.0	0.35	0.0	0.0	0.0	0.0	0.0	0.34	1.21	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	1.13	0.04
1947	0.0	0.0	0.02	0.0	0.0	0.0	0.07	0.53	0.0	0.0	0.0
1948	0.09	0.0	0.0	0.0	0.0	0.0	0.45	0.02	0.0	0.07	0.0
1949	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09	0.0	0.03
1950	0.0	0.0	0.28	0.07	0.0	0.32	0.56	0.0	0.0	0.84	0.25
1951	0.0	0.32	0.02	0.0	0.0	0.33	0.52	0.16	0.55	0.69	0.43
1952	0.0	0.0	0.0	0.0	0.30	0.04	0.95	0.03	0.0	0.61	0.10
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.26	0.0	0.0	0.04
1954	0.0	0.0	0.0	0.0	0.0	0.12	0.12	0.77	0.0	0.09	0.09
1955	0.0	0.0	0.0	0.0	0.0	0.12	0.28	0.02	0.06	0.0	0.14
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.50	0.14	0.13
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.25	0.0	0.0
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.02	0.42	0.15	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.33	0.33	0.41	0.86	0.36	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.02	0.0	0.02	0.0	0.0	0.0	0.0	0.0
1963	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.41
1964	0.01	0.0	0.0	0.0	0.0	0.04	0.01	0.0	0.01	0.0	0.0
1965	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1966	0.0	0.0	0.06	0.74	0.01	0.66	2.14	0.21	0.05	0.0	0.0
1967	0.22	0.0	1.02	0.31	0.0	0.43	0.24	0.0	0.32	0.0	0.0
1968	0.0	0.01	0.20	0.33	0.04	0.0	0.0	0.0	0.0	0.0	0.0
1969	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.20	0.22
1970	1.91	2.38	0.32	0.89	0.40	0.02	0.10	0.02	0.0	0.01	0.08
1971	0.53	0.05	0.01	0.0	0.45	0.14	0.32	0.0	0.04	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.21	0.09	0.40	0.21
1973	0.0	0.0	1.23	0.04	0.0	0.01	0.0	0.01	0.0	0.01	0.02

JULIAN DATE

YEAR	342	343	344	345	346	347	348	349	350	351	352
1938	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.23	0.0	0.0	0.21
1939	0.0	0.0	0.0	0.70	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1940	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03	0.27	0.24
1941	0.01	0.0	0.0	0.01	0.28	0.64	1.26	0.60	0.08	0.0	0.0
1942	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1943	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1944	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1945	0.0	0.0	0.0	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1946	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1947	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.16	0.18	0.0
1948	0.02	0.0	0.0	0.0	0.0	0.22	0.23	0.03	0.0	0.68	0.0
1949	0.64	0.0	0.0	0.0	0.0	0.0	0.0	0.21	0.05	0.14	0.04
1950	0.0	0.0	0.0	0.0	0.0	0.27	0.0	0.0	0.0	0.0	0.05
1951	0.0	0.0	0.0	0.0	0.0	0.07	0.0	0.0	0.0	0.0	0.0
1952	0.93	0.23	0.0	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.01
1954	0.0	0.48	1.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.05	0.0	0.57	0.02	0.0	0.0	0.0	0.0	0.0	0.02	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.91	0.13	0.26	0.48
1958	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1959	0.0	0.0	0.0	0.0	0.02	0.0	0.0	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.07	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.01	0.0	0.0	0.0	0.03	0.0	0.08	0.04	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.09	0.04	0.01	0.96	0.63	0.51	0.0
1963	0.10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.0	0.02	0.01	0.10	0.06	0.0	0.0	0.09	0.02	0.0	0.0
1965	0.0	0.01	1.49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.0	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.46	0.44	0.07
1968	0.0	0.0	0.58	0.0	0.02	0.24	0.04	0.52	0.0	0.0	0.06
1969	0.01	0.02	0.0	0.02	0.0	0.0	0.01	0.0	0.03	0.15	0.38
1970	0.07	0.0	0.0	0.0	0.0	0.24	0.0	0.35	0.38	0.55	0.21
1971	0.0	0.08	0.24	0.01	0.10	0.0	0.02	0.0	0.0	0.0	0.0
1972	0.23	0.0	0.0	0.01	0.0	0.11	0.0	0.0	0.0	0.16	0.02
1973	0.0	0.0	0.02	0.03	0.01	0.0	0.0	0.17	0.03	0.0	0.0

JULIAN DATE

YEAR	353	354	355	356	357	358	359	360	361	362	363
1938	0.60	0.38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1939	0.0	0.0	0.0	0.0	0.43	0.34	0.0	0.0	0.0	0.0	0.0
1940	0.56	0.02	0.0	0.11	0.88	0.91	0.24	0.19	0.04	0.76	0.21
1941	0.23	0.03	0.03	0.38	0.28	0.11	0.20	0.16	1.54	0.71	0.28
1942	0.0	0.0	0.0	0.05	0.32	0.35	0.0	0.0	0.0	0.04	0.0
1943	0.06	0.32	0.11	0.06	0.0	0.0	0.02	0.0	0.0	0.45	1.03
1944	0.0	0.03	0.0	0.0	0.23	0.02	0.0	0.0	0.0	0.0	0.73
1945	0.0	0.06	0.66	0.47	0.03	0.22	0.15	0.21	0.77	0.04	0.0
1946	0.0	0.0	0.0	0.0	0.25	0.30	0.02	0.21	0.0	0.0	0.0
1947	0.22	0.76	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1948	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.46	0.83	0.17	0.0
1949	0.17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1950	0.0	0.0	0.0	0.0	0.0	0.0	0.08	0.0	0.0	0.0	0.0
1951	0.33	0.10	0.0	0.0	0.0	0.02	0.13	0.14	0.0	0.37	1.64
1952	0.0	0.20	0.44	0.0	0.0	0.0	0.02	0.0	0.0	0.22	0.33
1953	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1954	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1955	0.01	0.05	0.48	0.04	0.28	2.39	1.87	0.80	0.14	0.03	0.0
1956	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1957	0.0	0.0	0.0	0.35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1958	0.0	0.0	0.01	0.10	0.0	0.0	0.02	0.0	0.27	0.0	0.0
1959	0.0	0.01	0.0	0.04	0.28	0.24	0.01	0.0	0.0	0.0	0.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1963	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1964	0.26	1.10	0.10	0.03	0.68	0.32	0.14	0.16	0.70	0.21	0.39
1965	0.0	0.0	0.0	0.0	0.68	0.0	0.0	0.02	1.84	1.26	0.61
1966	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1967	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.03
1968	0.17	0.0	0.01	0.0	0.10	0.30	0.61	0.04	0.02	0.0	0.0
1969	0.05	0.83	0.0	0.07	0.79	0.01	0.01	0.0	0.0	0.0	0.0
1970	0.0	1.05	0.15	0.0	0.0	0.0	0.02	0.44	0.20	0.13	0.03
1971	0.0	0.0	0.83	0.07	0.04	1.24	0.33	0.65	0.10	0.0	0.02
1972	0.19	0.01	0.01	0.08	0.02	0.05	0.0	0.0	0.0	0.05	0.0
1973	0.24	0.41	0.06	0.05	0.02	0.01	1.26	0.27	0.12	0.19	0.06

YEAR	364	365	366
1938	0.0	0.0	-1.00
1939	0.0	0.0	-1.00
1940	0.0	0.06	0.0
1941	0.23	0.0	-1.00
1942	0.0	0.0	-1.00
1943	0.71	0.52	-1.00
1944	0.76	0.01	0.0
1945	0.0	0.0	-1.00
1946	0.0	0.0	-1.00
1947	0.0	0.0	-1.00
1948	0.0	0.0	0.02
1949	0.0	0.0	-1.00
1950	0.0	0.0	-1.00
1951	0.40	0.16	-1.00
1952	0.0	0.24	0.60
1953	0.0	0.0	-1.00
1954	0.0	0.06	-1.00
1955	0.44	0.50	-1.00
1956	0.0	0.0	0.0
1957	0.0	0.0	-1.00
1958	0.0	0.0	-1.00
1959	0.0	0.02	-1.00
1960	0.0	0.0	0.0
1961	0.0	0.0	-1.00
1962	0.0	0.0	-1.00
1963	0.0	0.0	-1.00
1964	0.55	0.37	0.0
1965	0.31	0.0	-1.00
1966	0.0	0.0	-1.00
1967	0.0	0.0	-1.00
1968	0.0	0.0	0.0
1969	0.0	0.0	-1.00
1970	0.0	0.0	-1.00
1971	0.0	0.0	-1.00
1972	0.0	0.30	0.0
1973	0.02	0.33	-1.00

APPENDIX B

WEEKLY RAINFALL DATA

WEEKS

YEAR	O1	O2	O3	O4	ON	N1	N2
1938	0.71	0.00	0.23	0.00	0.61	0.00	0.00
1939	0.28	0.12	0.00	0.35	0.00	0.00	0.00
1940	0.00	0.00	0.00	0.00	0.62	0.12	0.00
1941	0.00	0.00	0.00	0.68	0.19	0.00	0.12
1942	0.00	0.34	0.03	0.76	0.23	0.00	0.81
1943	0.00	0.00	0.33	0.29	0.00	0.00	0.10
1944	0.00	0.08	0.00	0.09	0.96	0.76	3.26
1945	0.00	0.15	0.00	0.00	1.19	0.48	0.16
1946	0.11	0.00	0.18	0.00	0.00	0.00	0.26
1947	0.00	0.74	0.06	0.00	0.35	0.00	0.42
1948	0.00	0.53	1.60	0.00	0.00	0.22	0.00
1949	0.00	0.03	0.00	0.00	0.00	1.68	0.00
1950	0.05	0.00	0.03	1.41	0.27	0.00	1.26
1951	0.00	0.00	0.00	0.67	0.00	0.00	0.29
1952	0.00	0.00	0.09	0.00	0.00	0.00	1.90
1953	0.00	0.07	0.21	0.00	0.00	0.15	1.52
1954	0.00	0.00	0.00	0.00	0.00	1.18	0.97
1955	0.00	0.03	0.00	0.00	0.00	0.00	1.29
1956	0.12	0.08	0.00	0.16	0.28	0.00	0.00
1957	0.00	0.90	1.04	0.05	0.00	0.00	0.63
1958	0.00	0.00	0.00	0.00	0.00	0.14	0.23
1959	0.00	0.00	0.00	0.03	0.00	0.00	0.00
1960	0.05	0.00	0.00	0.00	0.00	0.16	0.47
1961	0.00	0.00	0.00	0.07	0.03	0.00	0.00
1962	0.00	1.32	0.00	0.00	0.00	0.03	0.05
1963	0.00	0.80	0.48	0.06	0.18	1.91	1.01
1964	0.00	0.00	0.00	0.00	2.84	1.50	1.22
1965	0.00	0.13	0.00	0.00	0.00	0.07	3.95
1966	0.08	0.00	0.00	0.00	0.00	1.65	0.95
1967	0.23	0.00	0.00	0.00	0.00	0.00	0.22
1968	0.00	0.00	0.21	0.00	0.14	0.78	0.68
1969	0.00	0.05	0.34	0.00	0.00	0.90	0.09
1970	0.00	0.00	0.21	0.32	0.28	0.65	0.03
1971	0.00	0.00	0.08	0.06	0.00	0.13	1.01
1972	0.00	1.51	0.71	0.00	0.00	1.53	3.92
1973	0.98	0.34	0.00	0.57	0.00	1.69	1.03

WEEKS

YEAR	N3	N4	D1	D2	D3	D4
1938	0.00	0.38	0.28	0.23	1.19	0.00
1939	0.00	0.48	0.00	0.70	0.00	0.77
1940	0.05	0.00	0.00	0.00	1.21	3.23
1941	0.00	0.07	0.79	2.78	0.75	3.28
1942	0.32	0.11	0.20	0.00	0.05	0.71
1943	0.25	0.08	0.52	0.00	0.55	1.48
1944	0.18	0.32	0.16	0.00	0.03	0.96
1945	0.39	0.35	1.55	0.07	1.19	1.42
1946	4.05	0.00	1.17	0.00	0.00	0.76
1947	0.00	0.00	0.60	0.00	1.32	0.00
1948	0.03	0.09	0.52	0.48	0.68	1.46
1949	0.00	0.00	0.76	0.21	0.40	0.00
1950	1.37	0.35	1.97	0.27	0.05	0.08
1951	2.72	0.32	2.68	0.07	0.43	2.28
1952	0.00	0.30	2.66	0.33	0.64	0.55
1953	0.33	0.00	0.30	0.00	0.00	0.00
1954	0.00	0.00	1.19	1.57	0.00	0.00
1955	0.32	0.05	0.65	0.57	0.57	5.51
1956	0.00	0.00	0.77	0.00	0.00	0.00
1957	0.20	0.00	1.25	0.91	1.22	0.00
1958	0.00	0.00	0.00	0.00	0.10	0.27
1959	0.00	0.00	0.00	0.00	0.04	0.52
1960	0.00	1.28	0.15	0.07	0.00	0.00
1961	0.72	2.16	0.36	0.11	0.04	0.00
1962	0.00	0.33	0.00	1.09	1.14	0.00
1963	2.16	0.00	0.51	0.00	0.03	0.00
1964	0.00	0.03	0.04	0.25	1.49	2.60
1965	2.20	0.00	0.00	1.49	0.00	4.39
1966	1.29	1.55	3.06	0.00	0.00	0.00
1967	0.00	1.55	0.99	0.00	1.03	0.03
1968	0.12	0.57	0.00	1.38	0.23	1.05
1969	0.00	0.00	0.42	0.00	1.51	0.79
1970	0.43	6.41	0.25	0.59	2.34	0.80
1971	0.00	1.03	0.50	0.42	0.90	2.36
1972	0.00	0.00	1.14	0.11	0.43	0.10
1973	0.75	1.27	0.00	0.20	0.79	1.90

WEEKS

YEAR	J1	J2	J3	J4	JF	F1
1939	1.18	0.00	0.00	0.31	2.35	0.82
1940	3.82	3.26	0.00	0.89	1.30	0.25
1941	1.21	0.85	1.96	2.13	0.00	3.74
1942	0.14	0.20	0.00	2.97	0.54	1.23
1943	0.00	0.00	1.57	0.87	0.59	0.56
1944	1.59	0.74	0.00	0.72	2.63	0.71
1945	0.00	0.00	0.00	0.04	3.39	0.21
1946	1.08	0.00	0.00	0.00	1.35	0.11
1947	0.00	0.03	0.00	0.38	0.03	0.66
1948	0.05	0.00	0.00	0.00	1.19	0.59
1949	0.12	0.00	1.38	0.20	0.84	1.24
1950	0.67	1.62	0.13	0.68	0.71	1.03
1951	0.12	0.90	0.81	0.07	0.16	0.51
1952	1.44	2.74	2.02	1.80	0.37	0.30
1953	0.20	1.14	0.31	0.00	0.00	0.00
1954	0.03	0.98	0.98	1.33	0.00	0.00
1955	1.31	0.74	2.11	0.00	0.43	0.00
1956	0.81	0.77	1.25	1.96	0.00	0.00
1957	0.62	2.14	0.93	0.58	0.08	0.25
1958	0.14	0.26	0.00	1.77	2.82	0.35
1959	1.38	2.78	0.00	0.15	0.05	1.91
1960	0.10	2.85	0.28	0.53	1.36	1.44
1961	0.00	0.00	0.00	1.49	0.83	0.41
1962	0.00	0.11	2.17	0.00	0.00	2.52
1963	0.12	0.00	0.00	0.00	3.72	1.45
1964	0.05	0.16	2.70	0.24	0.00	0.00
1965	1.68	0.03	0.28	0.32	0.50	0.05
1966	0.00	0.00	0.00	0.11	2.54	0.60
1967	0.00	0.00	2.37	1.78	1.56	0.00
1968	0.00	1.51	0.06	0.41	1.10	0.00
1969	0.00	0.51	4.34	2.98	0.64	2.40
1970	0.12	2.47	2.07	0.80	0.03	0.24
1971	0.24	0.61	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00	0.08	0.17
1973	0.37	0.83	2.45	0.67	1.74	2.77
1974	3.11	0.07	0.42	0.00	0.08	0.00

WEEKS

YEAR	F2	F3	FM	M1	M2	M3
1939	0.00	0.00	0.13	1.90	0.03	0.04
1940	1.36	1.55	4.20	0.04	0.37	0.00
1941	1.16	2.03	3.31	0.04	0.50	0.00
1942	0.00	1.26	0.00	1.42	0.99	0.00
1943	0.05	1.20	1.61	2.40	0.70	0.04
1944	0.00	2.96	2.47	0.61	0.00	0.00
1945	0.47	0.00	0.36	0.08	0.76	0.96
1946	0.87	0.07	0.14	0.05	0.85	0.14
1947	0.45	0.00	0.46	0.66	0.00	0.10
1948	0.00	0.00	0.34	0.23	1.99	2.12
1949	0.00	0.54	2.32	1.08	0.59	0.89
1950	0.00	0.00	0.00	0.11	0.04	1.46
1951	0.11	0.48	2.09	0.44	0.00	0.00
1952	0.54	0.89	0.03	1.54	2.23	0.71
1953	0.00	0.00	0.00	0.20	0.00	0.57
1954	1.58	0.00	0.00	0.65	2.14	1.16
1955	0.63	0.00	0.87	0.00	0.04	0.00
1956	0.00	1.54	0.20	0.04	0.00	0.05
1957	0.08	1.52	1.14	0.58	0.57	0.00
1958	0.60	1.53	0.47	0.06	2.60	2.20
1959	1.89	1.83	0.00	0.00	0.03	0.27
1960	0.14	0.03	0.48	0.03	0.33	0.00
1961	0.21	0.00	0.15	0.42	1.56	0.21
1962	2.29	0.98	0.28	1.29	0.26	0.54
1963	0.74	0.00	0.00	0.45	1.34	0.78
1964	0.29	0.00	0.37	0.00	0.27	1.36
1965	0.04	0.00	0.38	0.41	0.49	0.37
1966	0.04	0.53	0.35	0.04	0.08	0.00
1967	0.03	0.41	0.07	1.33	2.33	0.14
1968	0.40	0.77	0.03	0.48	2.06	0.08
1969	1.28	3.48	0.74	0.84	0.00	0.21
1970	1.00	0.00	3.37	0.20	0.00	0.00
1971	0.43	0.00	0.18	0.03	0.96	0.81
1972	0.00	0.08	0.10	0.00	0.04	0.00
1973	0.94	0.49	2.16	1.13	0.00	1.32
1974	0.53	0.00	1.99	0.58	0.03	0.21

WEEKS

YEAR	M4	A1	A2	A3	A4	A5
1939	0.36	0.70	0.09	0.00	0.09	0.00
1940	3.83	0.09	0.00	0.00	0.63	0.13
1941	4.23	2.47	1.30	0.00	0.17	0.15
1942	0.00	1.96	0.70	0.80	0.19	0.28
1943	0.40	0.31	0.00	0.00	0.99	0.00
1944	0.00	0.23	0.44	0.12	0.34	0.12
1945	0.65	0.00	0.43	0.00	0.00	0.00
1946	1.96	0.00	0.00	0.00	0.00	0.00
1947	0.68	0.33	0.00	0.00	0.00	0.00
1948	0.25	1.10	0.52	0.03	1.29	0.27
1949	0.05	0.00	0.00	0.00	0.00	0.03
1950	0.00	1.46	0.00	0.00	0.00	0.19
1951	0.00	0.00	0.03	0.00	0.88	0.37
1952	0.00	0.70	0.14	0.00	0.26	0.00
1953	0.00	0.13	0.07	0.15	0.63	0.30
1954	0.46	0.10	0.00	0.00	0.65	0.00
1955	0.06	0.00	0.00	0.73	0.61	0.72
1956	0.07	0.03	1.15	0.00	0.38	0.19
1957	0.19	0.00	0.08	1.23	0.00	0.30
1958	2.64	2.72	0.00	0.00	0.00	0.00
1959	0.00	0.00	0.00	0.00	0.46	0.00
1960	0.28	0.00	0.05	0.00	0.78	0.37
1961	0.00	0.00	0.18	1.02	0.00	0.46
1962	0.00	0.00	0.00	0.12	0.15	0.00
1963	1.7[illegible]	0.94	0.83	1.15	0.37	0.00
1964	0.35	0.00	0.00	0.00	0.08	0.53
1965	1.26	1.75	0.23	0.00	0.00	0.00
1966	0.00	0.00	0.17	0.00	0.00	0.00
1967	1.59	1.50	1.50	2.30	0.99	0.00
1968	1.16	0.00	0.00	0.00	0.00	0.00
1969	0.00	2.18	0.00	0.09	0.17	0.08
1970	0.00	0.00	0.08	0.08	0.00	0.00
1971	0.10	0.25	0.53	0.39	0.00	0.14
1972	0.00	0.25	0.39	0.00	0.05	0.05
1973	0.17	0.00	0.30	0.00	0.00	0.00
1974	3.45	0.26	0.05	0.36	0.77	0.00

APPENDIX C. WEEKLY AMOUNT OF RAINFALL

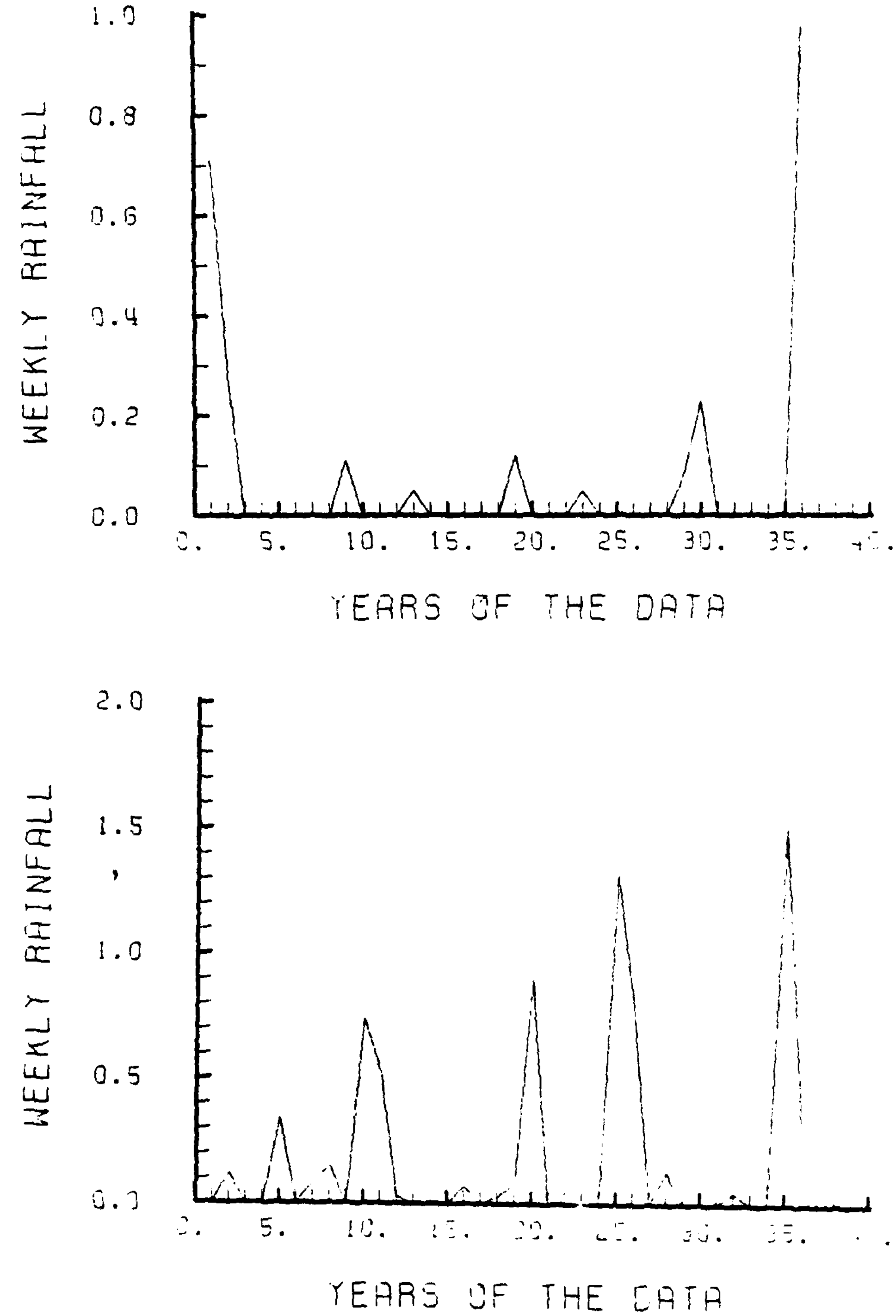
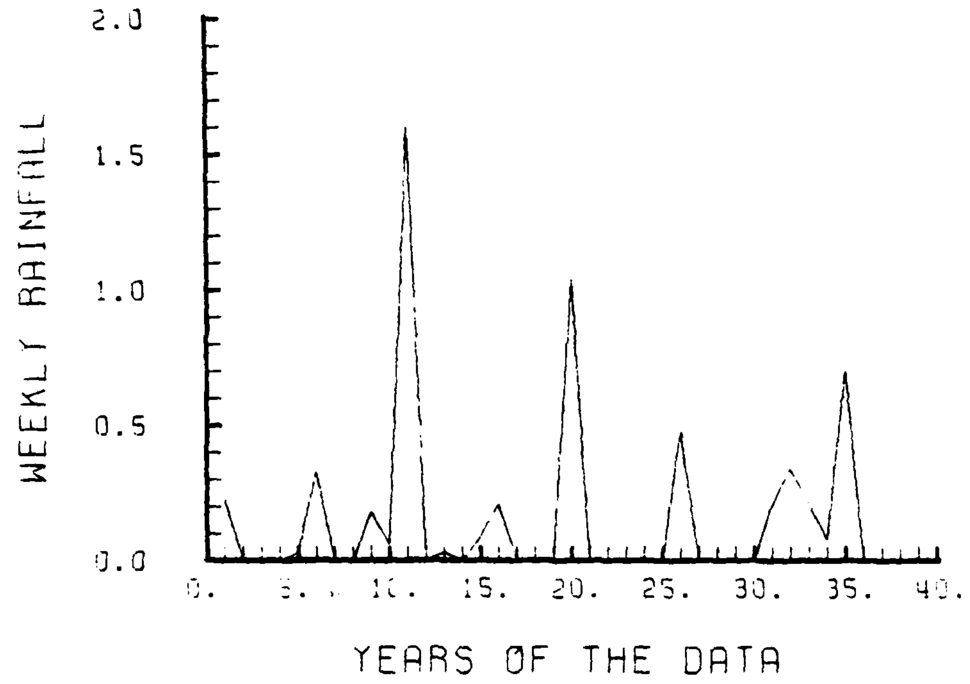


Figure 44. Weekly rainfall in inches for weeks 01 and 02



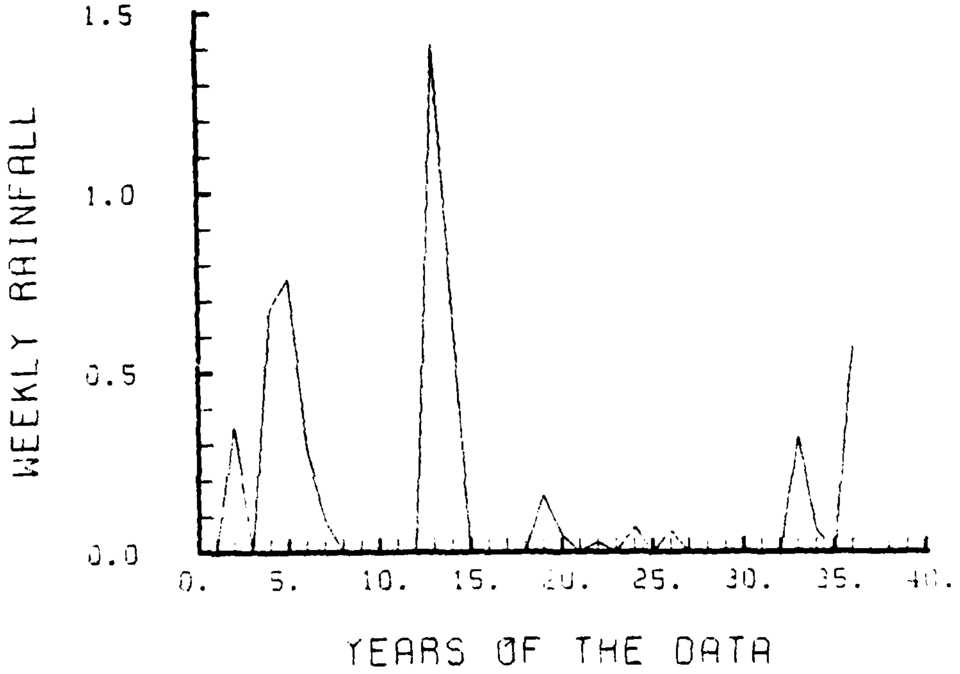
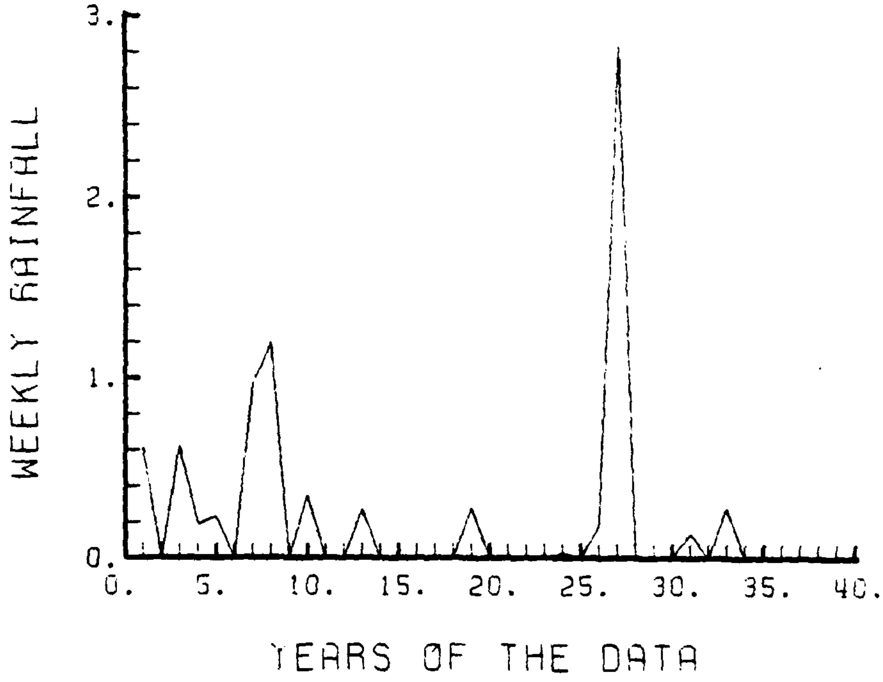


Figure 45. **Weekly rainfall in inches for weeks 03 and 04**



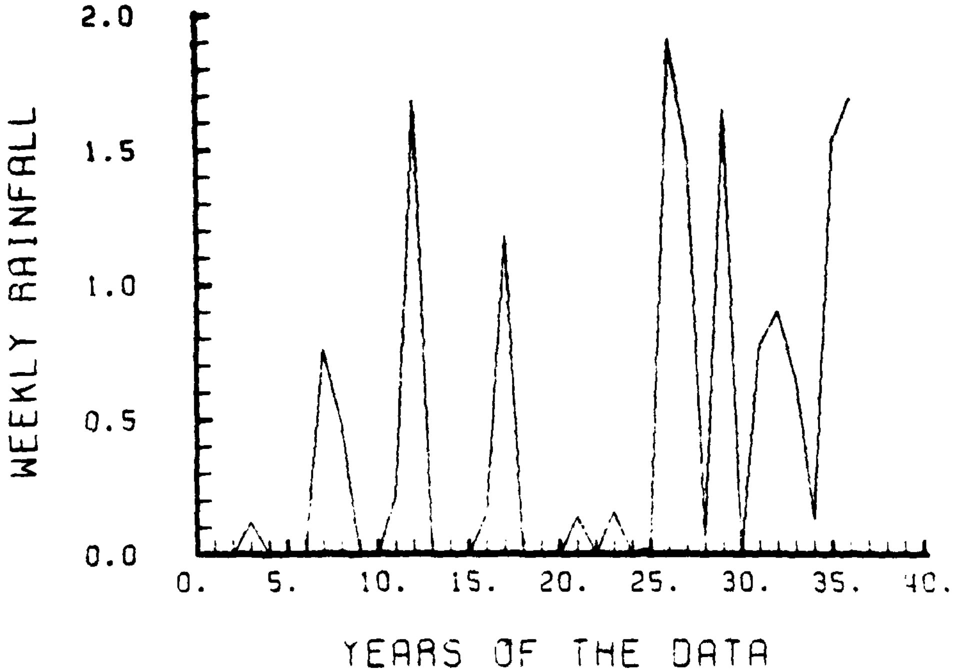
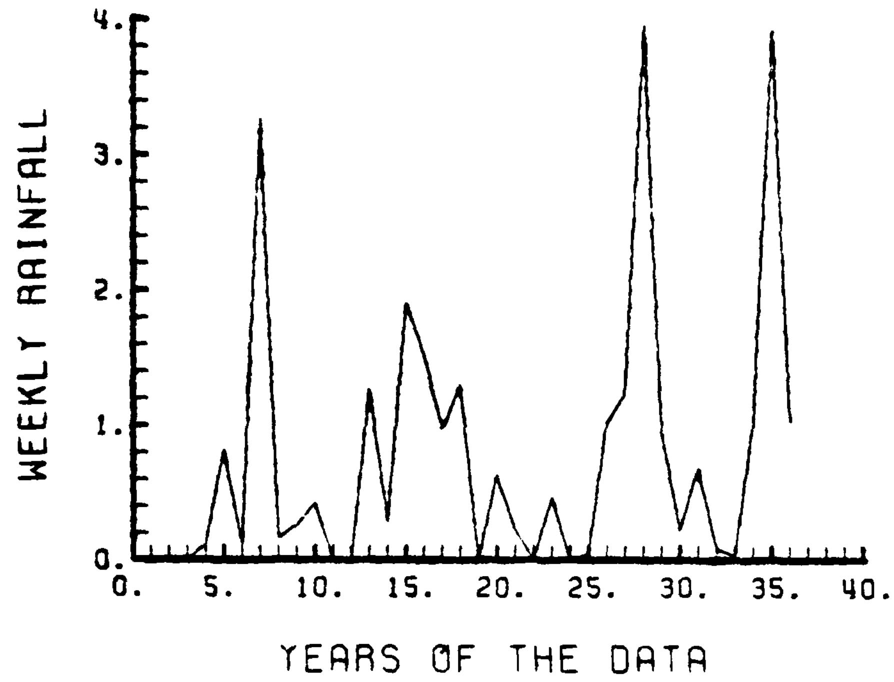


Figure 46. Weekly rainfall in inches for weeks ON and N1



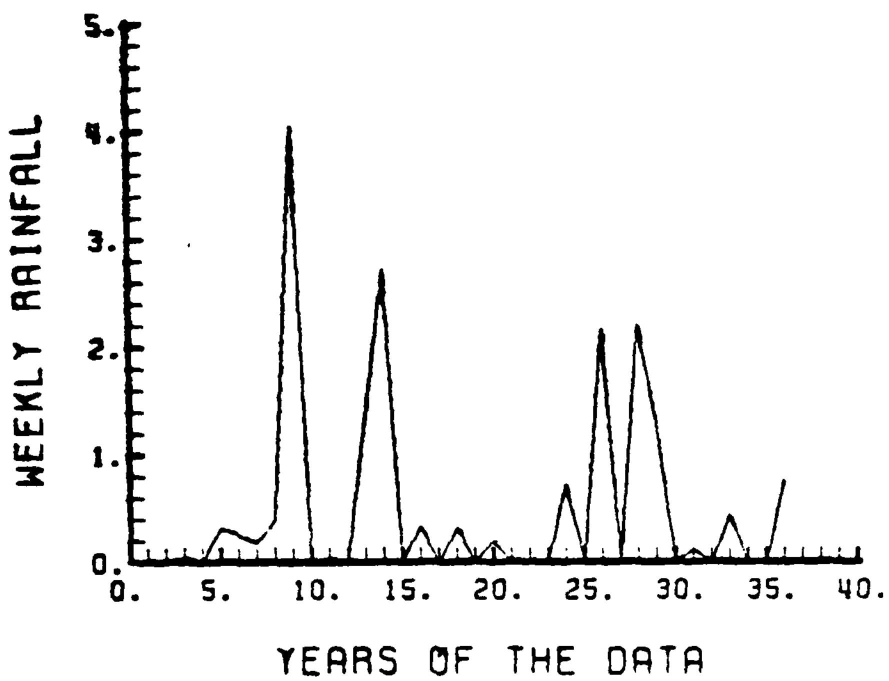
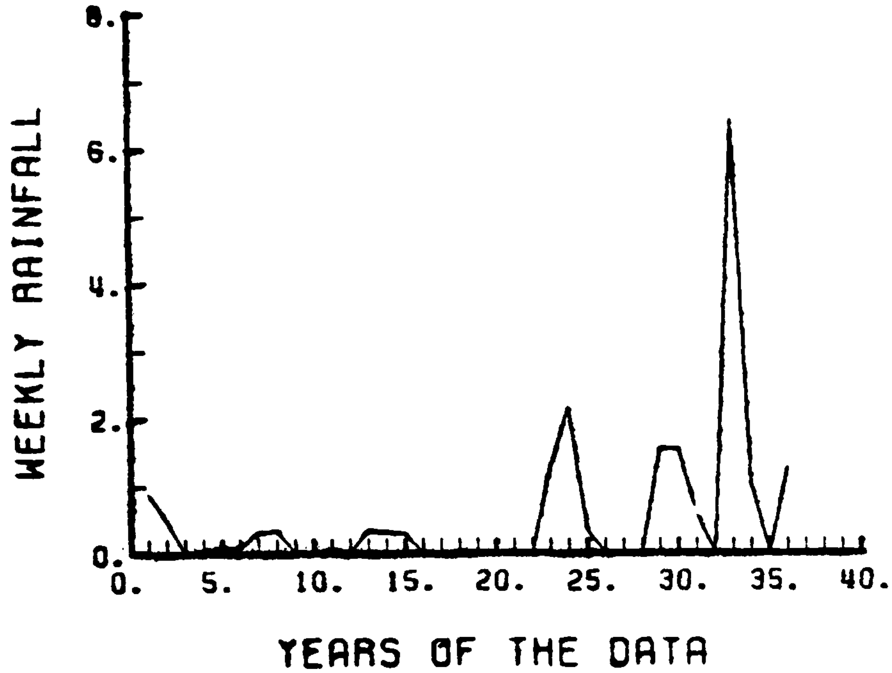


Figure 47. Weekly rainfall in inches for weeks N2 and N3



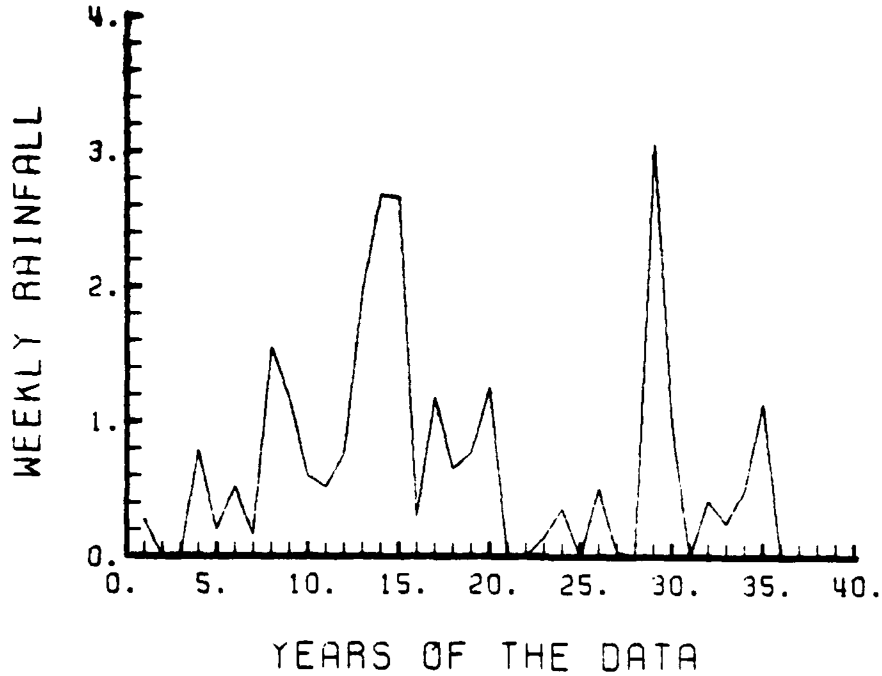


Figure 48. Weekly rainfall in inches for weeks N4 and D1

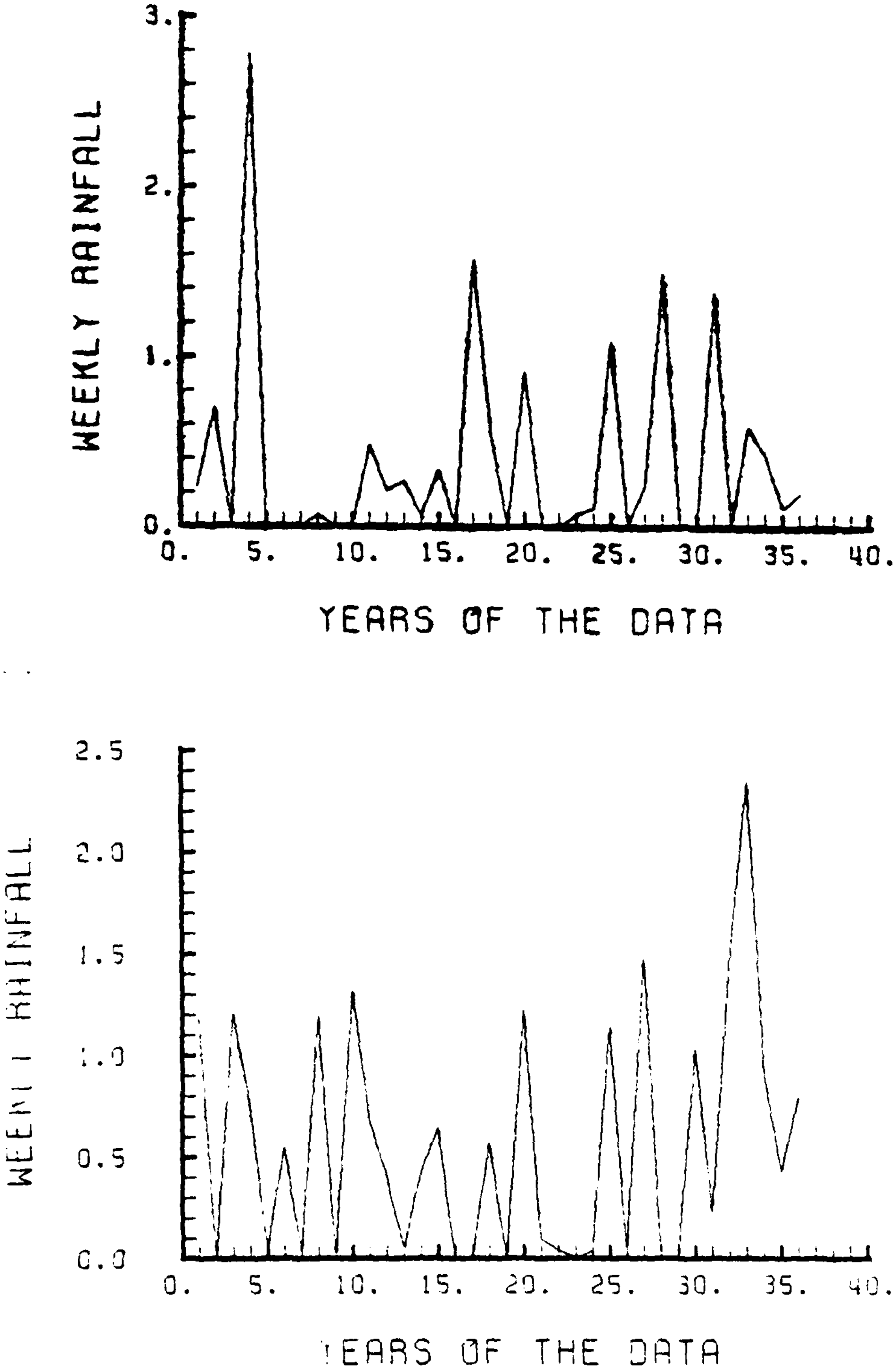
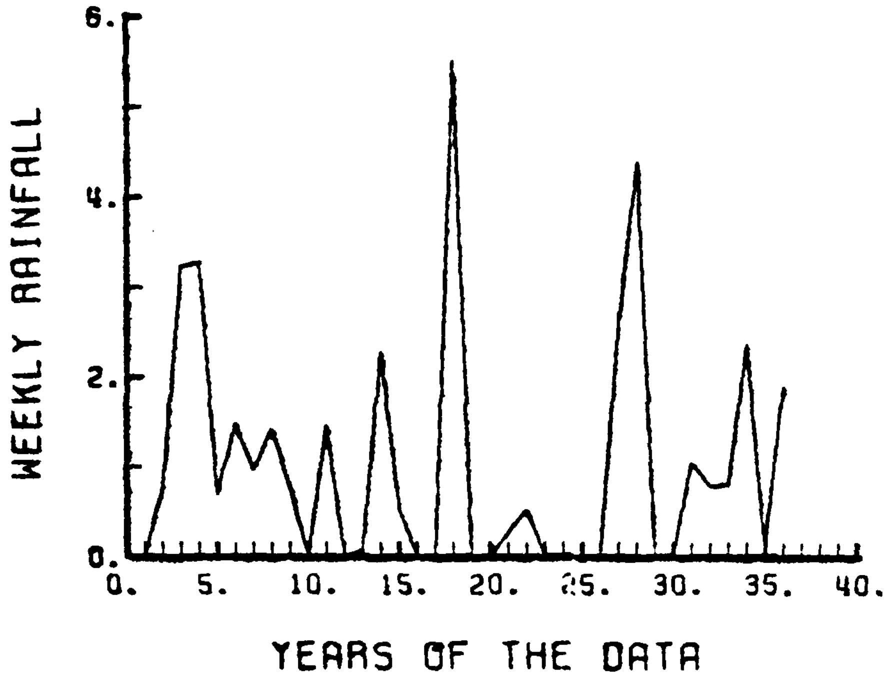


Figure 49. Weekly rainfall in inches for weeks D2 and D3



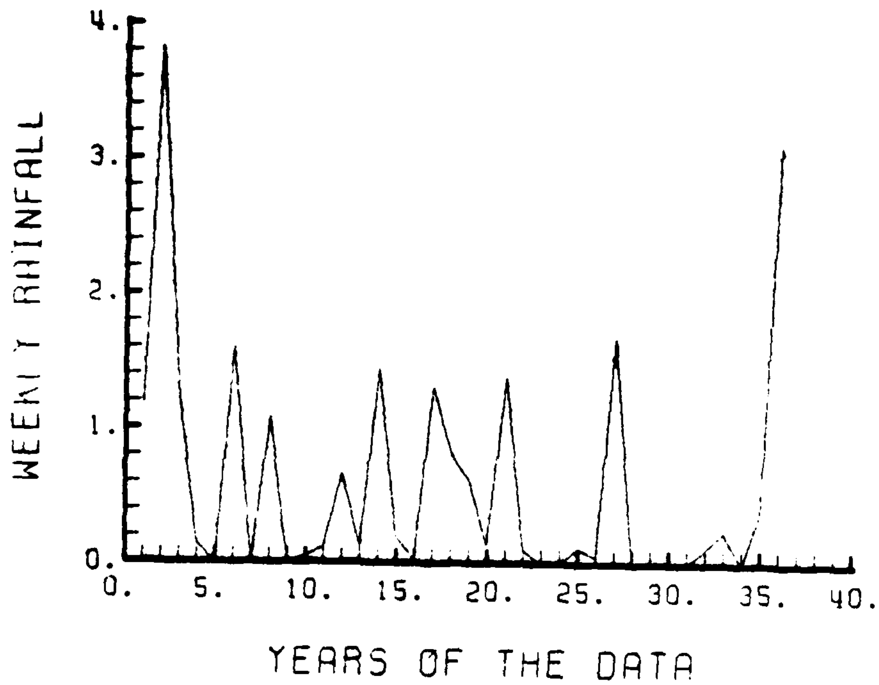


Figure 50. Weekly rainfall in inches for weeks D4 and J1

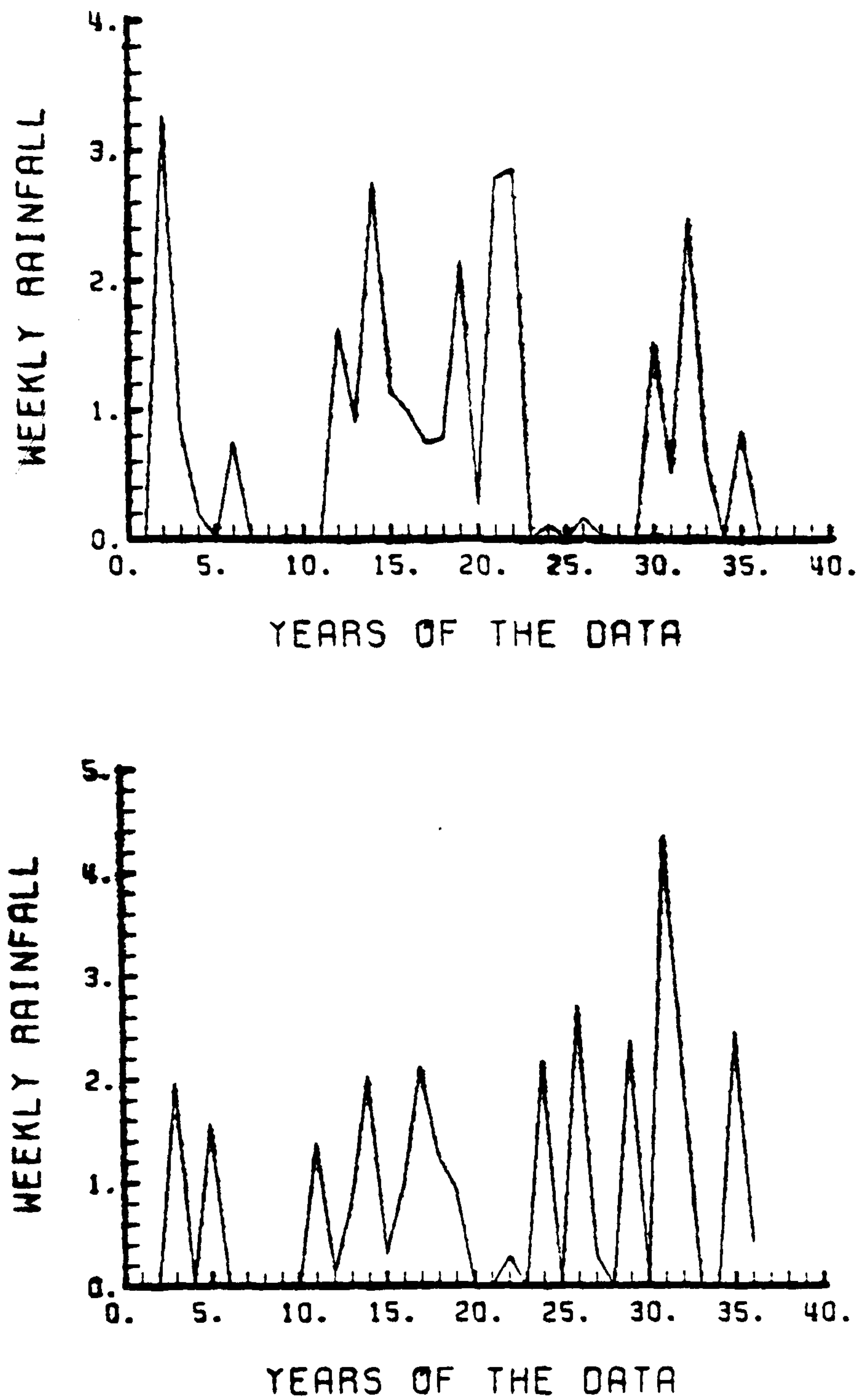
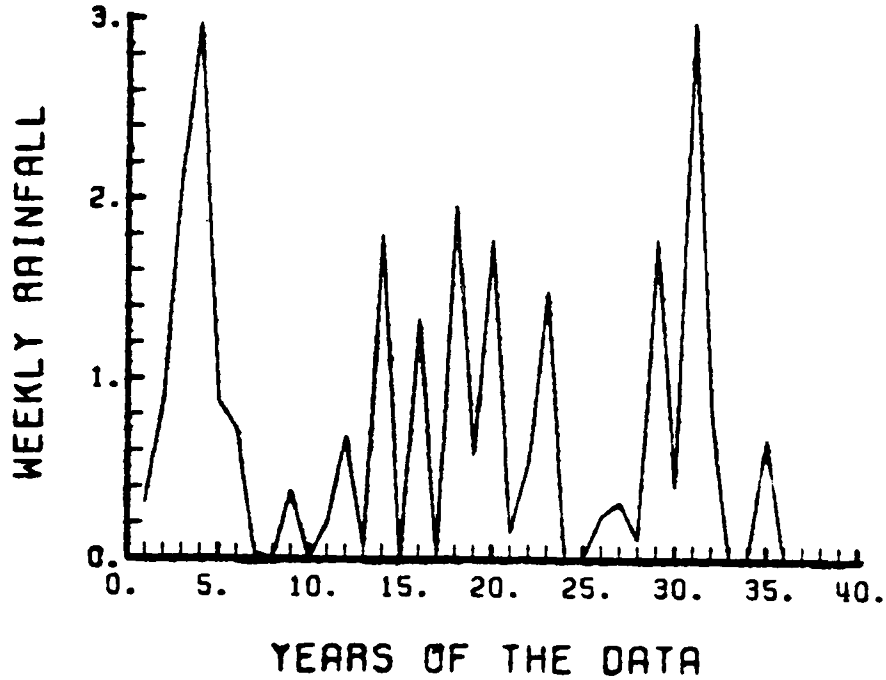


Figure 51. Weekly rainfall in inches for weeks J2 and J3



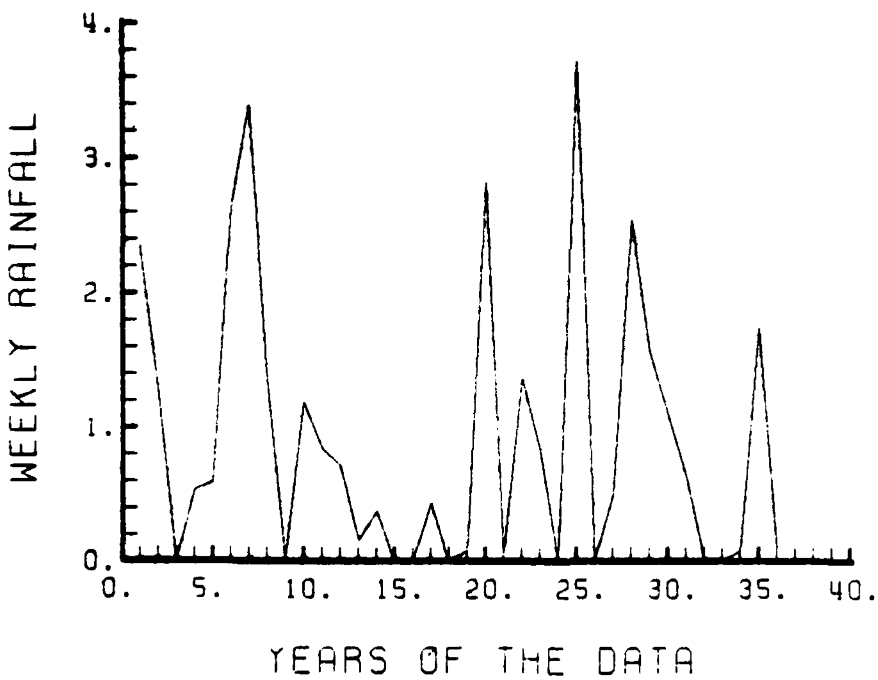
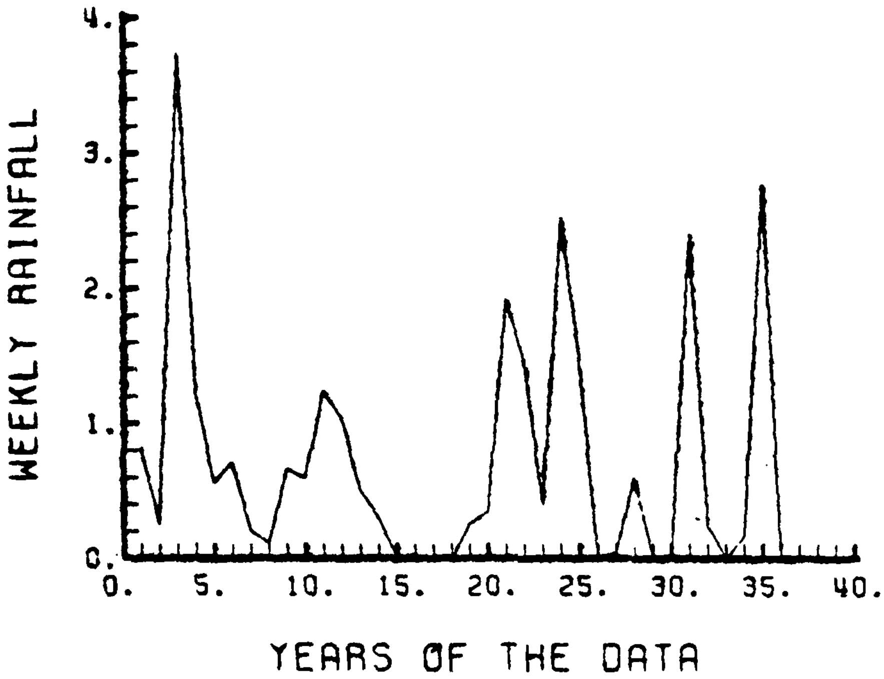


Figure 52. Weekly rainfall in inches for weeks J4 and JF



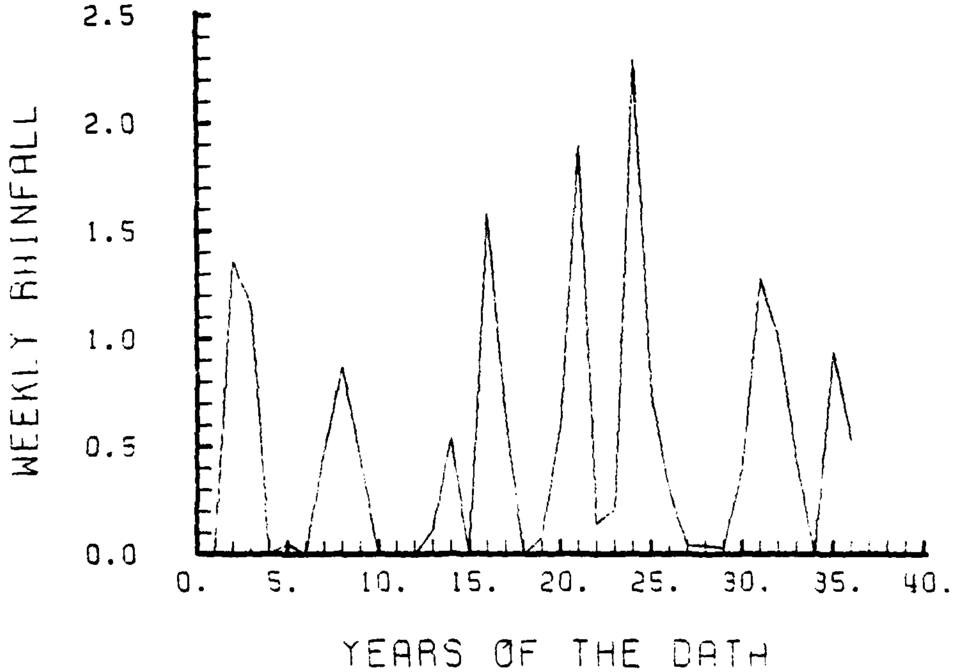
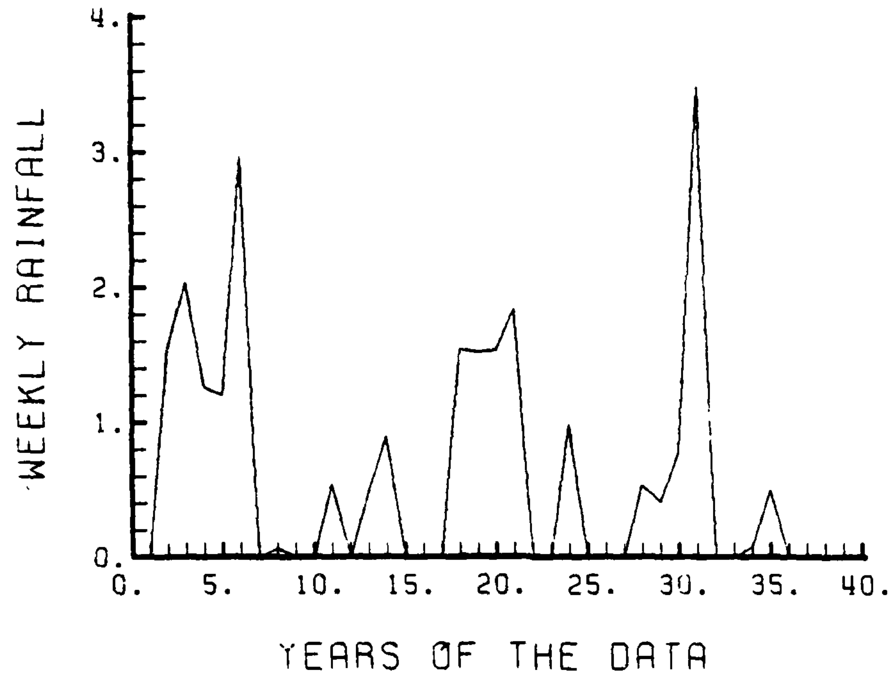


Figure 53. Weekly rainfall in inches for weeks F1 and F2



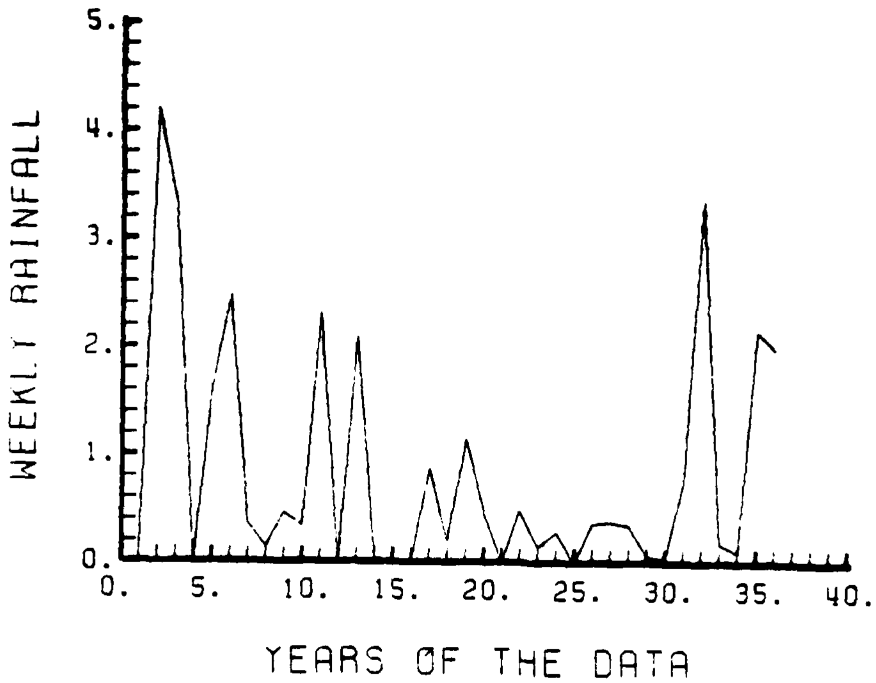
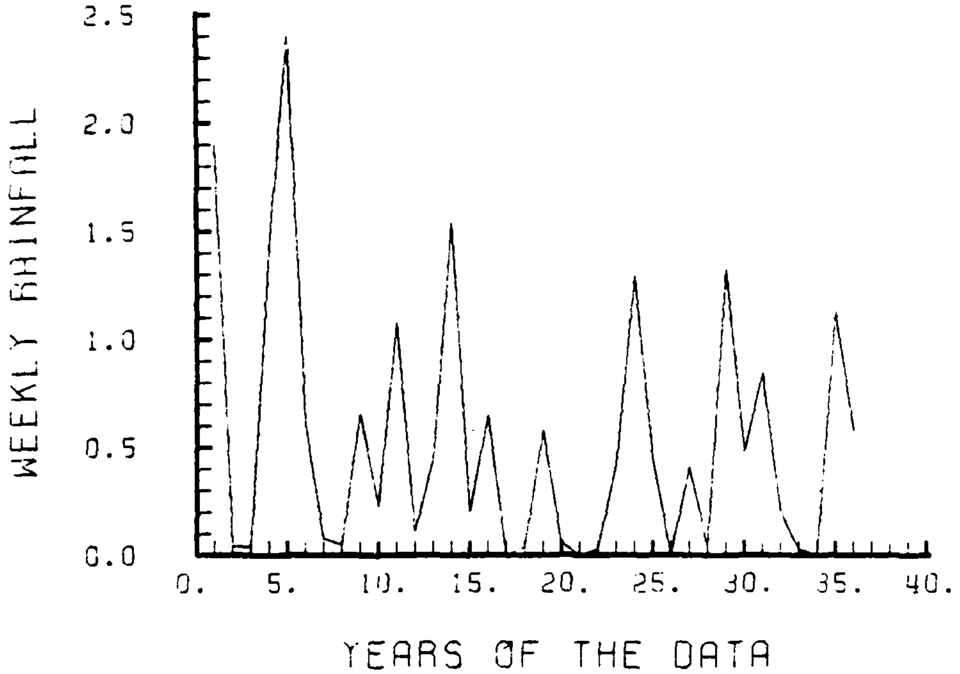


Figure 54. Weekly rainfall in inches for weeks F3 and FM



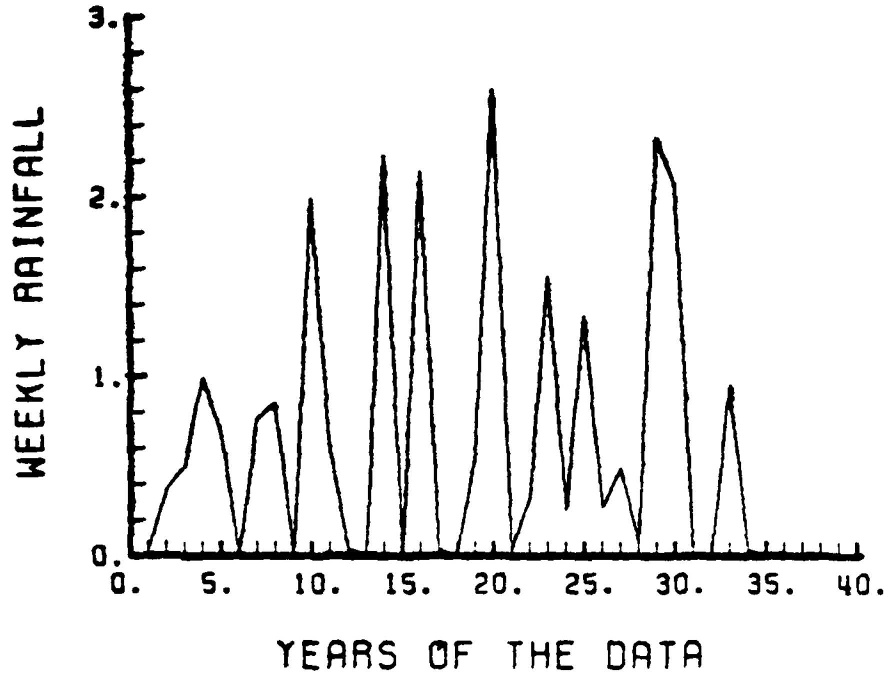
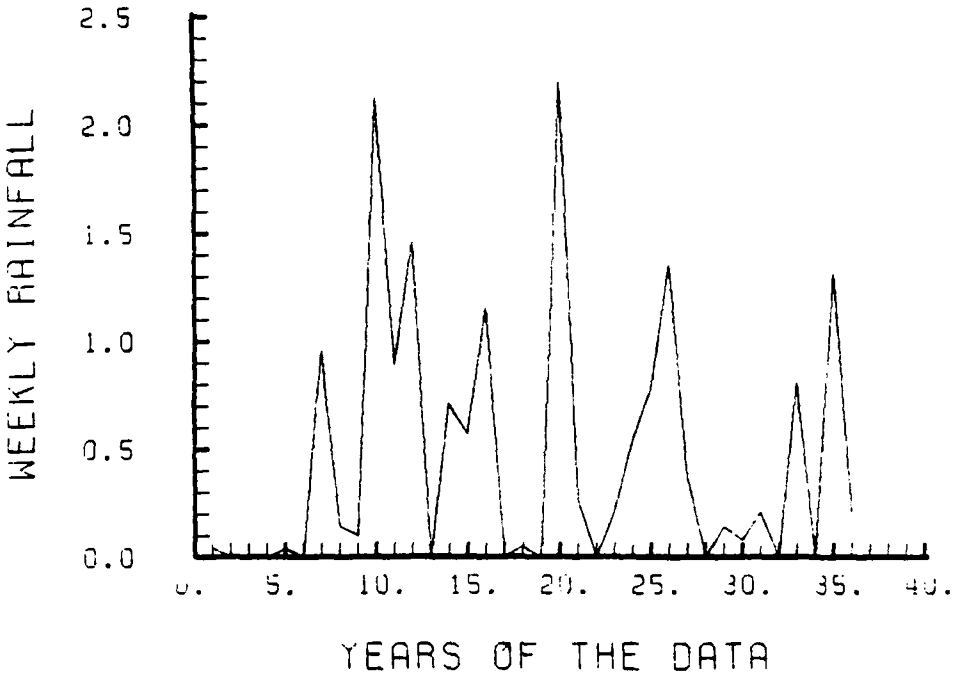


Figure 55. Weekly rainfall in inches for weeks M1 and M2



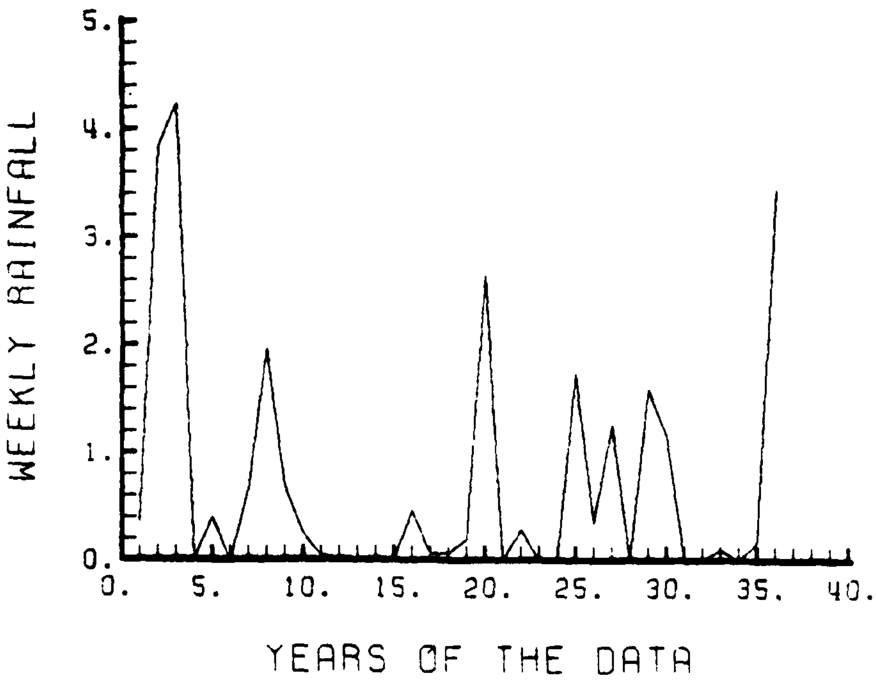
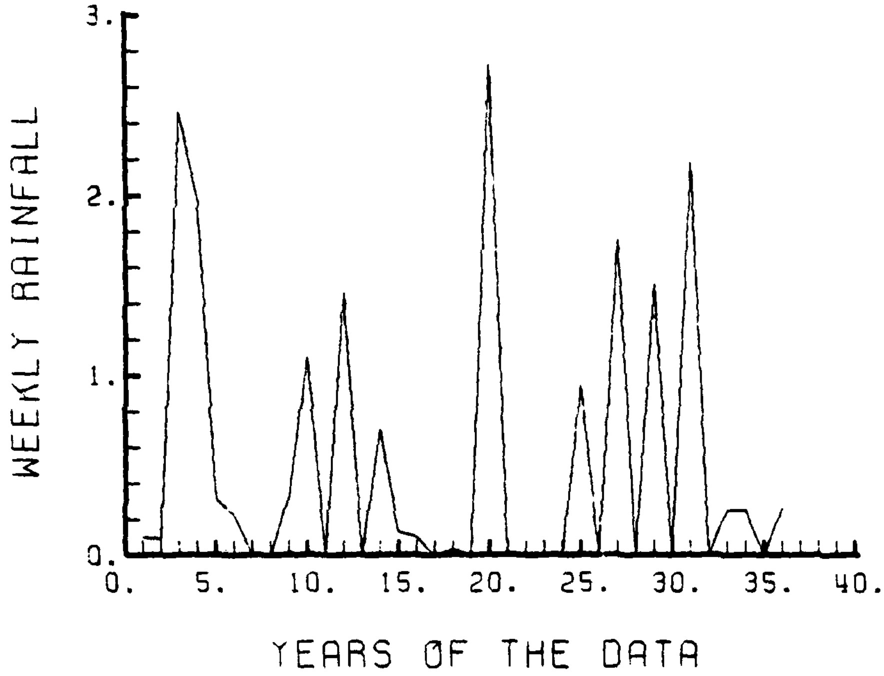


Figure 56. WEekly rainfall in inches for weeks M3 and M4



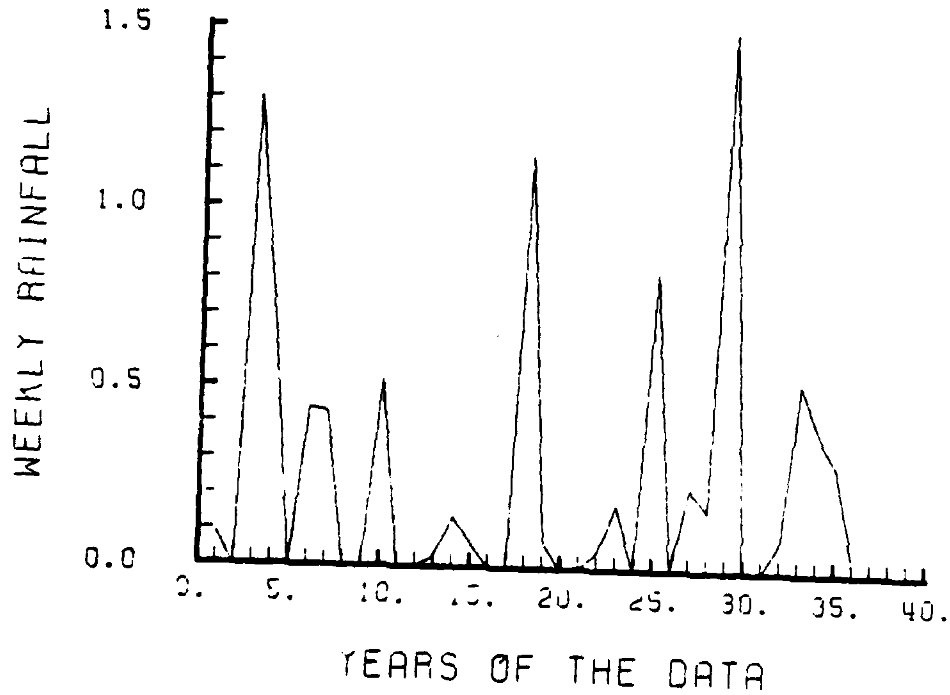
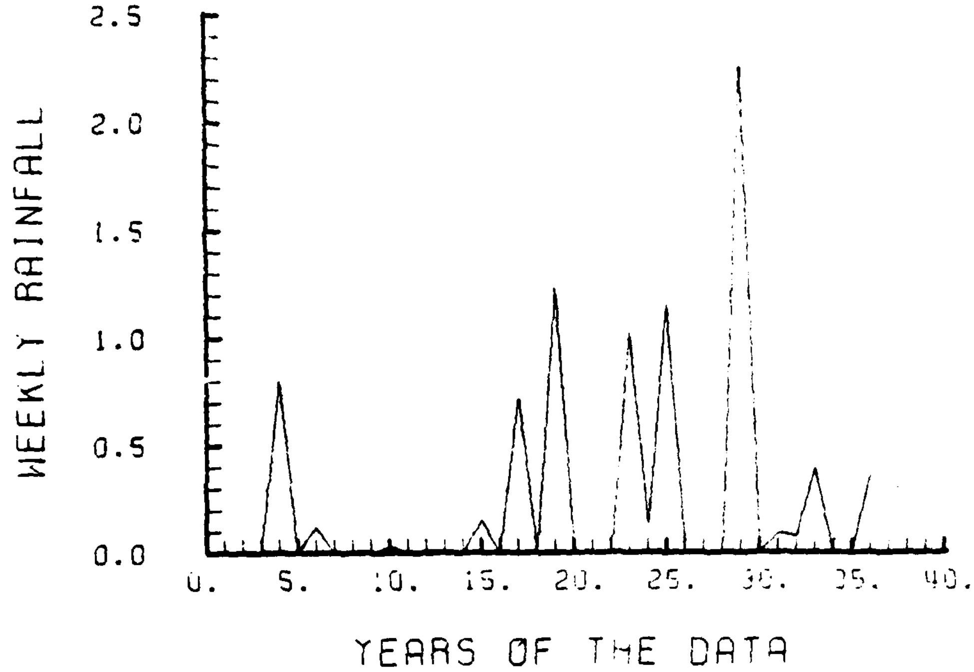


Figure 57. Weekly rainfall in inches for weeks A1 and A2



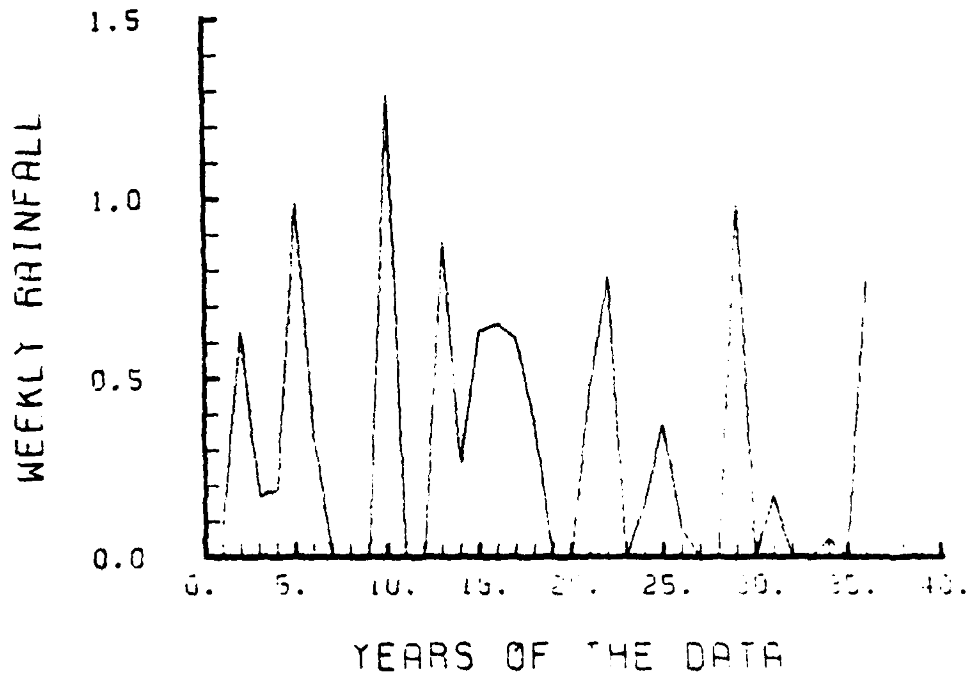


Figure 58. WEekly rainfall in inches for weeks A3 and A4

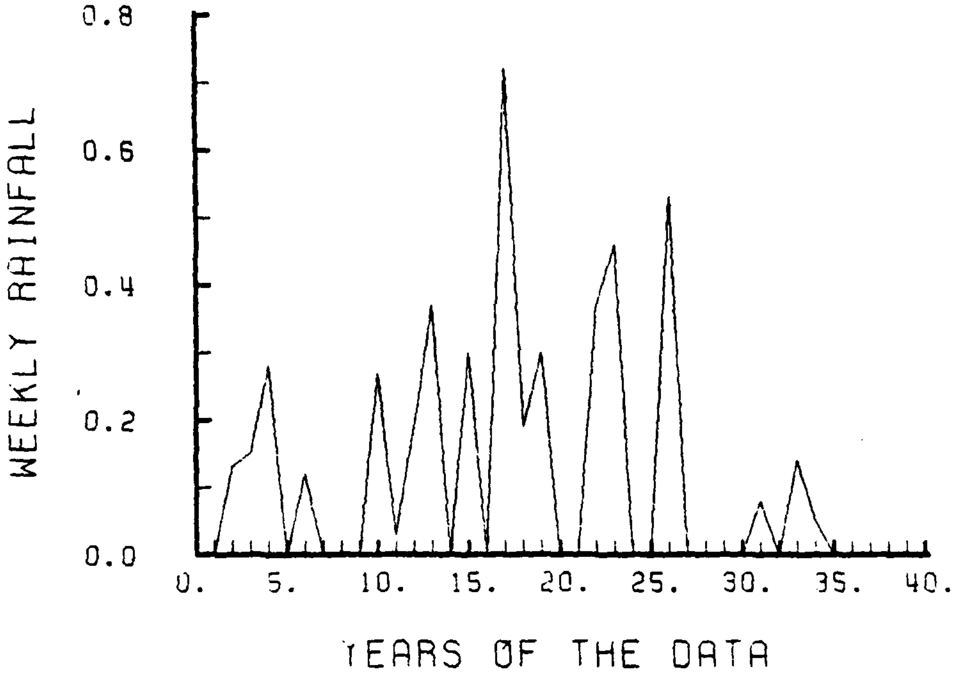


Figure 59. Weekly rainfall in inches for week AM

APPENDIX D

EXPONENTIAL DISTRIBUTION

The Exponential Distribution with parameter λ has the form

$$F(x) = 1 - \exp(-\lambda x) \quad , \quad 0 \leq x$$
$$= 0 \quad , \quad x < 0$$

It has density function,

$$f(x) = \lambda \exp(-\lambda x)$$

Suppose X has the exponential density with parameter λ.
Here are some characteristics of X.

a) The mean : $E[X] = 1/\lambda$

b) The variance : $V[X] = 1/\lambda^2$

std. dev [X] : $1/\lambda$

(Coef. of variation)^2 = 1

c) The Median : $X_{0.5} = 0.693E[X]$

d) The Lower Quartile: $X_{.25} = 0.288E[X]$

d) The Upper Quartile: $X_{.75} = 1.386E[X]$

f) The Skewness : 2

The Kurtosis : 6

ALGEBRAIC COMPUTATION OF SKEWNESS AND KURTOSIS FOR EXPONENTIAL DISTRIBUTION.

Exponential distribution with parameter $\lambda = 1$.

Density function : $f(x) = \exp(-x)$

Mean : 1

Variance : 1

A. SKEWNESS

$$\gamma_1 = \frac{E[(X-1)^3]}{(1)^{3/2}} = E[(X-1)^3]$$

$$E[(X-1)^3] = \int_0^\infty (X-1)^3 e^{-X} dX \; ; \quad \int_0^\infty X^k e^{-X} dx = k!$$

$$= 3! - 3x^2! + 3x^1! - 1x^0!$$

$$\gamma_1 = 2$$

B. KURTOSIS

$$\gamma_2 = E[(X-1)^4] - 3$$

$$E[(X-1)^4] = \int_0^\infty (X-1)^4 e^{-X} dx; \quad \text{again} \quad \int_0^\infty X^k e^{-X} dx = k!$$

$$= 4! - 4x^3! + 6x^2! - 4x^1! + 1x^0!$$

$$= 9$$

$$\gamma_2 = 9 - 3 = 6$$

SAMPLE PROPERTIES OF SKEWNESS AND KURTOSIS

Cramer [Ref. 6] gives a discussion of mean and variances of the skewness and kurtosis for sampling. In general, the mean of g_1 and g_2 are:

$$E[g_1] = \gamma_1, \qquad E[g_2] = \gamma_2$$

and the variances are:

$$Var[g_1] = \frac{4\mu_2^2\mu_6 - 12\mu_2\mu_3\mu_5 - 24\mu_2^3\mu_4 + 9\mu_3^2\mu_4 + 35\mu_2^2\mu_3^2 + 36\mu_2^5}{4 \times n \times \mu_2^5}$$

$$Var[g_2] = \frac{\mu_2^2\mu_8 - 4\mu_2\mu_4\mu_6 - 8\mu_2^2\mu_3\mu_5 + 4\mu_4^3 - \mu_2^2\mu_4^2 + 16\mu_2\mu_3^2\mu_4 + 16\mu_2^3\mu_3^2}{n \times \mu_2^6}$$

When the parent population is exponential,

$$E[g_1] = 2, \qquad E[g_2] = 6$$

$$Var[g_1] = \frac{225}{8xn}, \qquad Var[g_2] = \frac{1332}{n}$$

for the computation.

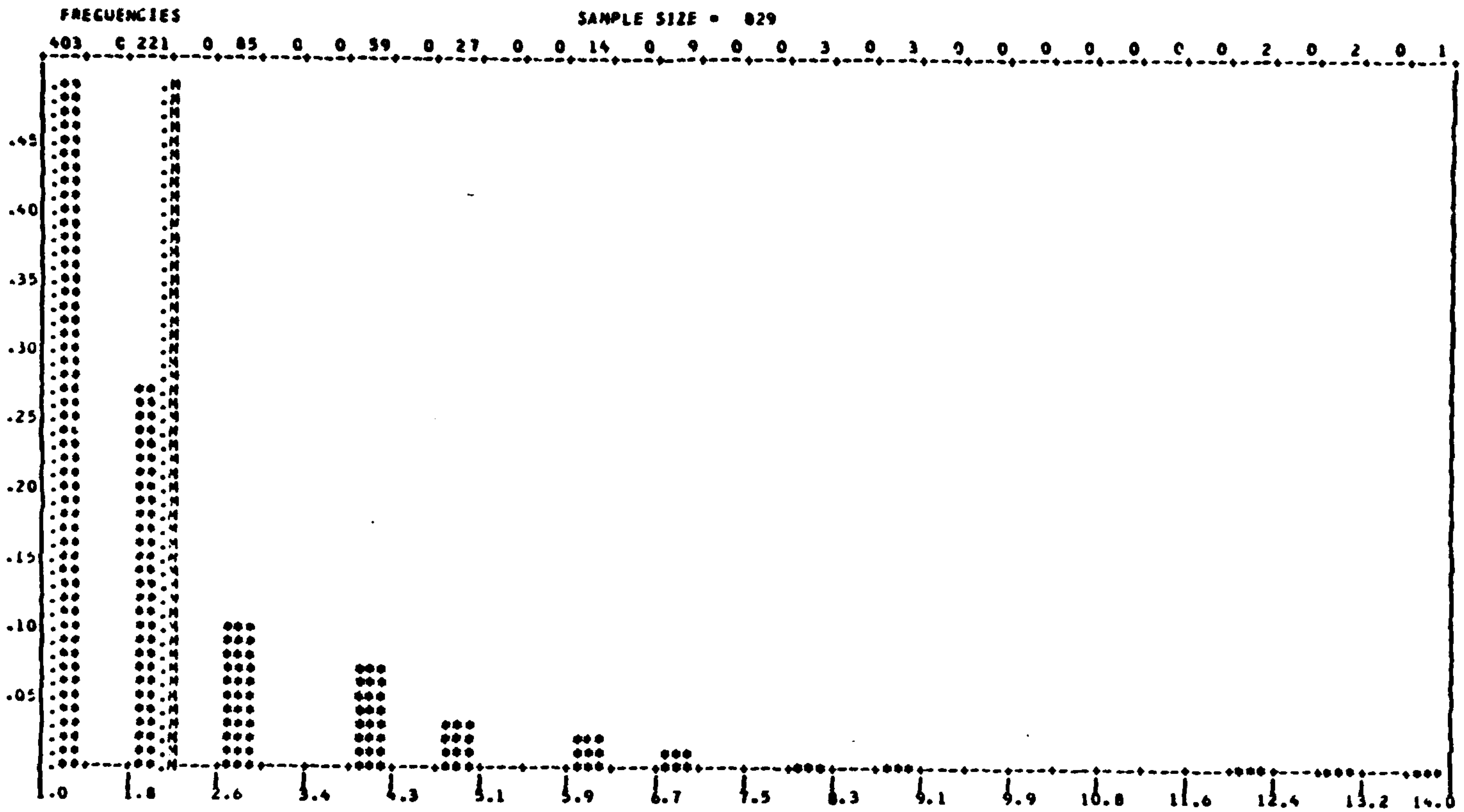
In general for the exponential distribution with density function $f(x) = e^{-x}$, the kth moment; $\mu_k = \int_0^\infty X^k e^{-X} dx = k!$ So, by using this formula and putting it in the equations of variance:

$$Var[g_1] = \frac{225}{8n}, \qquad Var[g_2] = \frac{1332}{n}$$

Table 22: ESTIMATED AND SIMULATED VALUES FOR SKEWNESS AND KURTOSIS FOR SAME SAMPLE SIZES.

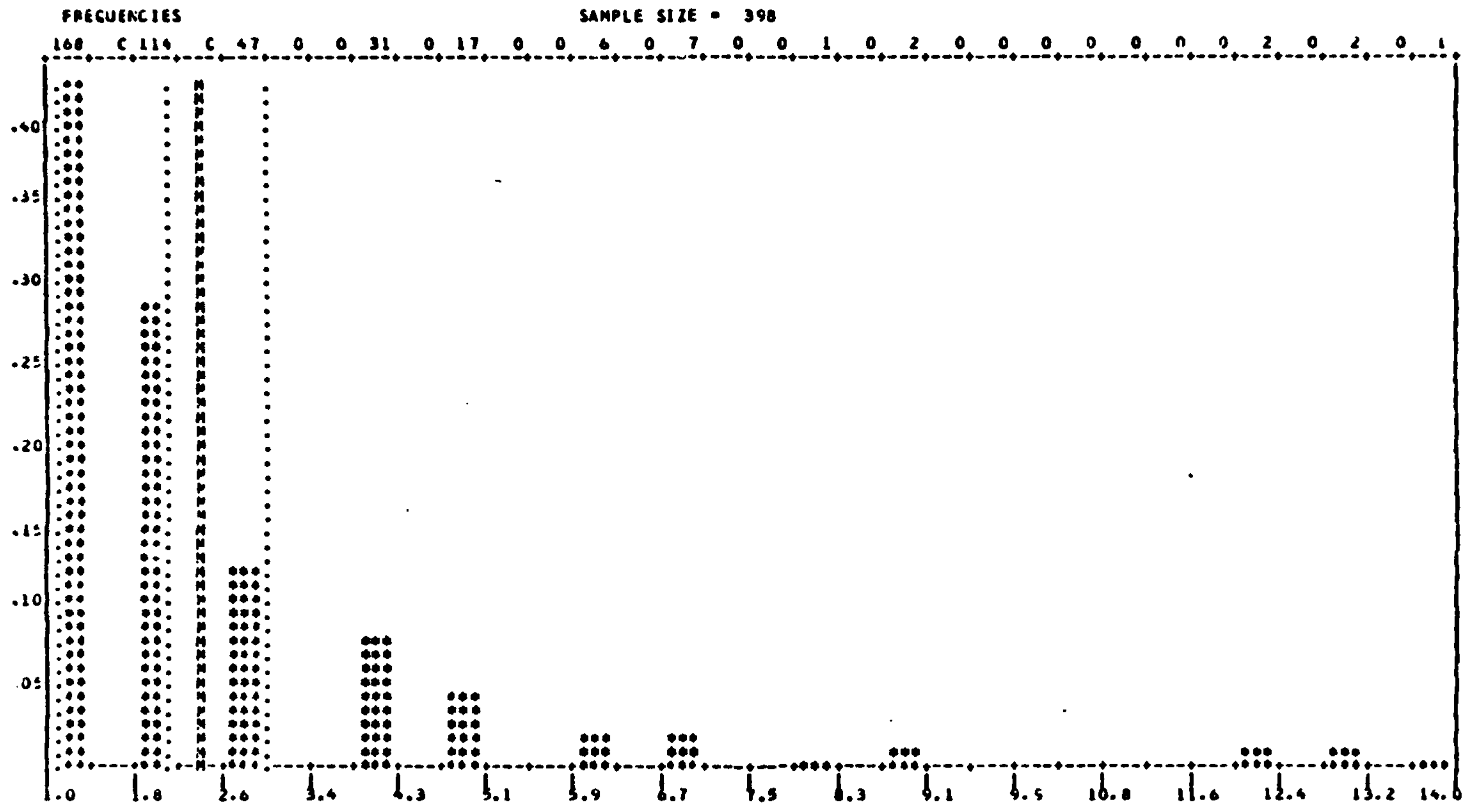
WEEK	# OF YEARS POS. RAINFALL	ESTIM. SKEWNESS	SIMULATED SKEWNESS	ESTIM. KURTOSIS	SIMULATED KURTOSIS
O1	9	1.57	1.11	0.43	0.24
O2	17	1.23	1.37	0.10	1.36
O3	16	2.05	1.34	3.16	1.25
O4	15	1.50	1.33	1.65	1.17
ON	14	2.62	1.29	5.82	1.02
N1	20	0.39	1.43	-1.58	1.70
N2	28	1.78	1.54	2.26	2.31
N3	19	1.64	1.41	1.65	1.57
N4	22	3.39	1.45	11.39	1.83
D1	28	1.45	1.54	1.08	2.31
D2	22	1.84	1.45	3.03	1.83
D3	28	0.70	1.54	0.17	2.31
D4	24	1.34	1.49	1.10	2.02
J1	26	1.73	1.52	2.66	2.19
J2	25	0.83	1.50	-0.73	2.09
J3	21	0.76	1.44	0.44	1.76
J4	27	1.04	1.52	-0.01	2.22
JF	29	1.00	1.55	-0.11	2.37
F1	27	1.45	1.52	1.24	2.22
F2	27	1.10	1.52	0.47	2.22
F3	21	1.05	1.44	0.65	1.76
FM	30	1.31	1.55	0.46	2.40
M1	32	1.25	1.57	0.84	2.50
M2	28	0.83	1.54	-0.81	2.31
M3	25	1.07	1.50	0.17	2.09
M4	23	1.34	1.47	0.39	1.94
A1	21	0.81	1.44	-0.94	1.76
A2	22	1.34	1.45	0.59	1.83
A3	14	0.15	1.29	1.49	1.02
A4	22	0.56	1.45	-0.72	1.83
AM	18	1.03	1.39	0.55	1.50

APPENDIX E. HISTOGRAMS OF AMOUNT OF RAINFALL IN EXACTLY N DAYS LASTING STORMS



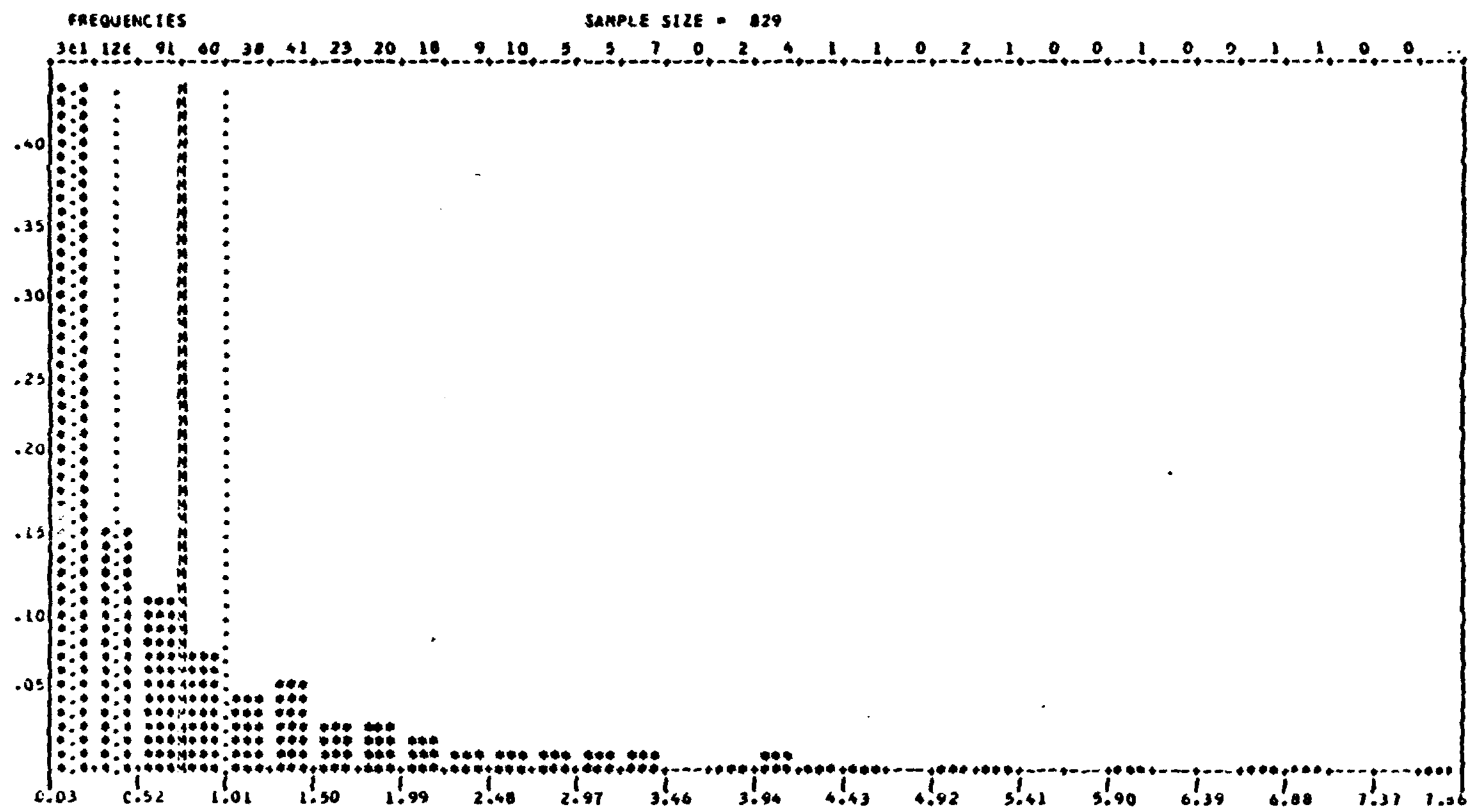
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	2.090473E+00	VARIANCE	2.717649E+00	M3	1.254191E+01	MINIMUM	1.000000E+00
MEDIAN	2.000000E+00	STD DEV	1.648529E+00	M4	1.091311E+02	.10 QUANTILE	1.000000E+00
TRIMEAN	1.750000E+00	COEF VAR	7.885924E-01	SKEWNESS	2.799458E+00	.25 QUANTILE (HINGE)	1.000000E+00
MIDMEAN	1.527710E+00	MEAN DEV	1.062726E+00	KURTOSIS	1.177617E+01	.50 QUANTILE (MEDIAN)	2.000000E+00
MIDRANGE	7.500000E+00	RANGE	1.300000E+01	BETA1	1.249656E+01	.75 QUANTILE (HINGE)	2.000000E+00
GEOM MEAN	1.703184E+00	MIDSPREAD	1.000000E+00	BETA2	1.086579E+02	.90 QUANTILE	4.000000E+00
HARM MEAN	1.462848E+00					MAXIMUM	1.400000E+01

Figure 60. Histogram of the LS in days for October through April in the 36-year period



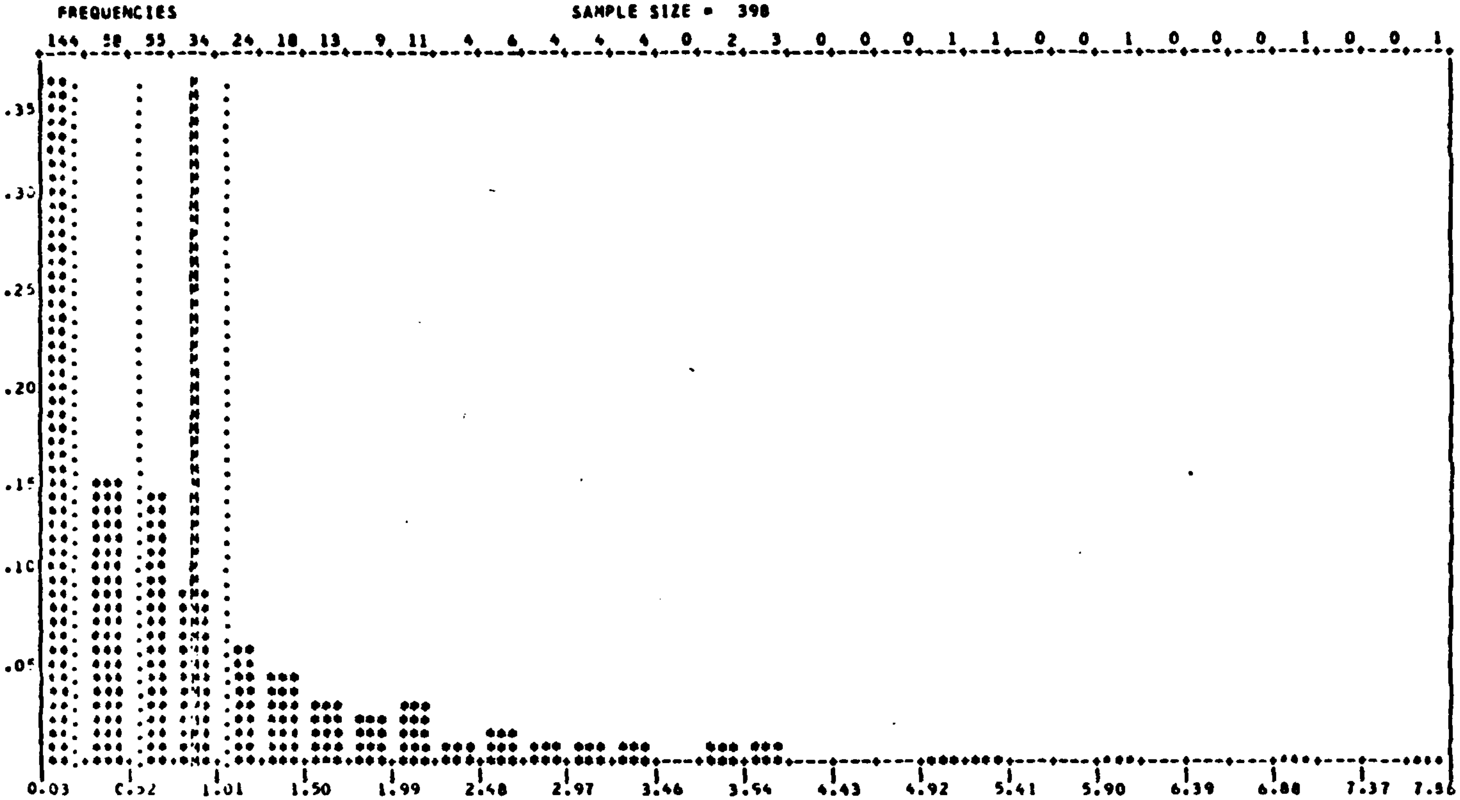
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	2.314070E+00	VARIANCE	3.636626E+00	M3	1.965634E+01	MINIMUM	1.000000E+00
MEDIAN	2.000000E+00	STD DEV	1.906994E+00	M4	1.863538E+02	.10 QUANTILE	1.000000E+00
TRIMEAN	2.000000E+00	COEF VAR	8.240865E-01	SKEWNESS	2.834359E+00	.25 QUANTILE (HINGE)	1.000000E+00
MIDMEAN	1.740000E+00	MEAN DEV	1.158291E+00	KURTOSIS	1.109097E+01	.50 QUANTILE (MEDIAN)	2.000000E+00
MIDRANGE	7.500000E+00	RANGE	1.300000E+01	BETA1	1.950844E+01	.75 QUANTILE (HINGE)	3.000000E+00
GEOM MEAN	1.843744E+00	MIDSPREAD	2.000000E+00	BETA2	1.846795E+02	.90 QUANTILE	4.000000E+00
HARM MEAN	1.563507E+00					MAXIMUM	1.400000E+01

Figure 61. Histogram of the LS in days for December through February in the 36-year period



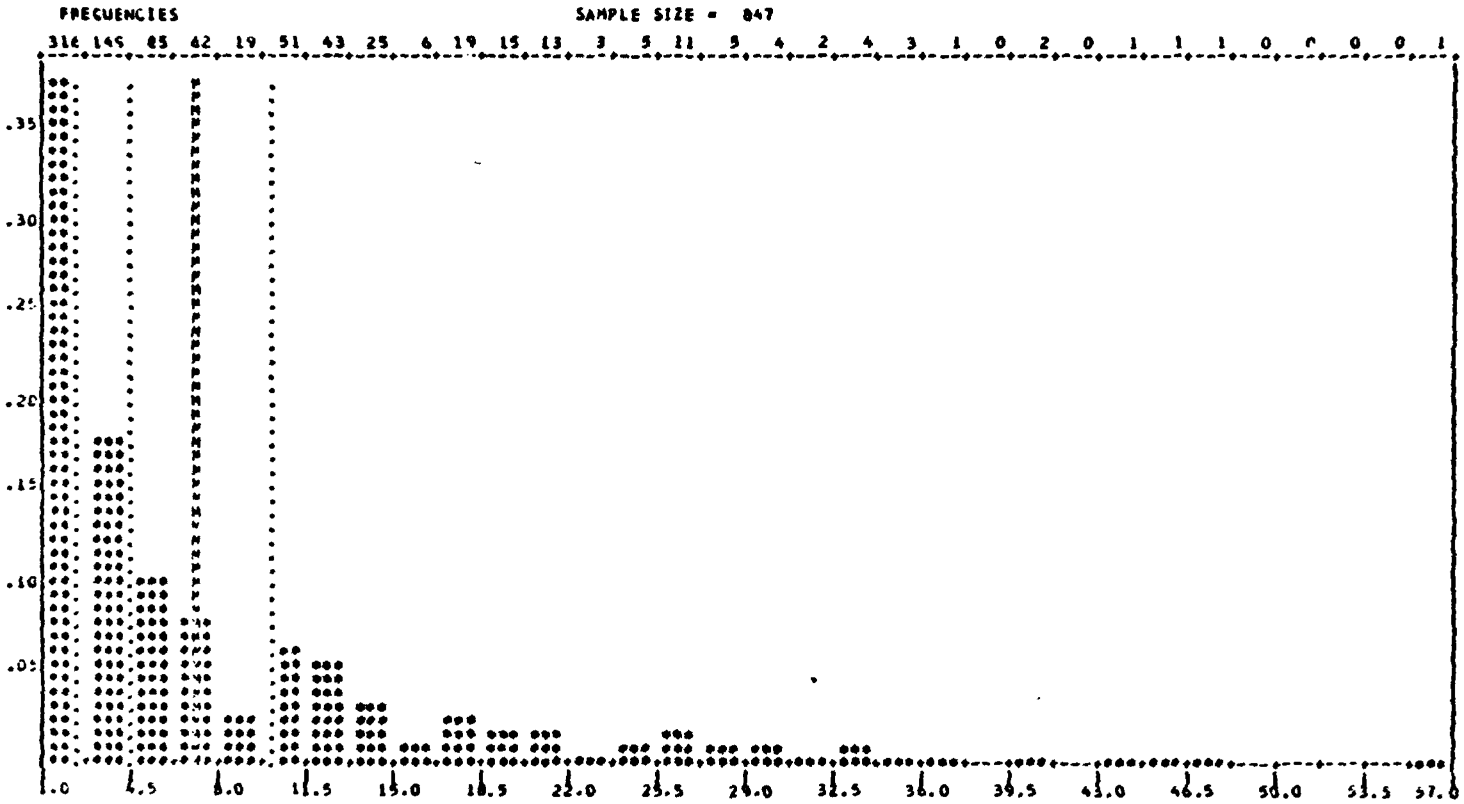
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	7.061155E-01	VARIANCE	8.632756E-01	M3	2.356102E+00	MINIMUM	3.000000E-02
MEDIAN	3.500000E-01	STD DEV	9.291263E-01	M4	1.166496E+01	.10 QUANTILE	5.000000E-02
TRIMEAN	4.374998E-01	COEF VAR	1.315827E+00	SKEWNESS	2.937446E+00	.25 QUANTILE (HINGE)	1.100000E-01
MIDMEAN	4.146988E-01	MEAN DEV	5.646318E-01	KURTOSIS	1.265252E+01	.50 QUANTILE (MEDIAN)	3.500000E-01
MIDRANGE	3.944995E+00	RANGE	7.829997E+00	BETA1	2.347584E+00	.75 QUANTILE (HINGE)	9.399996E-01
GEOM MEAN	3.274572E-01	MIDSPREAD	8.299996E-01	BETA2	1.161406E+01	.90 QUANTILE	1.799996E+00
HARM MEAN	1.443543E-01					MAXIMUM	7.859998E+00

Figure 62. Histogram of the AR in inches in all storms for October through April in the 36-year period



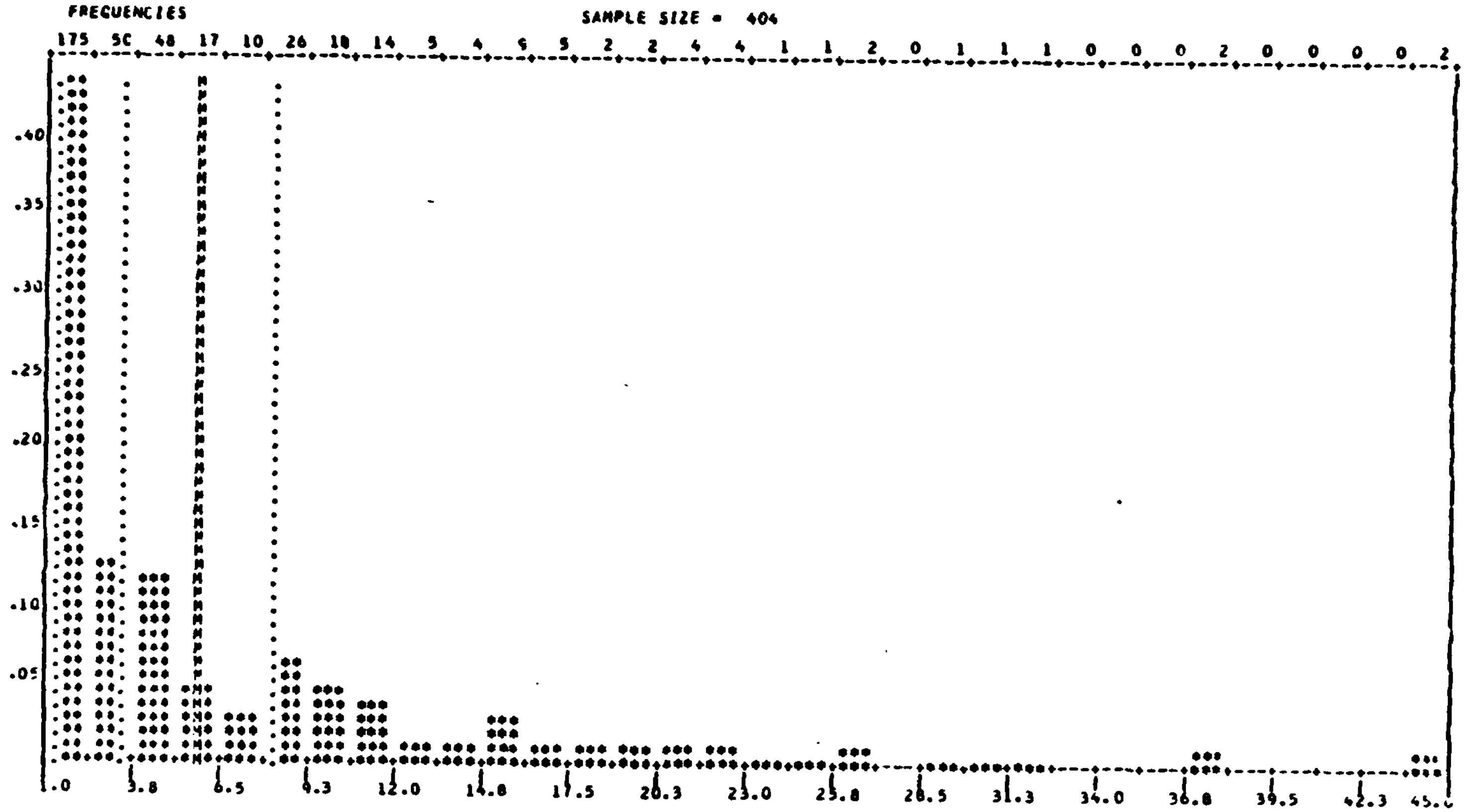
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	8.264318E-01	VARIANCE	1.061737E+00	M3	3.098789E+00	MINIMUM	3.000000E-02
MEDIAN	5.099999E-01	STD DEV	1.030406E+00	M4	1.625441E+01	.10 QUANTILE	5.000000E-02
TRIMEAN	5.574356E-01	COEF VAR	1.246813E+00	SKEWNESS	2.832481E+00	.25 QUANTILE (HINGE)	1.600000E-01
MIDMEAN	5.231000E-01	MEAN DEV	6.348740E-01	KURTOSIS	1.141908E+01	.50 QUANTILE (MEDIAN)	5.099999E-01
MIDRANGE	3.944999E+00	RANGE	7.829997E+00	BETA1	8.075471E+00	.75 QUANTILE (HINGE)	1.049999E+00
GEOM MEAN	4.054414E-01	MIDSPREAD	8.899992E-01	BETA2	1.610799E+01	.90 QUANTILE	2.029999E+00
HARM MEAN	1.723157E-01					MAXIMUM	7.859998E+00

Figure 63. Histogram of the AR in inches in all storms for December through February in the 36-year period



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	6.884297E+00	VARIANCE	6.010475E+01	M3	1.019395E+03	MINIMUM	1.000000E+00
MEDIAN	4.000000E+00	STD DEV	7.752726E+00	M4	3.256657E+04	.10 QUANTILE	1.000000E+00
TRIMEAN	5.000000E+00	COEF VAR	1.126145E+00	SKEWNESS	2.187657E+00	.25 QUANTILE (HINGE)	2.000000E+00
MIDMEAN	4.404705E+00	MEAN DEV	5.063754E+03	KURTOSIS	6.014765E+00	.50 QUANTILE (MEDIAN)	4.000000E+00
MIDRANGE	2.900000E+01	RANGE	5.600000E+01	BETA1	1.015788E+03	.75 QUANTILE (HINGE)	1.000000E+01
GEOM MEAN	3.583396E+00	MIDSPREAD	8.000000E+00	BETA2	3.243832E+04	.90 QUANTILE	1.700000E+01
HARM MEAN	2.458656E+00					MAXIMUM	5.700000E+01

Figure 64. Histogram of the LN in days for October through April in the 36-year period



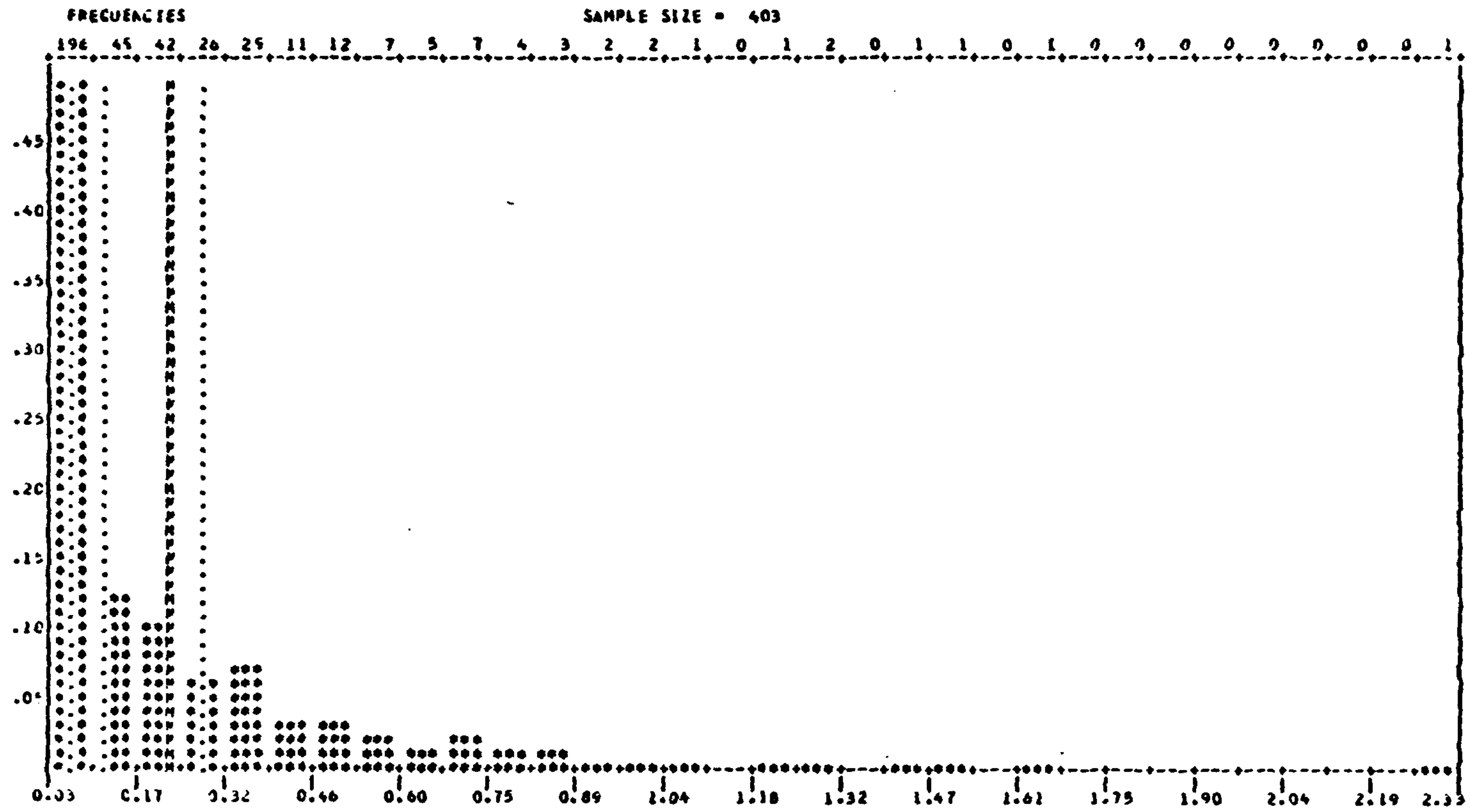
CENTRAL TENDENCY	
MEAN	5.636138E+00
MEDIAN	3.000000E+00
TRIMEAN	3.750000E+00
MIDMEAN	3.440554E+00
MIDRANGE	2.300000E+01
GEOM MEAN	3.333656E+00
HARM MEAN	2.189333E+00

SPREAD	
VARIANCE	4.450995E+01
STD DEV	6.671577E+00
COEF VAR	1.183714E+00
MEAN DEV	4.061881E+00
RANGE	4.400000E+01
MIDSPREAD	7.000000E+00

HIGHER CENTRAL MOMENTS	
M3	7.730642E+02
M4	2.324526E+04
SKEWNESS	2.603335E+00
KURTOSIS	8.733302E+00
BETA1	7.673333E+02
BETA2	2.304443E+04

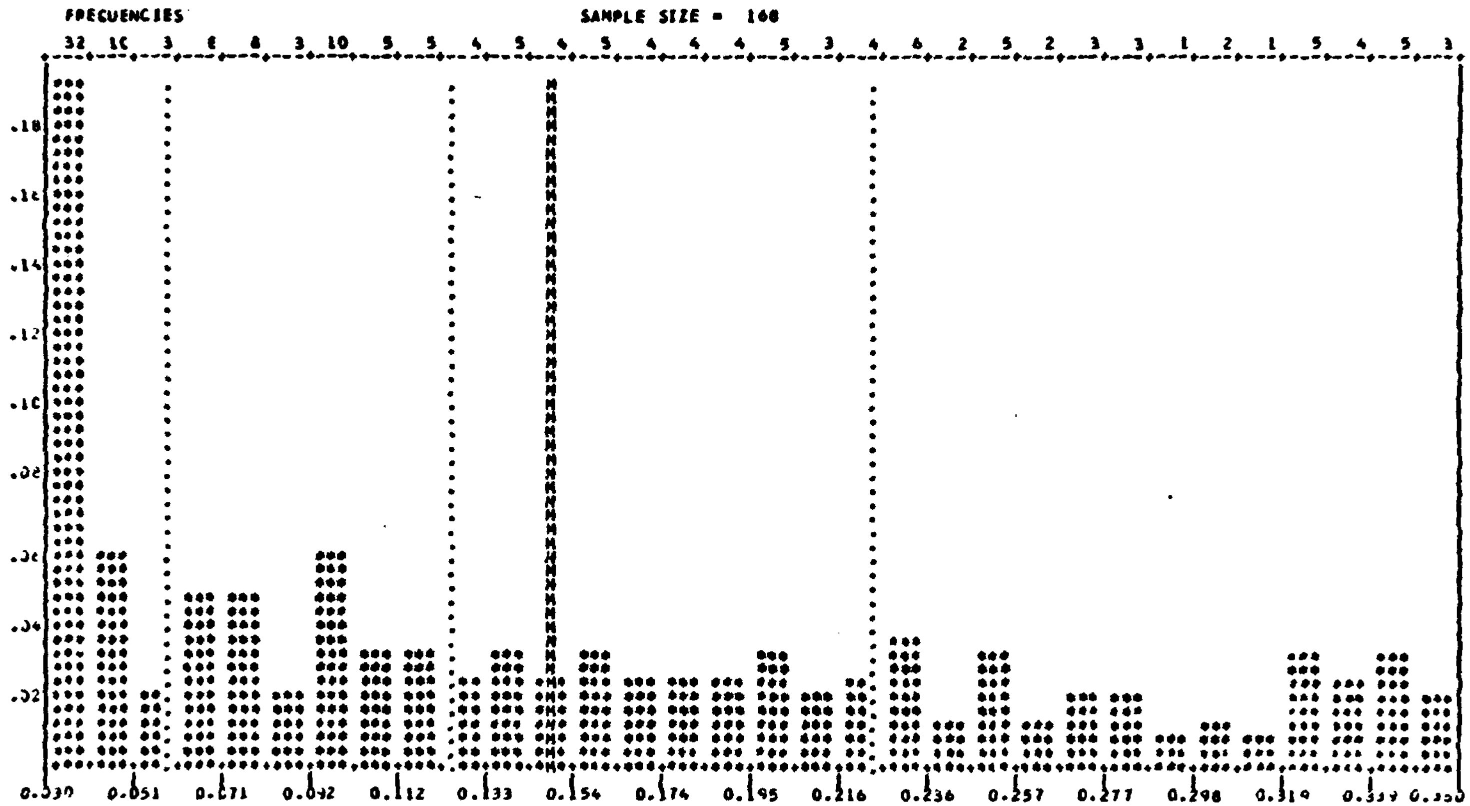
DISTRIBUTION		
MINIMUM		1.000000E+00
.10 QUANTILE		1.000000E+00
.25 QUANTILE	(HINGE)	1.000000E+00
.50 QUANTILE	(MEDIAN)	3.000000E+00
.75 QUANTILE	(HINGE)	8.000000E+00
.90 QUANTILE		1.300000E+01
MAXIMUM		4.500000E+01

Figure 65. Histogram of the LN in days for December through February in the 36-year period



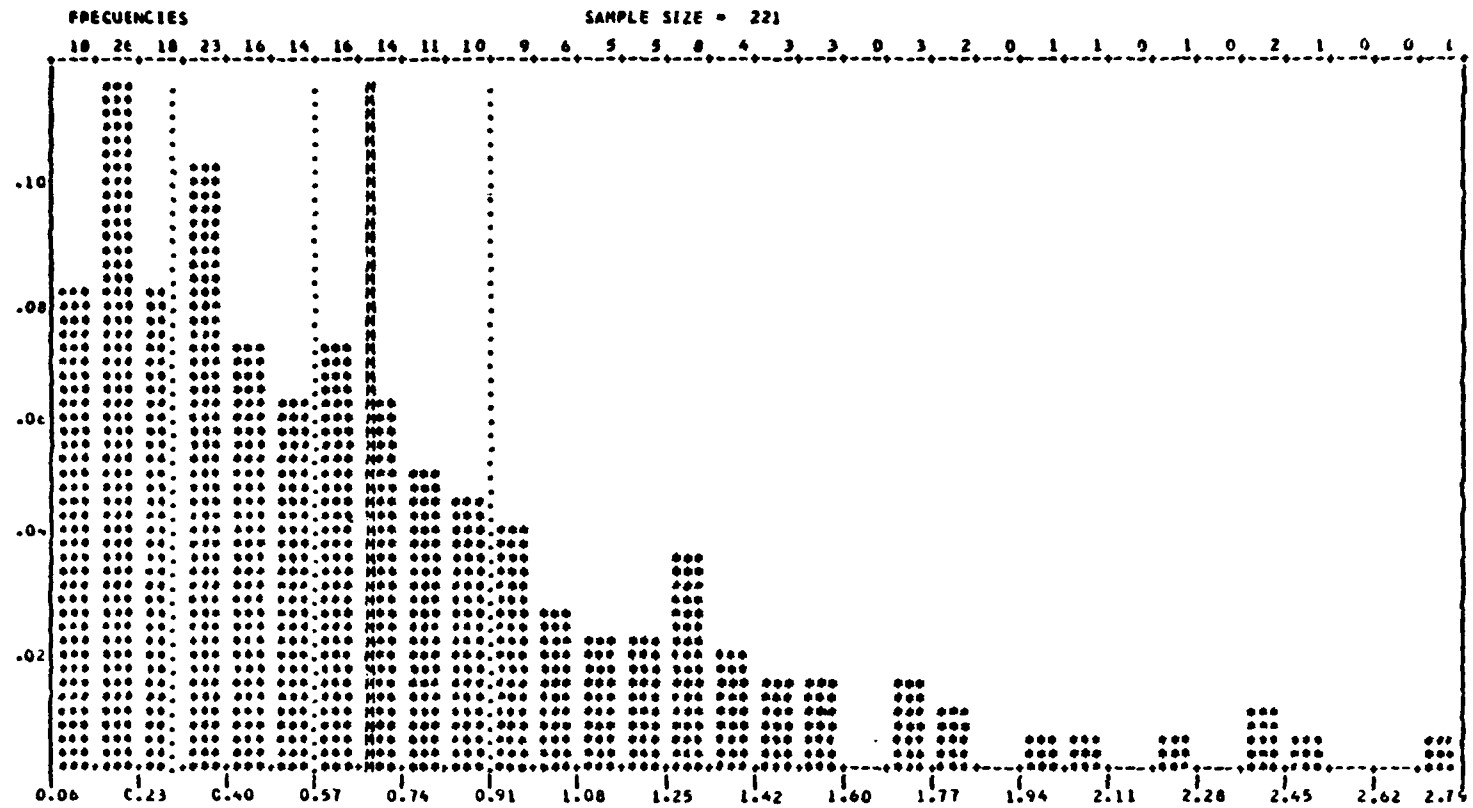
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	2.174461E-01	VARIANCE	7.265186E-02	M3	6.112146E-02	MINIMUM	3.000000E-02
MEDIAN	1.100000E-01	STD DEV	2.695401E-01	M4	9.025270E-02	.10 QUANTILE	3.000000E-02
TRIMEAN	1.350000E-01	COEF VAR	1.239583E+00	SKEWNESS	3.121218E+00	.25 QUANTILE (HINGE)	5.000000E-02
MIDMEAN	1.334482E-01	MEAN DEV	1.588585E-01	KURTOSIS	1.405883E+01	.50 QUANTILE (MEDIAN)	1.100000E-01
MIDRANGE	1.179999E+00	RANGE	2.299999E+00	BETA1	6.066727E-02	.75 QUANTILE (HINGE)	2.700000E-01
GEOM MEAN	1.267075E-01	MIDSPREAD	2.200000E-01	BETA2	8.943522E-02	.90 QUANTILE	5.100000E-01
HARM MEAN	8.173937E-02					MAXIMUM	2.330000E+00

Figure 66. Histogram of AR in inches in the exactly 1 day lasting storms for October through April in the 36-year period



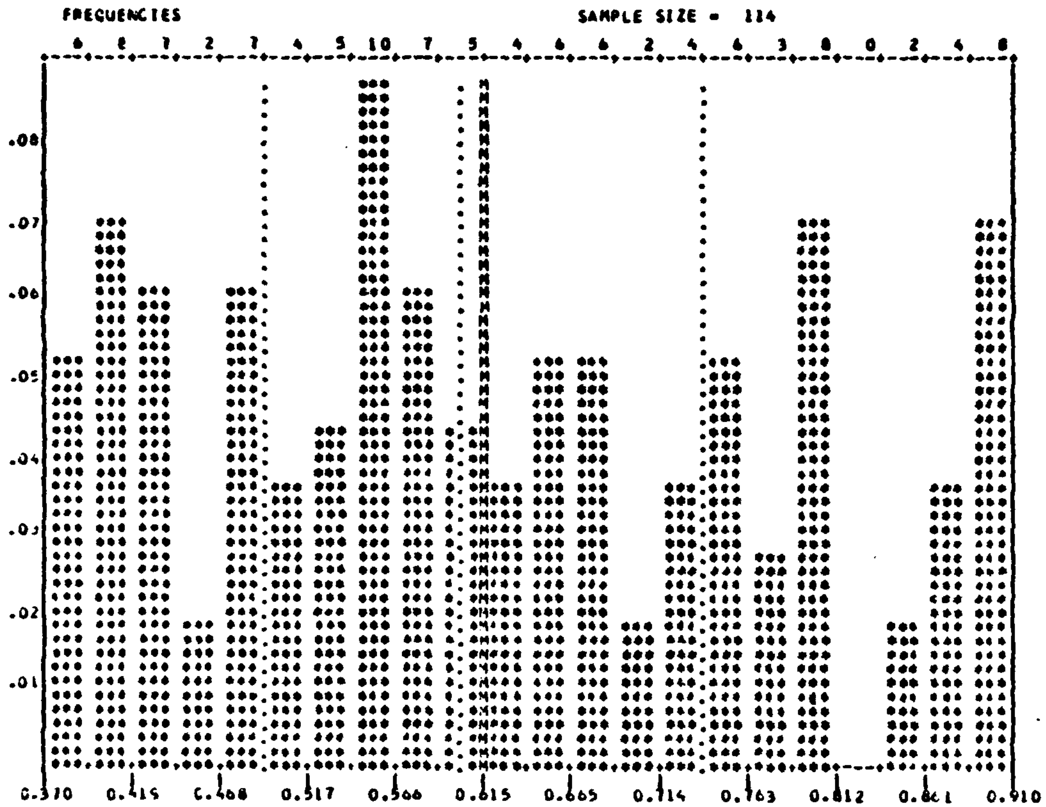
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.478571E-01	VARIANCE	9.831306E-03	M3	5.275756E-04	MINIMUM	3.000000E-02
MEDIAN	1.249999E-01	STD DEV	9.915292E-02	M4	1.995237E-04	.10 QUANTILE	3.000000E-02
TRIMEAN	1.324959E-01	COEF VAR	6.705995E-01	SKEWNESS	5.412129E-01	.25 QUANTILE (HINGE)	5.499998E-02
MIDMEAN	1.320238E-01	MEAN DEV	8.369046E-02	KURTOSIS	-9.351033E-01	.50 QUANTILE (MEDIAN)	1.249999E-01
MIDRANGE	1.949999E-01	RANGE	3.299999E-01	BETA1	5.181923E-04	.75 QUANTILE (HINGE)	2.250000E-01
GEOM MEAN	1.126237E-01	MIDSPREAD	1.700000E-01	BETA2	1.981943E-04	.90 QUANTILE	3.100000E-01
HARM MEAN	8.235419E-02					MAXIMUM	3.600000E-01

Figure 67. Histogram of the AR in inches in the exactly 1 day lasting storms for December through February in the 36-year period



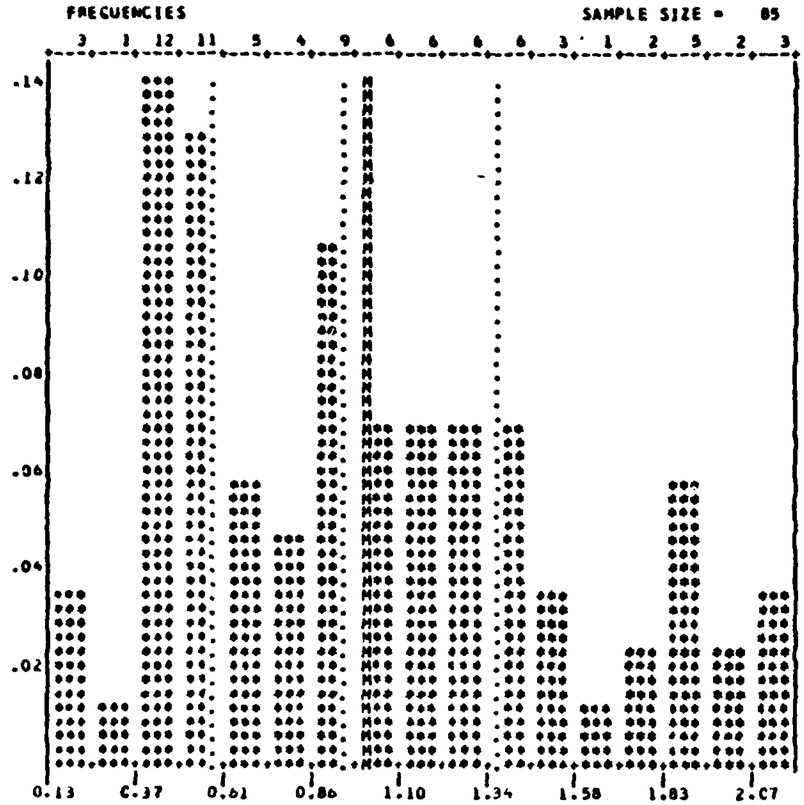
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	6.716741E-01	VARIANCE	2.608228E-01	M3	1.916285E-01	MINIMUM	6.000000E-02
MEDIAN	5.600000E-01	STD DEV	5.107081E-01	M4	3.610747E-01	.10 QUANTILE	1.600000E-01
TRIMEAN	5.787499E-01	COEF VAR	7.603510E-01	SKEWNESS	1.438606E+00	.25 QUANTILE (HINGE)	2.800000E-01
MIDMEAN	5.571621E-01	MEAN DEV	3.788234E-01	KURTOSIS	2.307696E+00	.50 QUANTILE (MEDIAN)	5.600000E-01
MIDRANGE	1.424999E+00	RANGE	2.729999E+00	BETA1	1.890351E-01	.75 QUANTILE (HINGE)	9.150000E-01
GEOM MEAN	5.027308E-01	MIDSPREAD	6.350000E-01	BETA2	3.563739E-01	.90 QUANTILE	1.300000E+00
HARM MEAN	3.616061E-01					MAXIMUM	2.789999E+00

Figure 68. Histogram of the AR in inches in the exactly 2 days lasting storms for October through April in the 36-year period



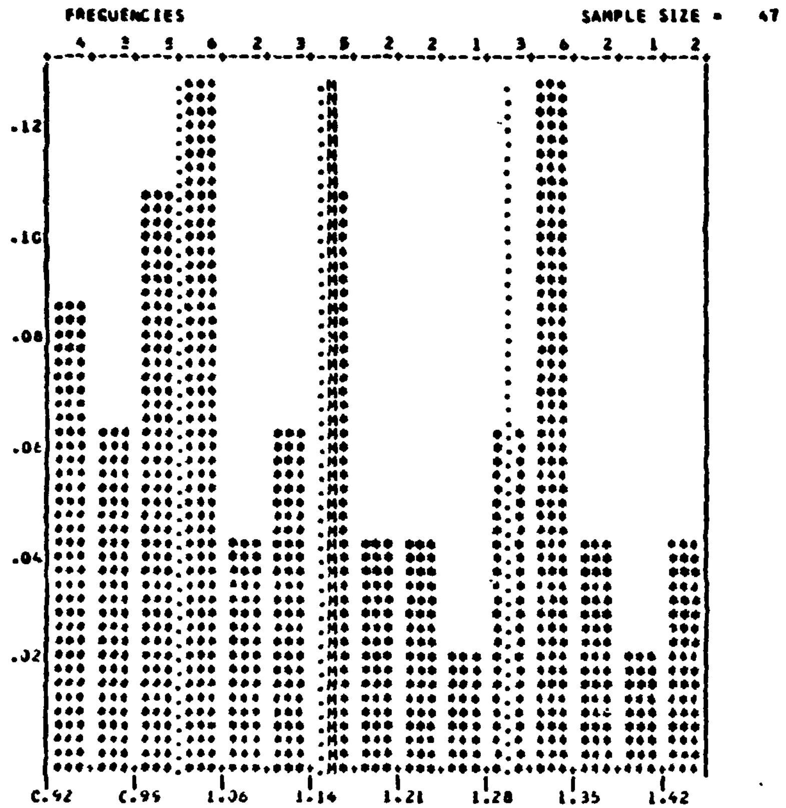
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	6.175438E-01	VARIANCE	2.484347E-02	M3	9.031123E-04	MINIMUM	3.699999E-01
MEDIAN	6.049995E-01	STD DEV	1.576181E-01	M4	1.204316E-03	.10 QUANTILE	4.100000E-01
TRIMEAN	6.099997E-01	COEF VAR	2.552338E-01	SKEWNESS	2.306341E-01	.25 QUANTILE (HINGE)	4.899999E-01
MIDMEAN	6.081034E-01	MEAN DEV	1.326315E-01	KURTOSIS	-1.048736E+00	.50 QUANTILE (MEDIAN)	6.049995E-01
MIDRANGE	6.399999E-01	RANGE	5.400001E-01	BETA1	8.794854E-04	.75 QUANTILE (HINGE)	7.400000E-01
GEOM MEAN	5.974455E-01	MIDSPREAD	2.500031E-01	BETA2	1.194116E-03	.90 QUANTILE	8.600000E-01
HARM MEAN	5.775803E-01					MAXIMUM	9.100000E-01

Figure 69. Histogram of the AR in inches in the exactly 2 days lasting storms for December through February in the 36-year period



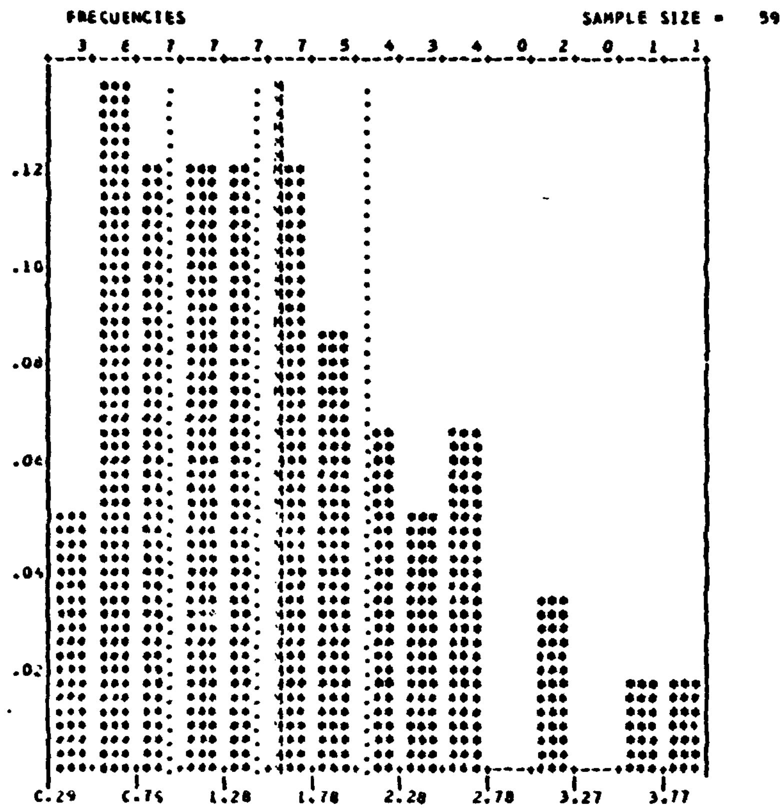
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.012823E+00	VARIANCE	2.821867E-01	M3	7.777208E-02	MINIMUM	1.299999E-01
MEDIAN	9.300000E-01	STD DEV	5.312125E-01	M4	1.817723E-01	.10 QUANTILE	3.899999E-01
TRIMEAN	9.474993E-01	COEF VAR	5.244869E-01	SKEWNESS	5.188226E-01	.25 QUANTILE (HINGE)	5.649996E-01
MIDMEAN	9.416278E-01	MEAN DEV	4.348232E-01	KURTOSIS	-7.172689E-01	.50 QUANTILE (MEDIAN)	9.300000E-01
MIDRANGE	1.159999E+00	RANGE	2.059999E+00	BETA1	7.504874E-02	.75 QUANTILE (HINGE)	1.364995E+00
GEOM MEAN	8.668480E-01	MIDSPREAD	7.999992E-01	BETA2	1.787403E-01	.90 QUANTILE	1.849995E+00
HARM MEAN	7.133575E-01					MAXIMUM	2.189999E+00

Figure 70. Histogram of the AR in inches in the exactly 3 days lasting storms for October through April in the 36-year period



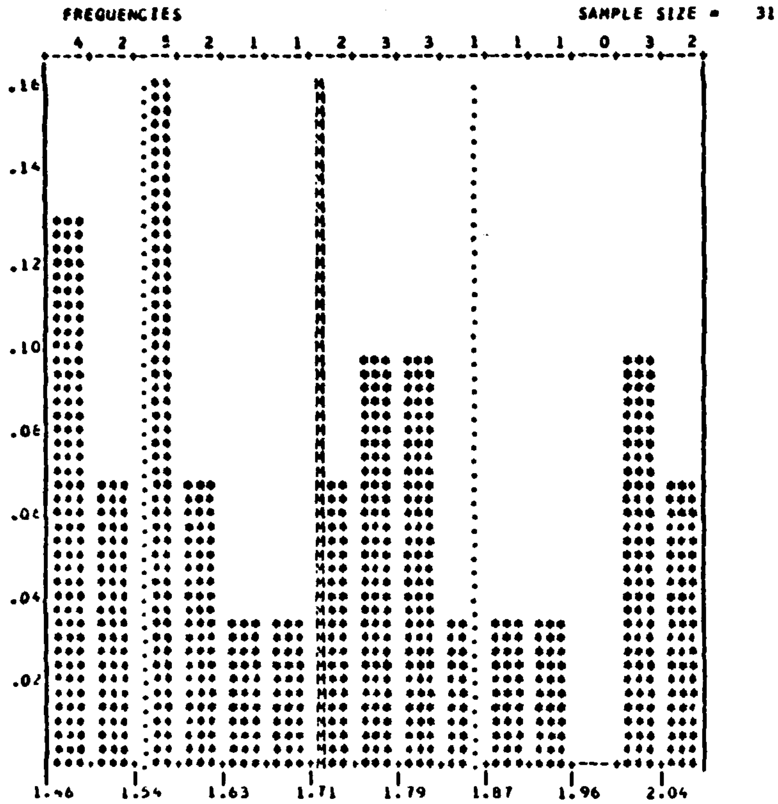
CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.150382E+00	VARIANCE	2.401049E-02	M3	1.013228E-03	MINIMUM	9.200000E-01
MEDIAN	1.139999E+00	STD DEV	1.549532E-01	M4	1.053889E-03	.10 QUANTILE	9.400000E-01
TRIMEAN	1.150000E+00	COEF VAR	1.339983E-01	SKEWNESS	2.723363E-01	.25 QUANTILE (HINGE)	1.020000E+00
MIDMEAN	1.143600E+00	MEAN DEV	1.312764E-01	KURTOSIS	-1.171929E+00	.50 QUANTILE (MEDIAN)	1.139999E+00
MIDRANGE	1.189999E+00	RANGE	5.399991E-01	BETA1	9.494713E-04	.75 QUANTILE (HINGE)	1.300000E+00
GEOM MEAN	1.146341E+00	MIDSPREAD	2.800007E-01	BETA2	1.035440E-03	.90 QUANTILE	1.369999E+00
HARM MEAN	1.136477E+00					MAXIMUM	1.459999E+00

Figure 71. Histogram of the AR in inches in the exactly 3 days lasting storms for December through February in the 36-year period



CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.530677E+00	VARIANCE	6.959022E-01	M3	4.774402E-01	MINIMUM	2.900000E-01
MEDIAN	1.459999E+00	STD DEV	8.342075E-01	M4	1.609689E+00	.10 QUANTILE	5.700000E-01
TRIMEAN	1.464999E+00	COEF VAR	5.311134E-01	SKEWNESS	8.224257E-01	.25 QUANTILE (HINGE)	9.299999E-01
MIDMEAN	1.462500E+00	MEAN DEV	6.669487E-01	KURTOSIS	3.242950E-01	.50 QUANTILE (MEDIAN)	1.459999E+00
MIDRANGE	2.155000E+00	RANGE	3.730000E+00	BETA1	4.534381E-01	.75 QUANTILE (HINGE)	2.069998E+00
GEOM MEAN	1.354261E+00	MIDSPREAD	1.159998E+00	BETA2	1.548761E+00	.90 QUANTILE	2.569999E+00
HARM MEAN	1.141141E+00					MAXIMUM	4.020000E+00

Figure 72. Histogram of AR in inches in the exactly 4 days lasting storms for October through April in the 36-year period

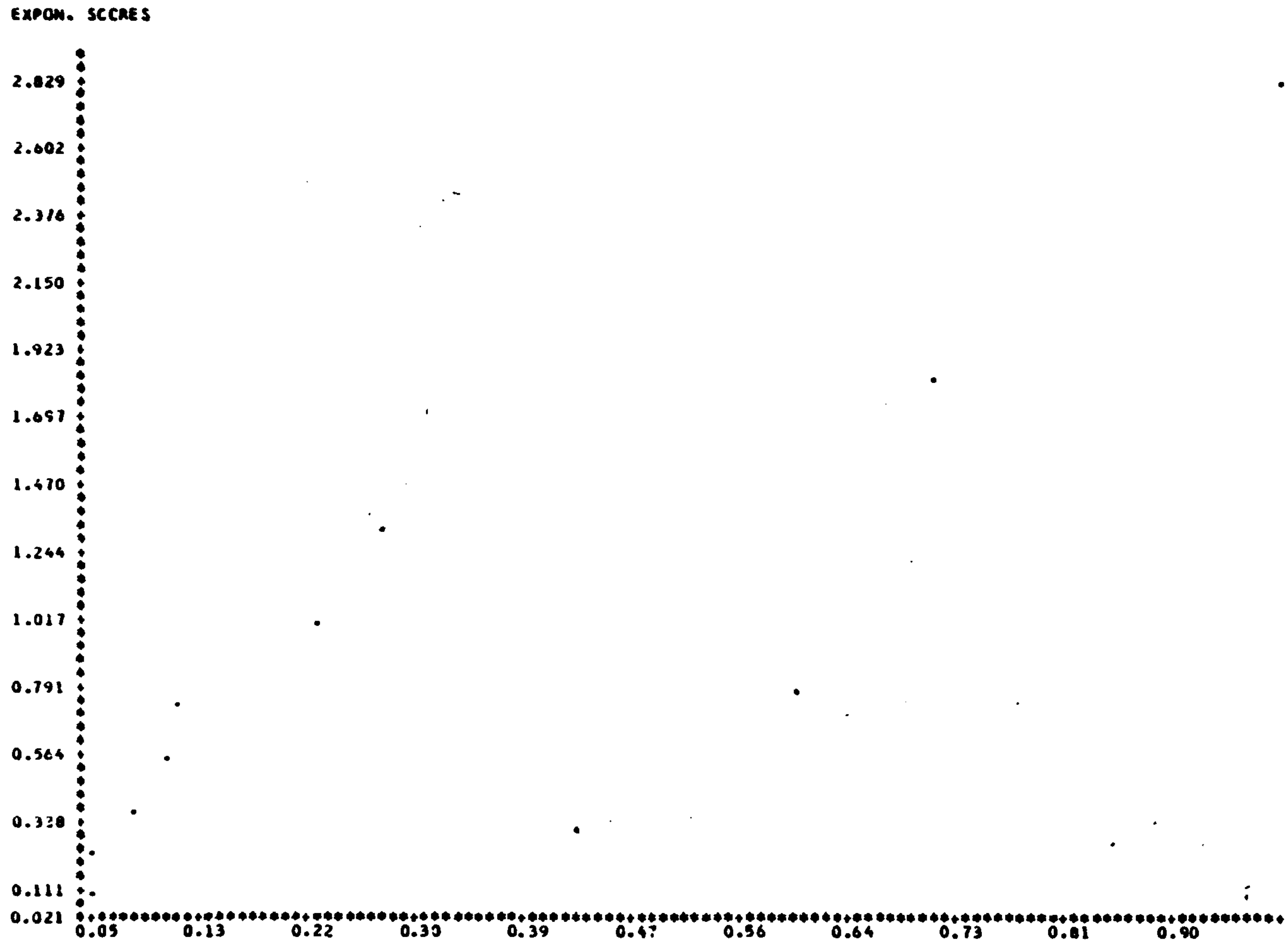


CENTRAL TENDENCY		SPREAD		HIGHER CENTRAL MOMENTS		DISTRIBUTION	
MEAN	1.721612E+00	VARIANCE	3.656064E-02	M3	2.749031E-03	MINIMUM	1.459999E+00
MEDIAN	1.719999E+00	STD DEV	1.912084E-01	M4	2.424324E-03	.10 QUANTILE	1.490000E+00
TRIMEAN	1.714959E+00	COEF VAR	1.110635E-01	SKEWNESS	3.932412E-01	.25 QUANTILE (HINGE)	1.549999E+00
MIDMEAN	1.658234E+00	MEAN DEV	1.635483E-01	KURTOSIS	-1.186311E+00	.50 QUANTILE (MEDIAN)	1.719999E+00
MIDRANGE	1.770000E+00	RANGE	6.200008E-01	BETA1	2.488718E-03	.75 QUANTILE (HINGE)	1.869999E+00
GEOM MEAN	1.711537E+00	MIDSPREAD	3.199997E-01	BETA2	2.357676E-03	.90 QUANTILE	2.000000E+00
HARM MEAN	1.701702E+00					MAXIMUM	2.080000E+00

Figure 73. Histogram of AR in inches in the exactly 4 days lasting storms for December through February in the 36-year period

APPENDIX F. PLOT OF EXPONENTIAL SCORES VERSUS OBSERVED SCORES FOR WEEKLY DATA

NUMBER OF ORDERED PAIRS = 9

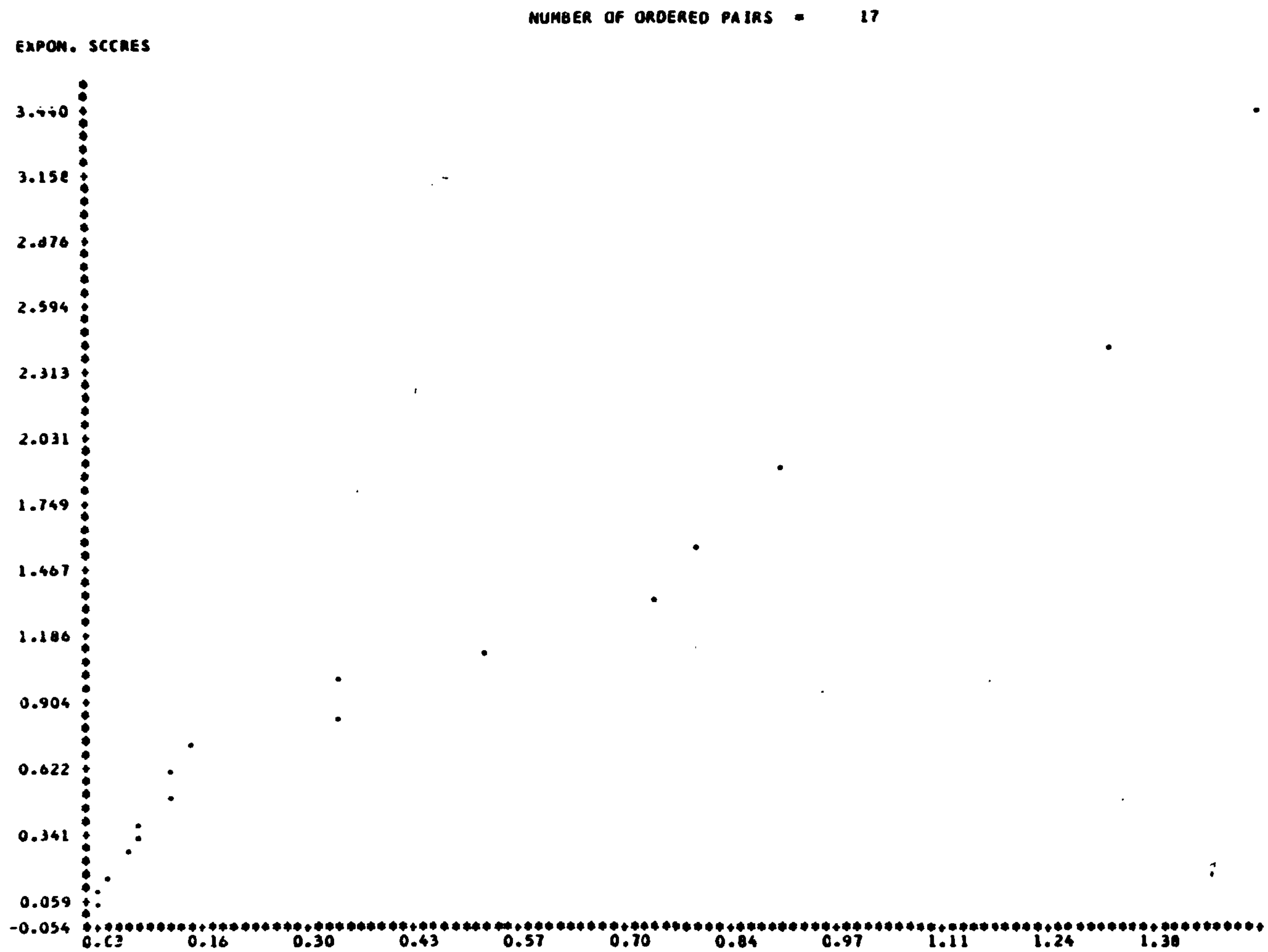


X-SCALE : '*' = 0.845E-02 UNITS

Y-SCALE : '*' = 0.453E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.571202E+00 GAMMA2 = 4.344463E-01

Figure 74. Exponential scores versus observed scores for week 01



X-SCALE : '*' = 0.135E-01 UNITS
Y-SCALE : '*' = 0.563E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.231586E+00 GAMMA2 = 1.014958E-01

Figure 75. Exponential scores versus observed scores for week 02

AD-A109 525 NAVAL POSTGRADUATE SCHOOL MONTEREY CA F/G 4/2

A STATISTICAL ANALYSIS OF DAILY AND WEEKLY RAINFALL FOR THE MON--ETC(U)

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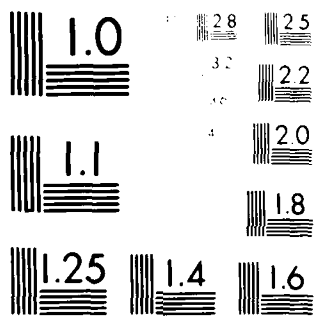
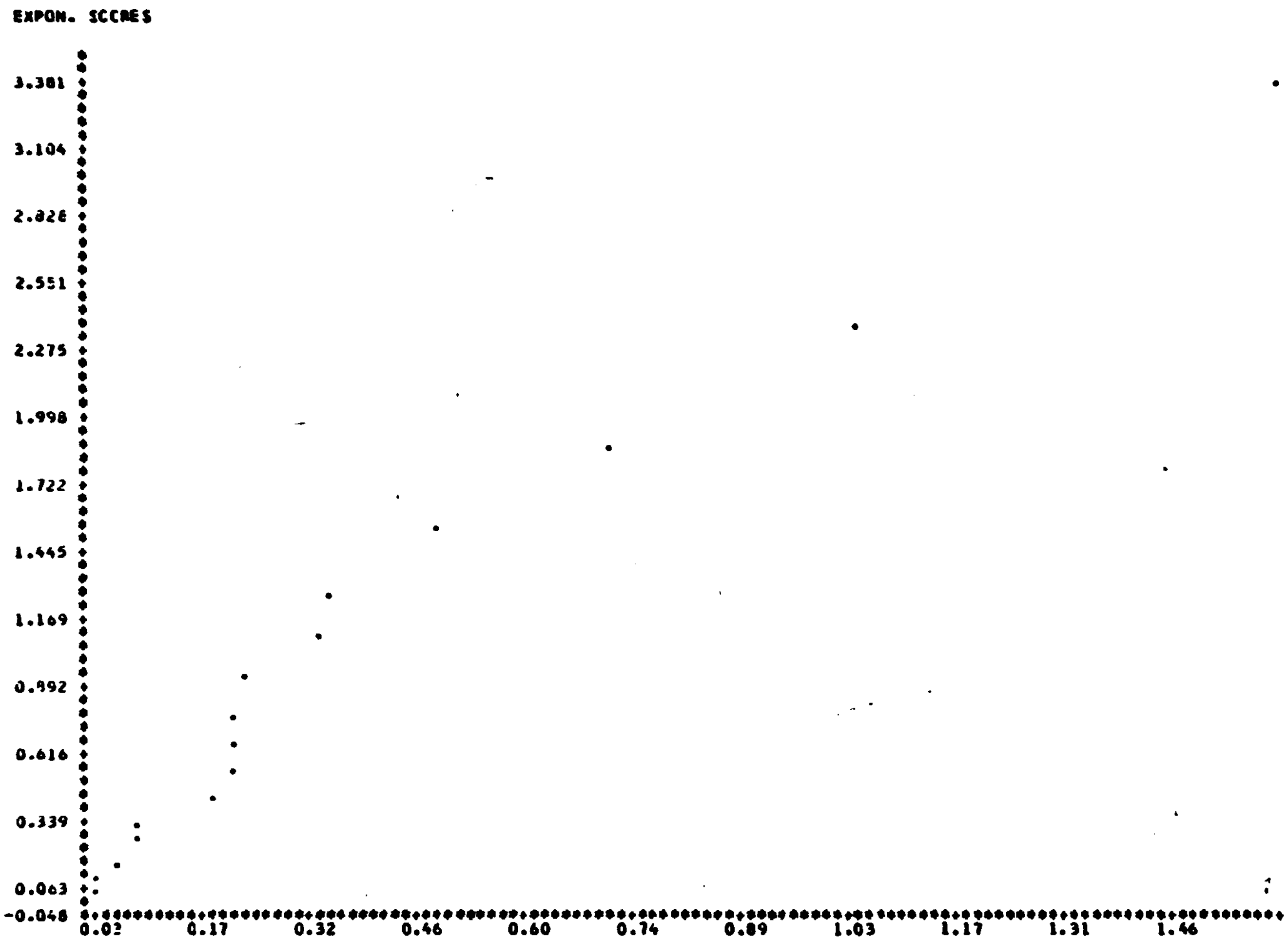


MICROCOPY RESOLUTION TEST CHART

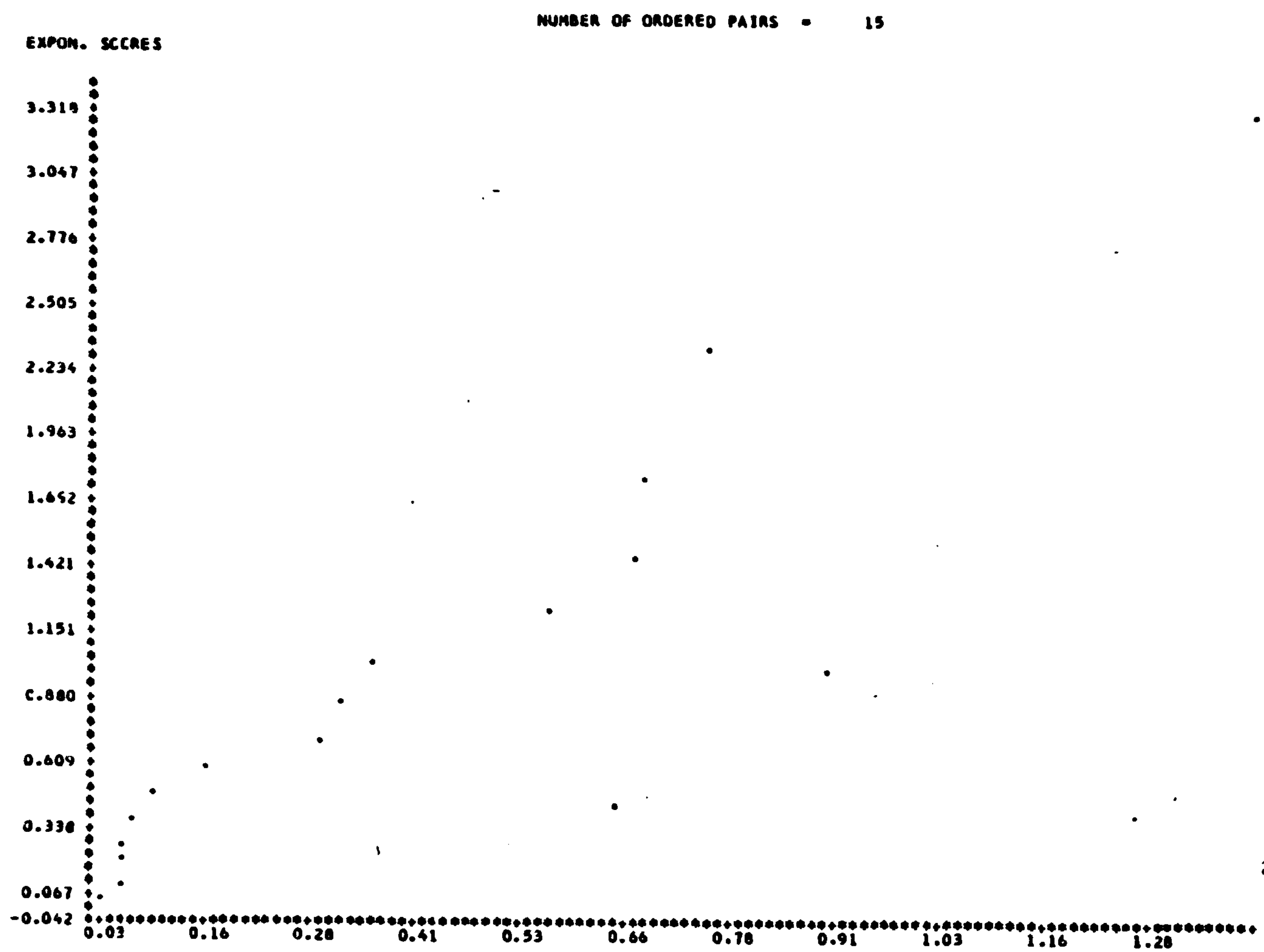
NUMBER OF ORDERED PAIRS = 16



X-SCALE : '*' = 0.143E-01 UNITS
Y-SCALE : '*' = 0.553E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 2.050803E+00 GAMMA2 = 3.163898E+00

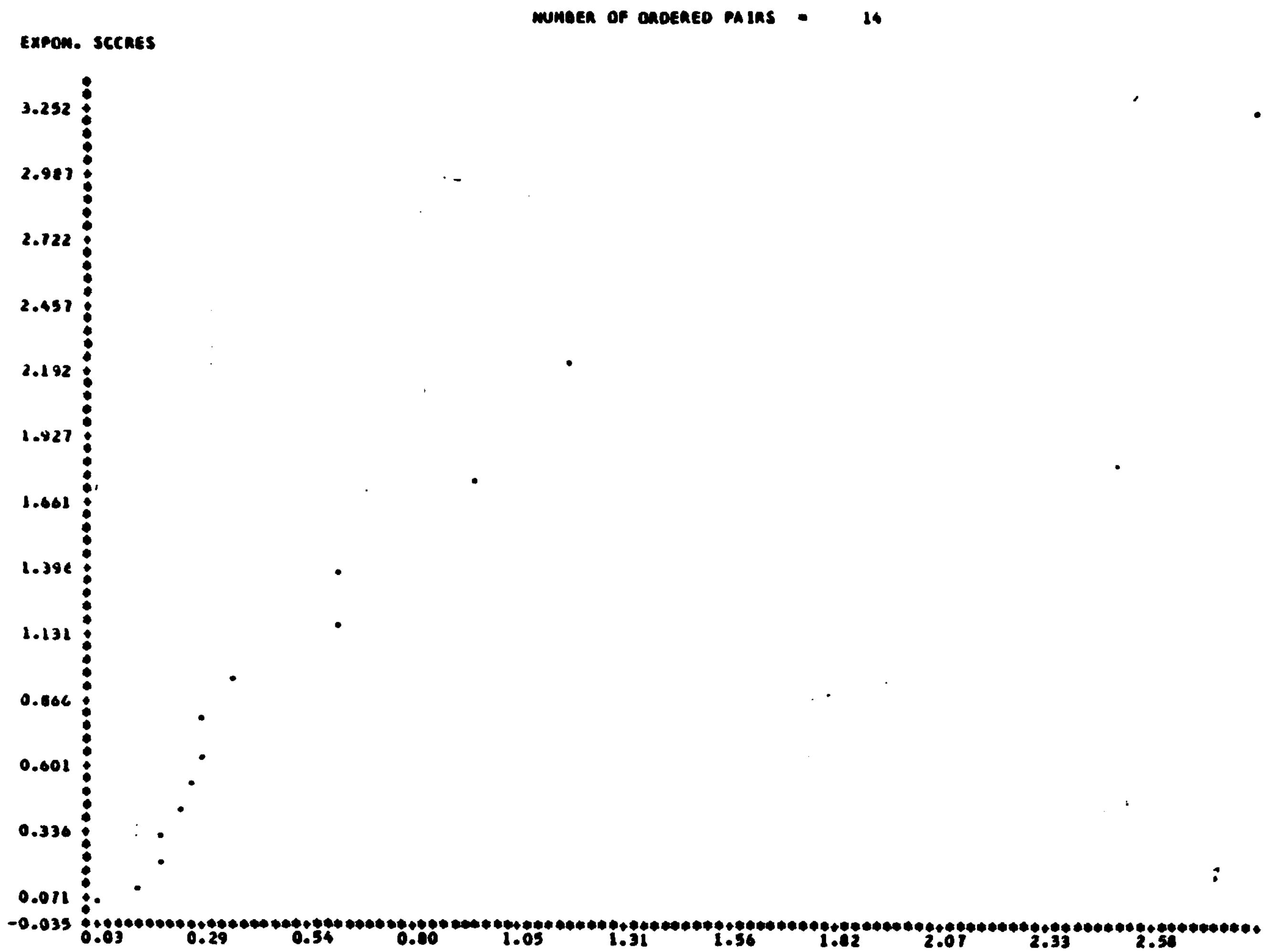
Figure 76. Exponential scores versus observed scores for week 03



X-SCALE : '*' = 0.125E-01 UNITS
Y-SCALE : '*' = 0.542E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.498537E+00 GAMMA2 = 1.652067E+00

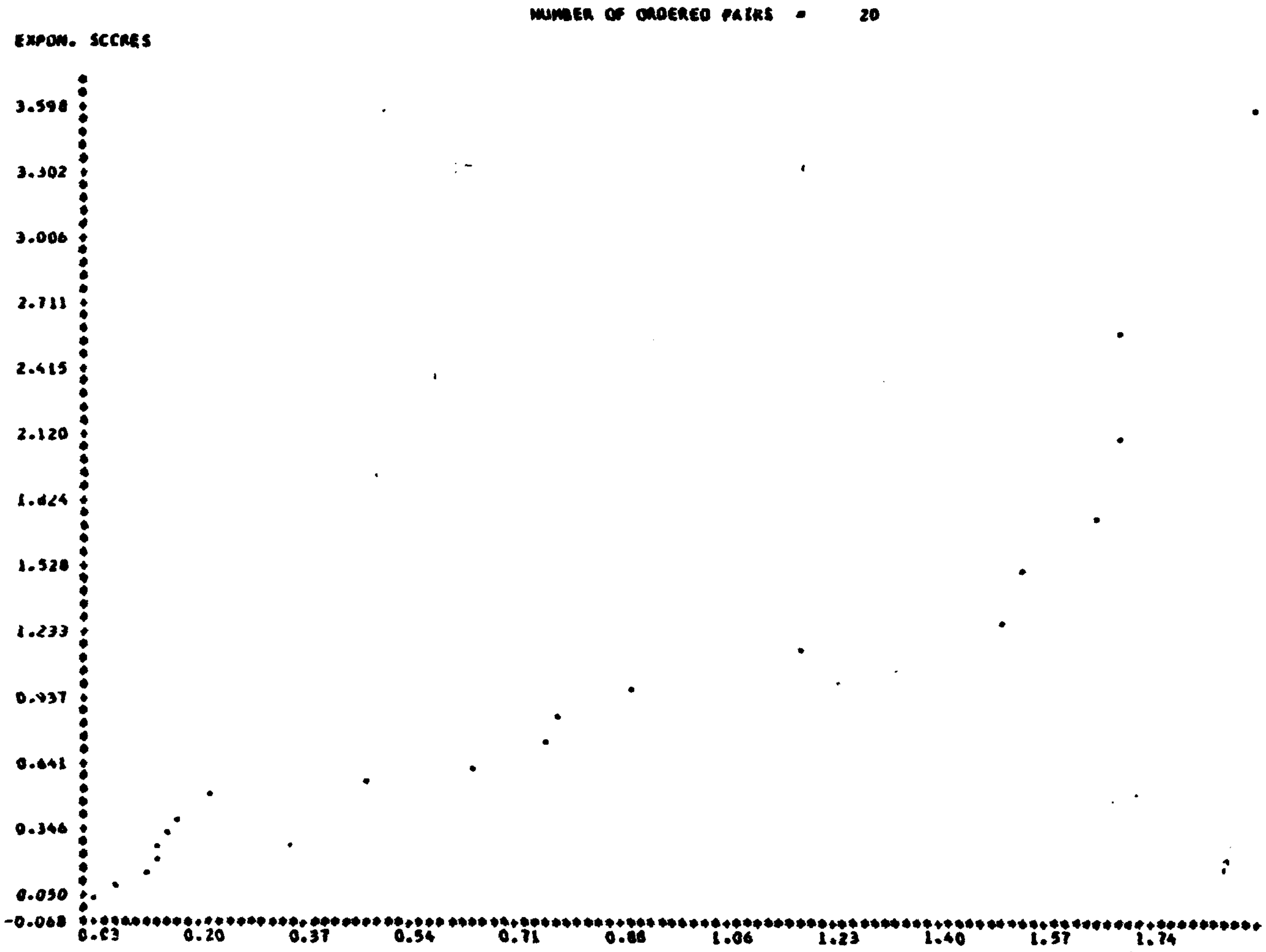
Figure 77. Exponential scores versus observed scores for week 04



X-SCALE : '*' = 0.255E-01 UNITS
Y-SCALE : '*' = 0.530E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 2.615961E+00 GAMMA2 = 5.815357E+00

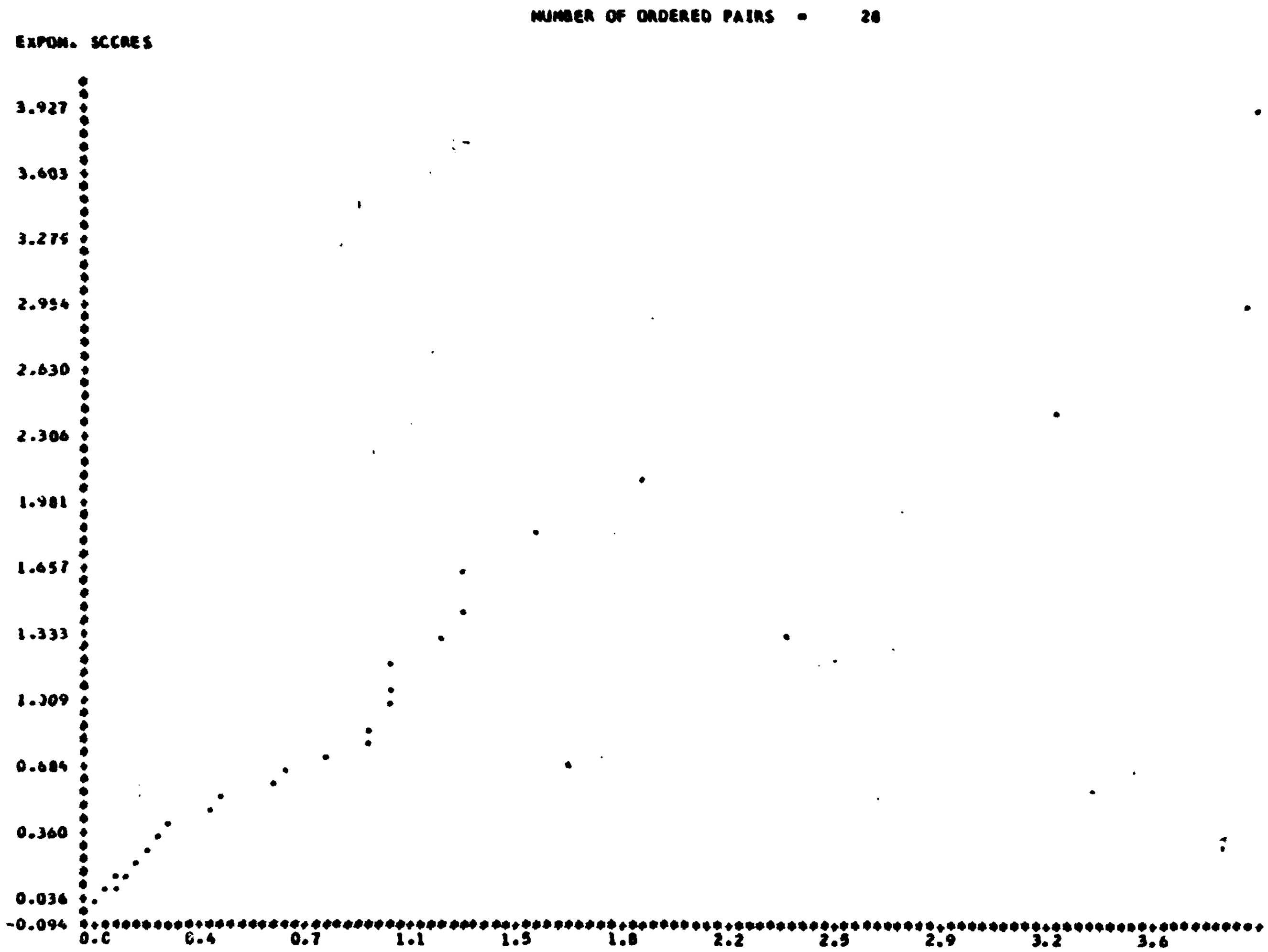
Figure 78. Exponential scores versus observed scores for week ON



X-SCALE : '*' = 0.171E-01 UNITS
Y-SCALE : '*' = 0.591E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 3.900155E-01 GAMMA2 = -1.575627E+00

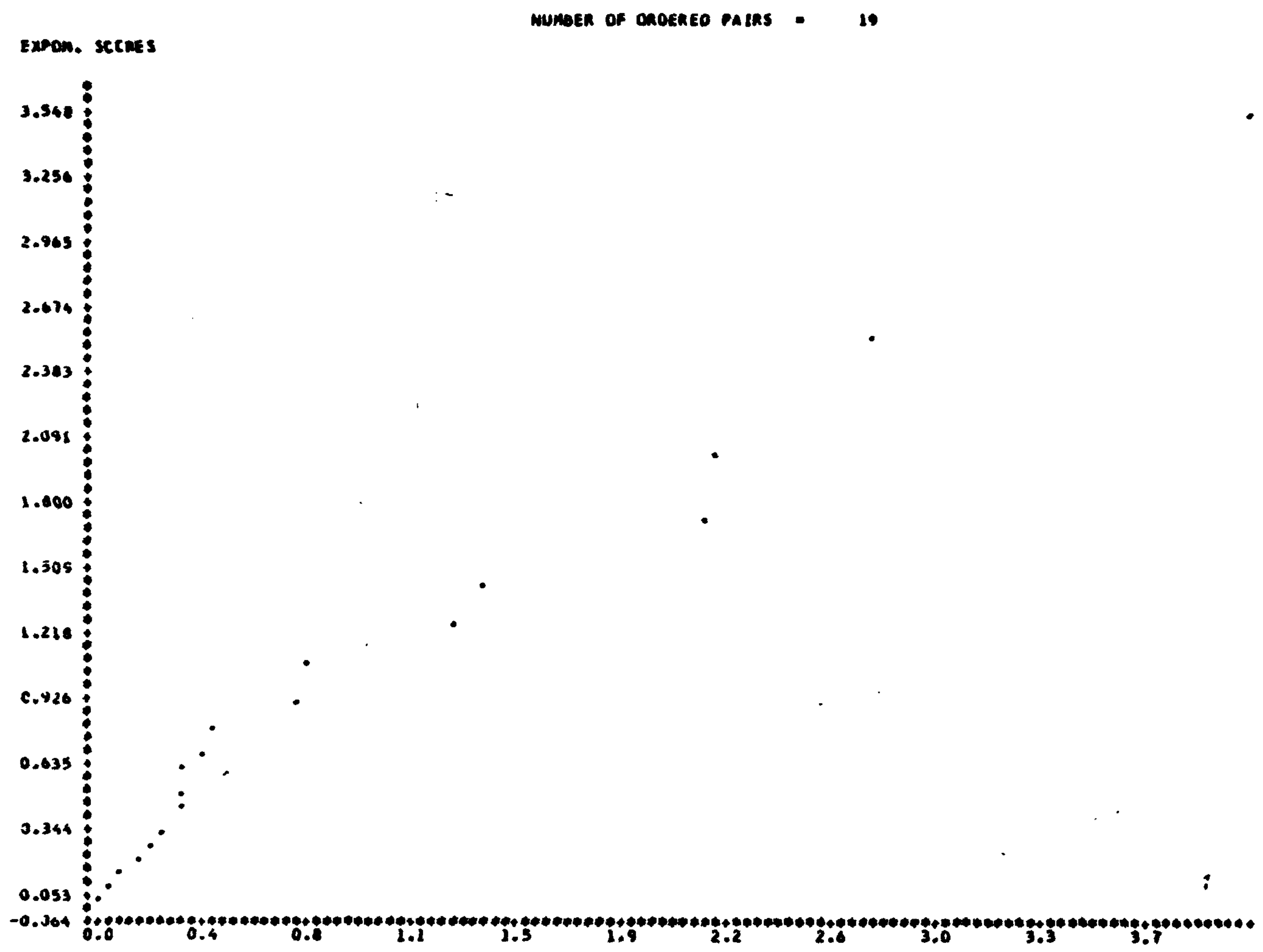
Figure 79. Exponential scores versus observed scores for week N1



X-SCALE : '*' = 0.356E-01 UNITS
Y-SCALE : '*' = 0.649E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.781254E+00 GAMMA2 = 2.257390E+00

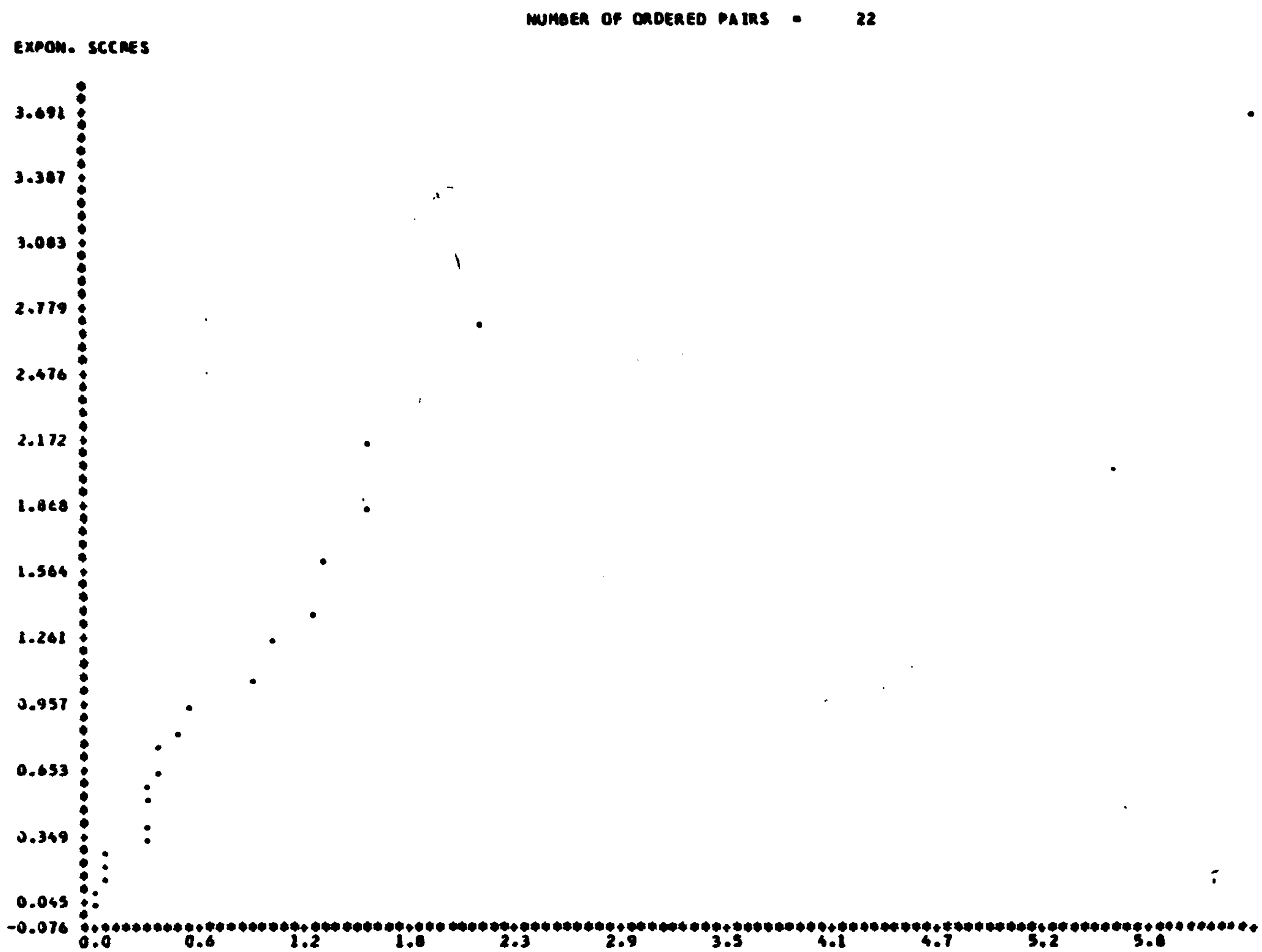
Figure 80. Exponential scores versus observed scores for week N2



X-SCALE : '+' = 0.365E-01 UNITS
Y-SCALE : '+' = 0.583E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.636559E+00 GAMMA2 = 1.644663E+00

Figure 81. Exponential scores versus observed scores for week N3

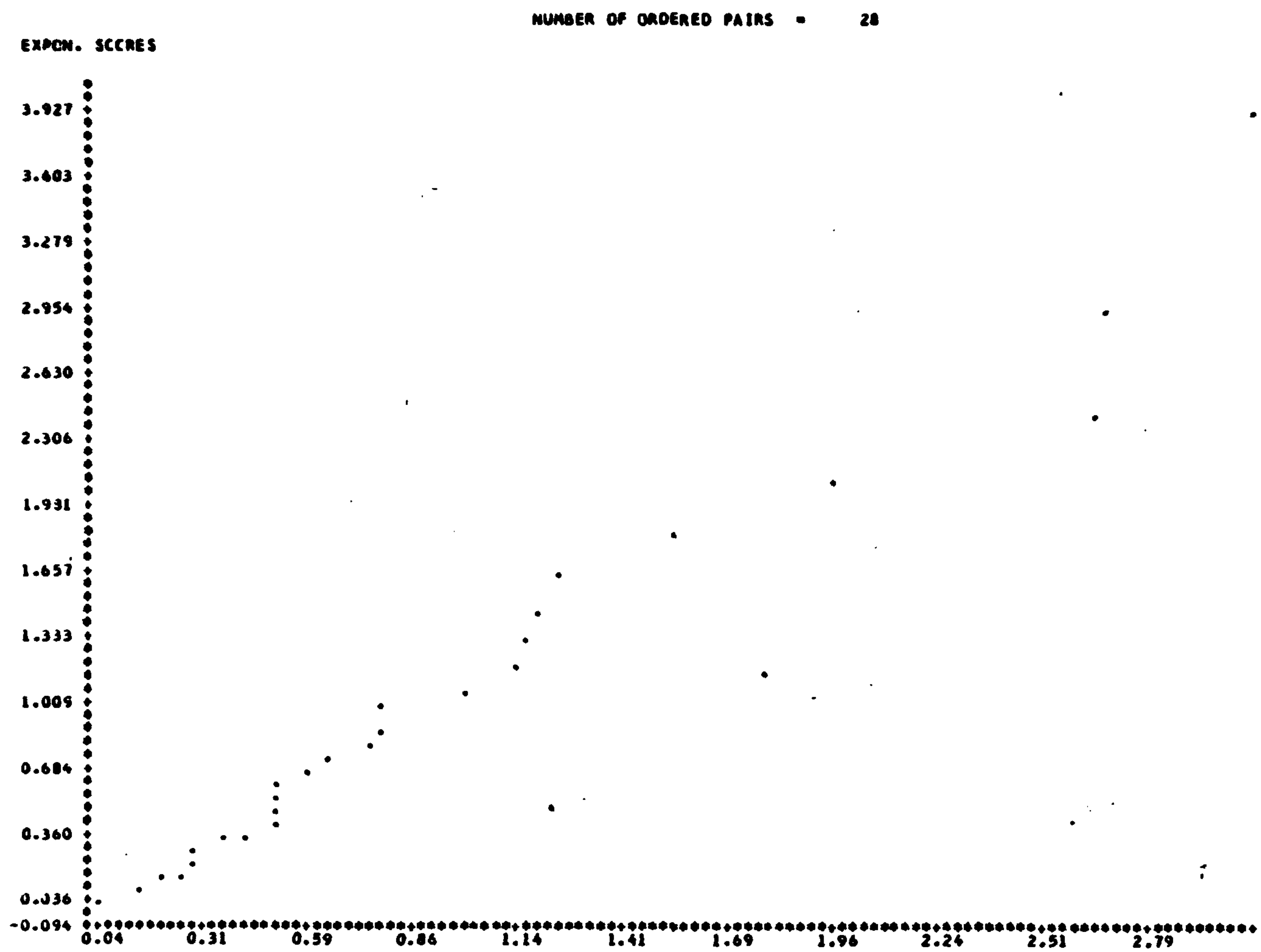


X-SCALE : '*' = 0.580E-01 UNITS

Y-SCALE : '*' = 0.608E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 3.385616E+00 GAMMA2 = 1.139031E+01

Figure 82. Exponential scores versus observed scores for week N4

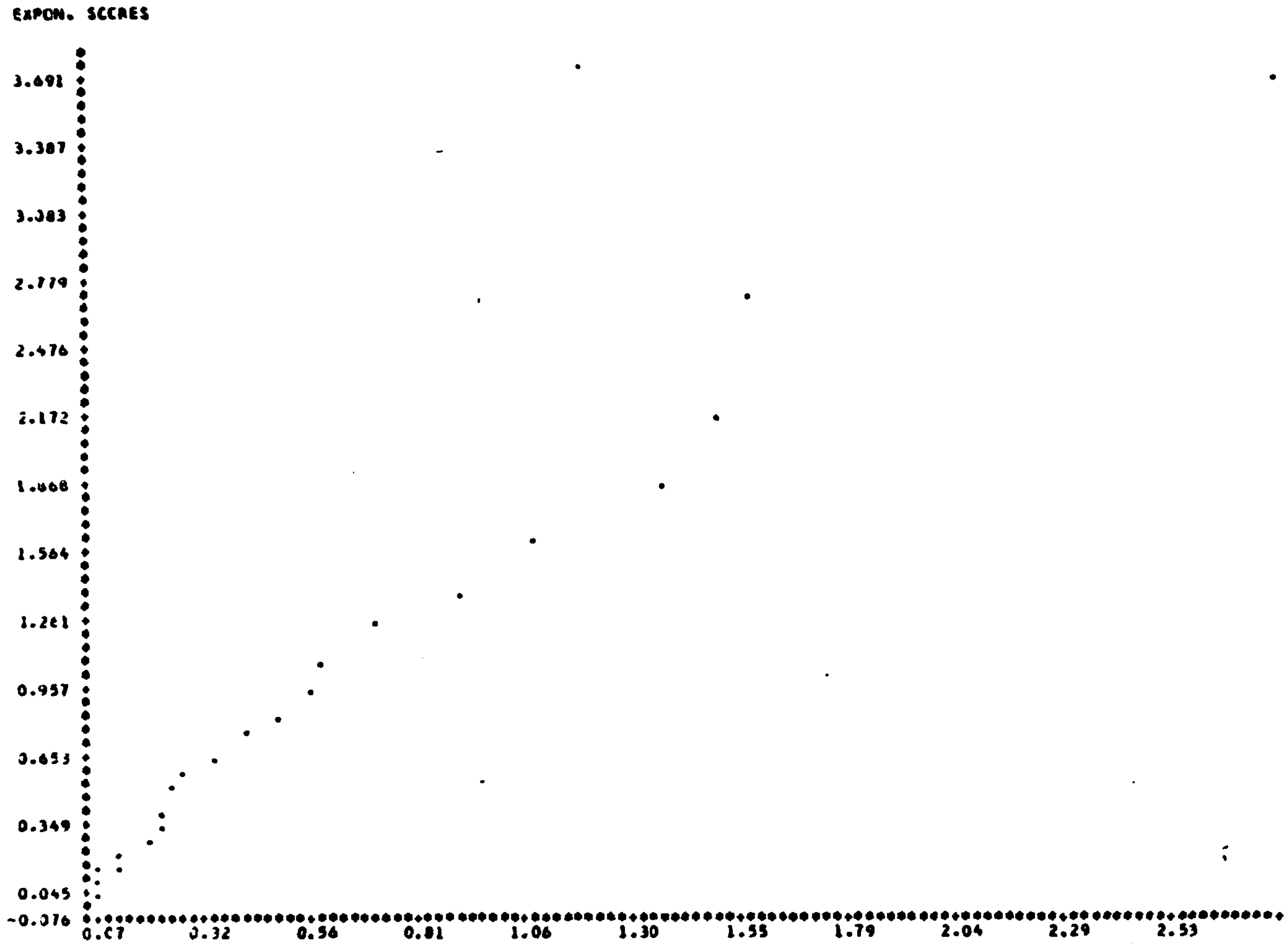


X-SCALE : '*' = 0.275E-01 UNITS
Y-SCALE : '*' = 0.649E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.448464E+00 GAMMA2 = 1.076383E+00

Figure 83. Exponential scores versus observed scores for week D1

NUMBER OF ORDERED PAIRS = 22



X-SCALE : '*' = 0.246E-01 UNITS

Y-SCALE : '*' = 0.608E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.834657E+00 GAMMA2 = 3.027522E+00

Figure 84. Exponential scores versus observed scores for week D2

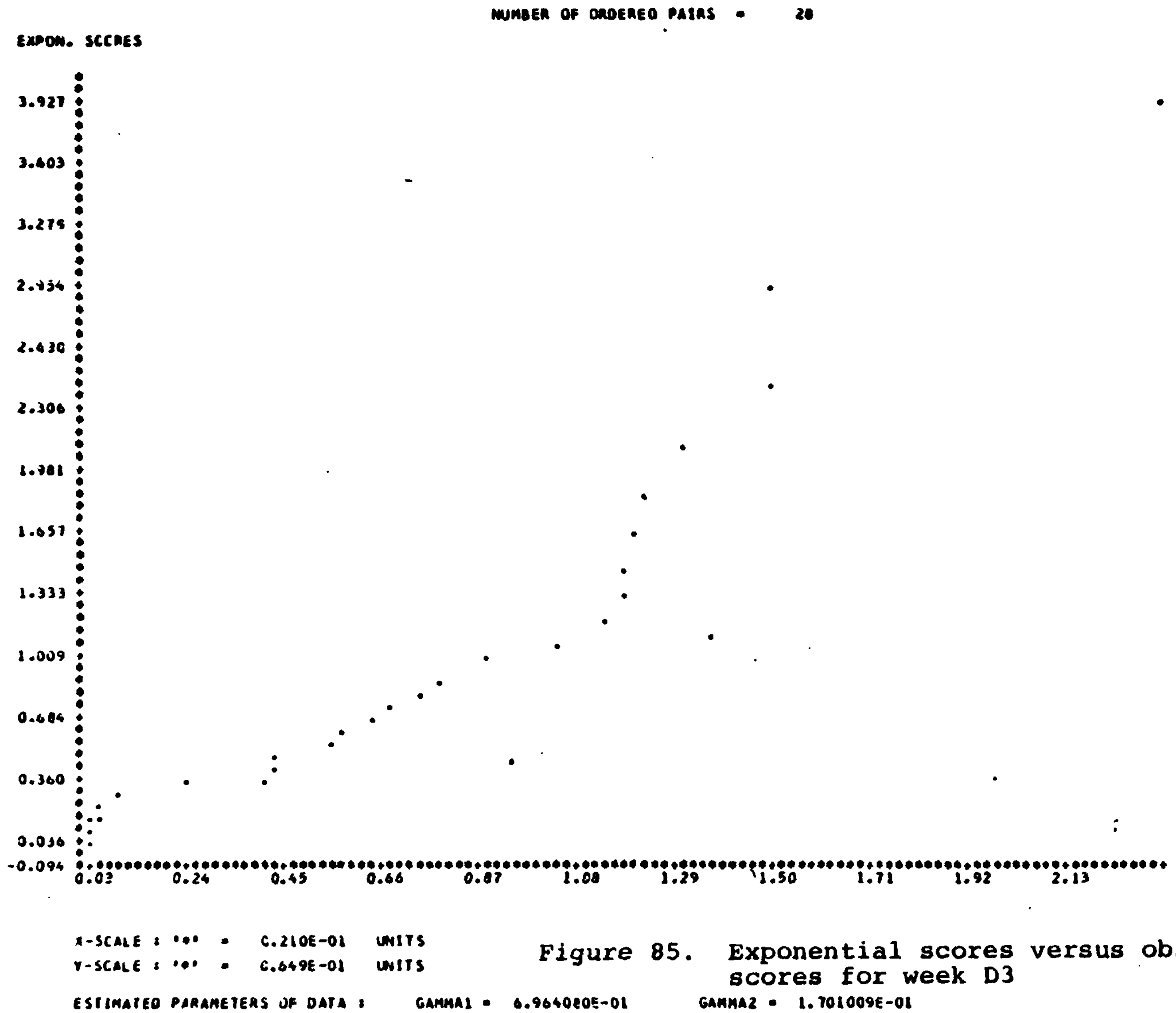


Figure 85. Exponential scores versus observed scores for week D3

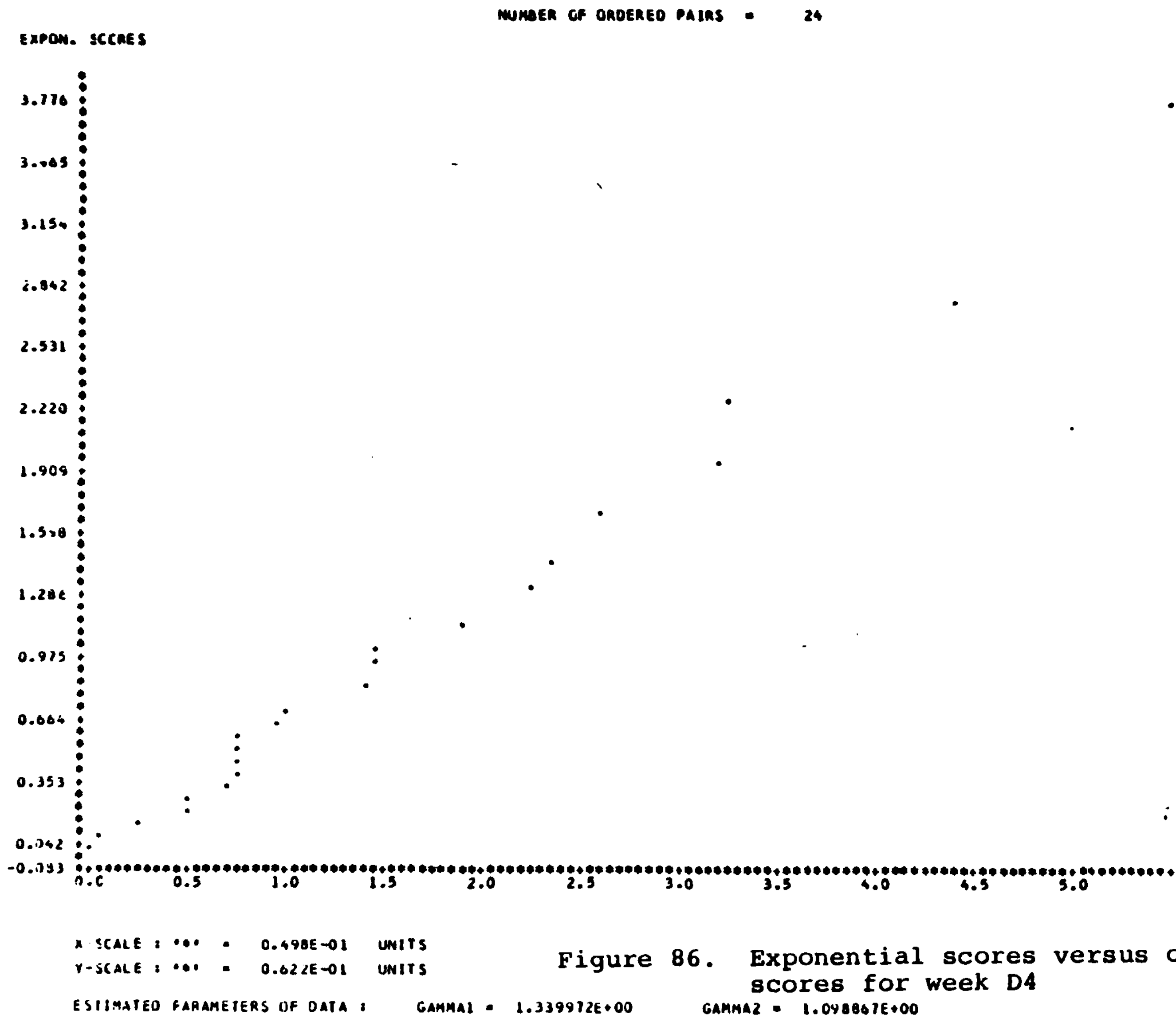
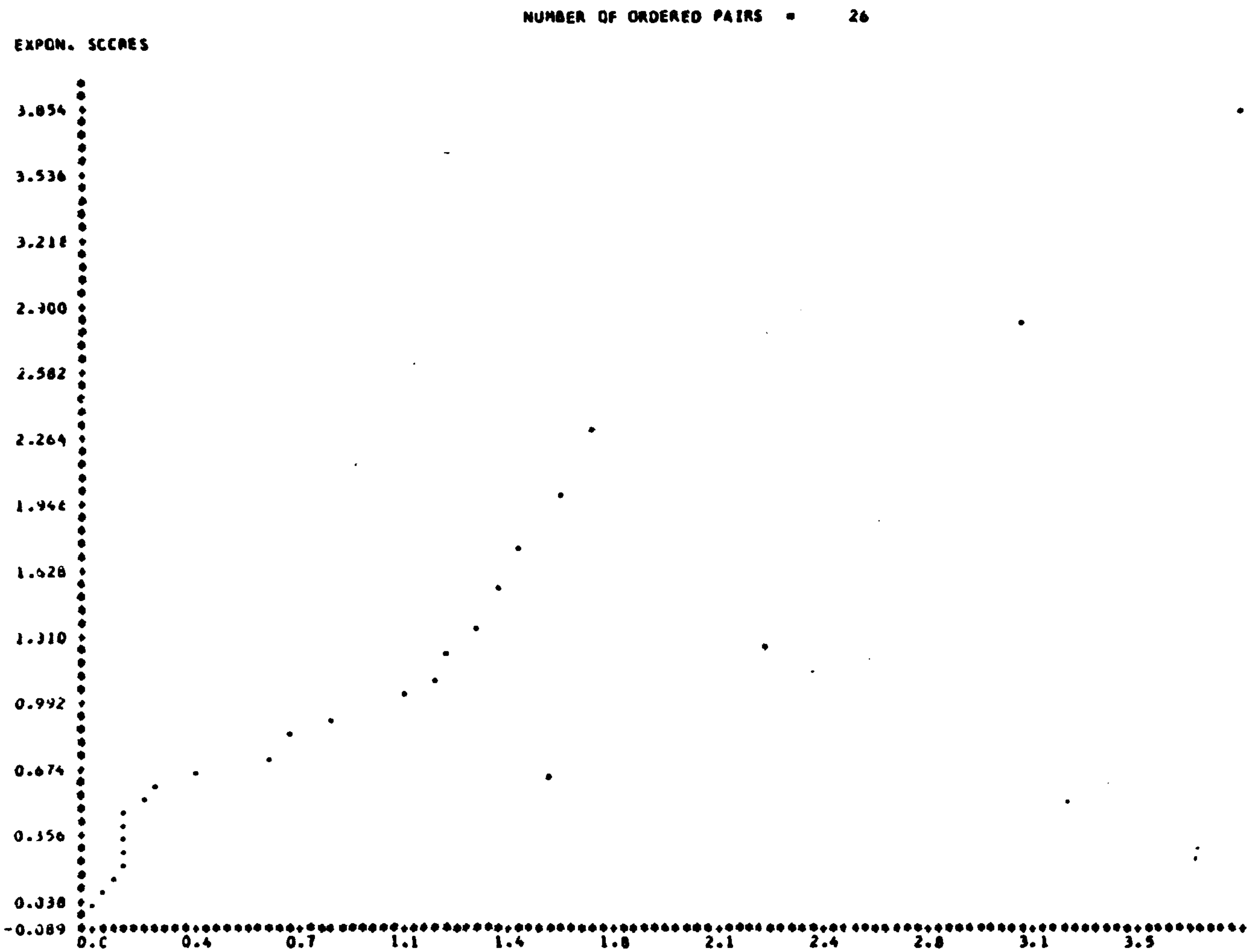
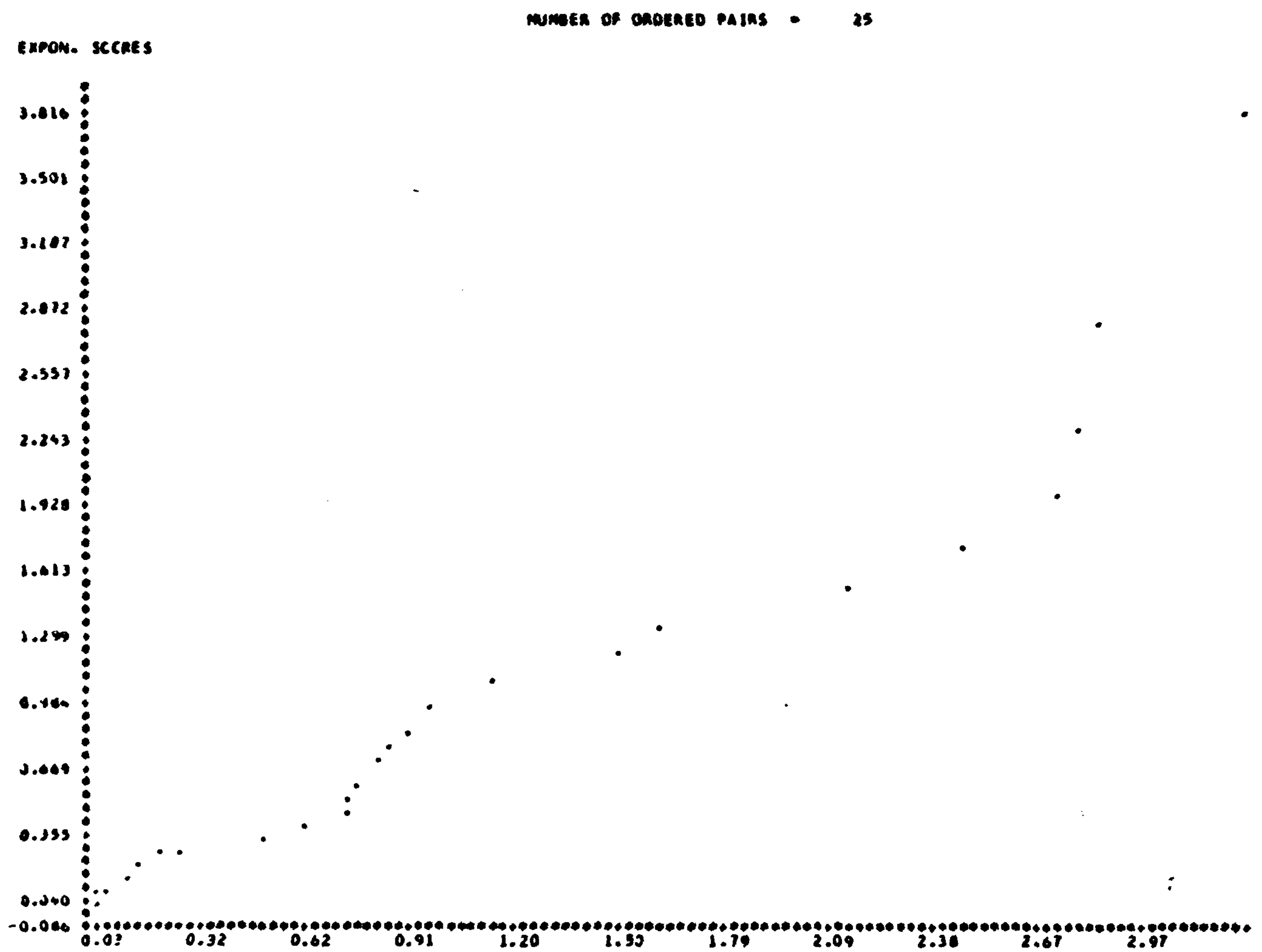


Figure 86. Exponential scores versus observed scores for week D4



X-SCALE : '+' = 0.345E-01 UNITS
Y-SCALE : '+' = 0.636E-01 UNITS
ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.733326E+00 GAMMA2 = 2.656740E+00

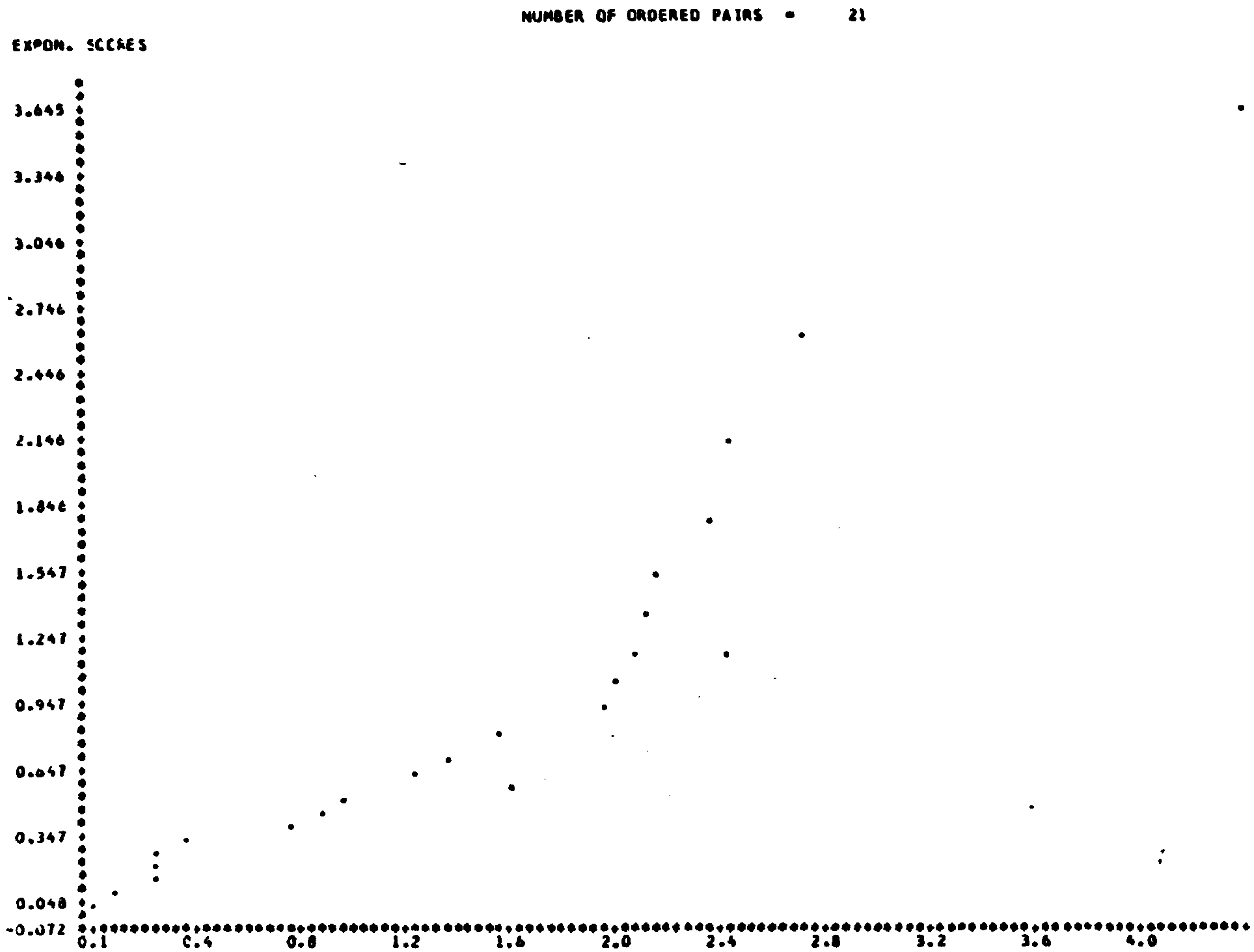
Figure 87. Exponential scores versus observed scores for week J1



X-SCALE : *** = 0.294E-01 UNITS
Y-SCALE : *** = 0.629E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 8.340170E-01 GAMMA2 = -7.332582E-01

Figure 88. Exponential scores versus observed scores for week J2



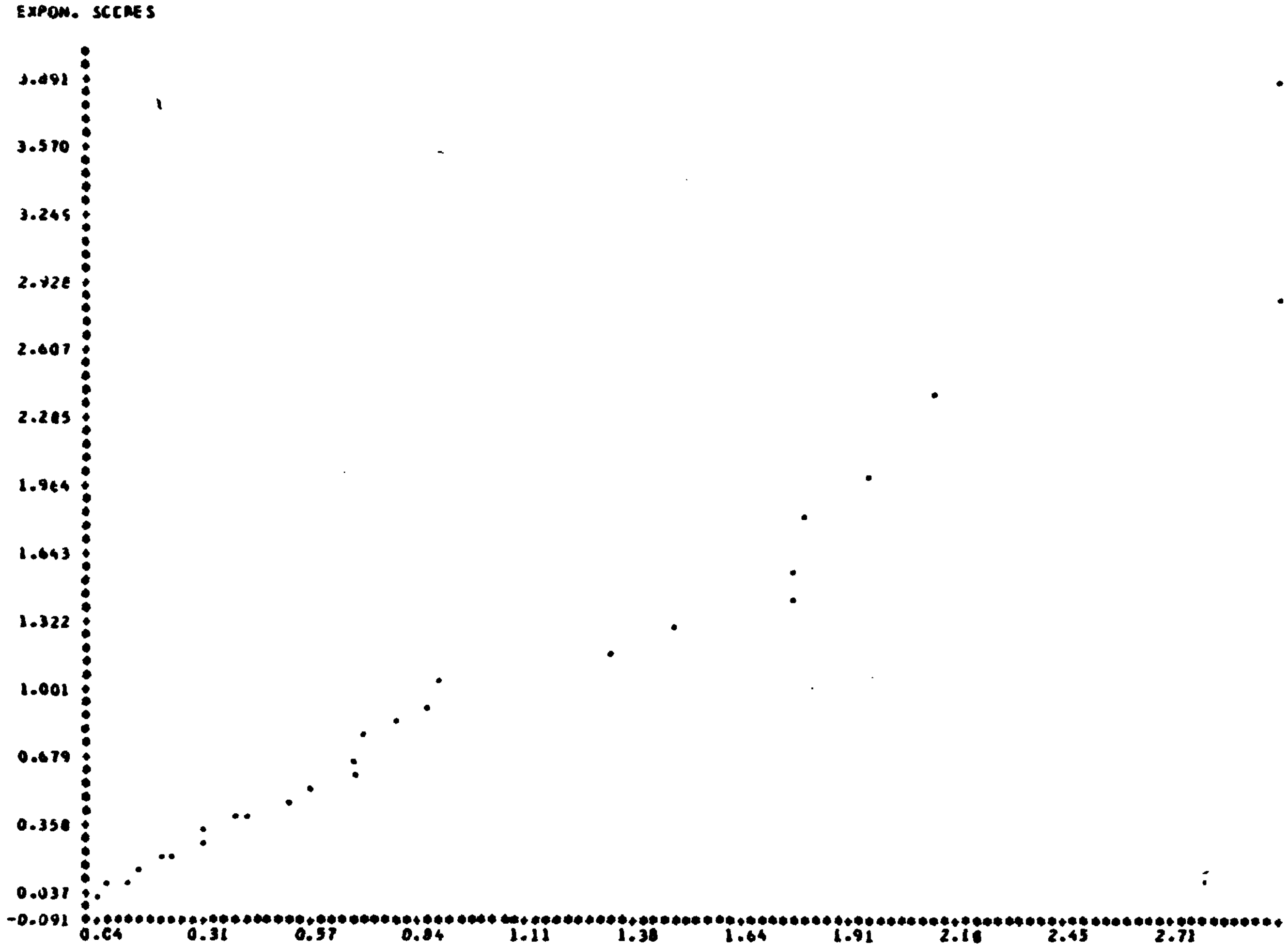
X-SCALE : '*' = 0.389E-01 UNITS

Y-SCALE : '*' = 0.600E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 7.564707E-01 GAMMA2 = 4.405704E-01

Figure 89. Exponential scores versus observed scores for week J3

NUMBER OF ORDERED PAIRS = 27



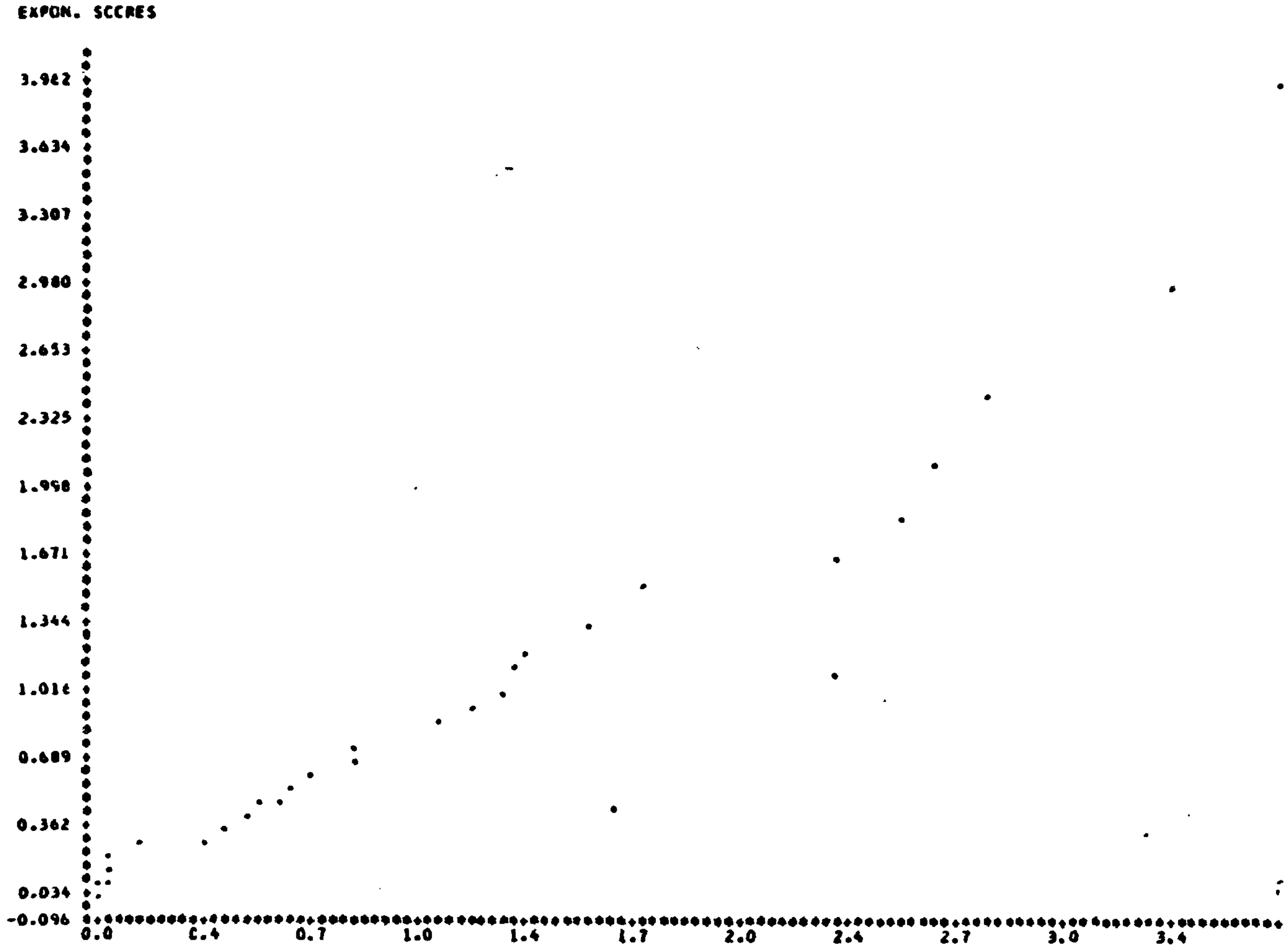
X-SCALE : '+' = 0.267E-01 UNITS

Y-SCALE : '+' = 0.642E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.038048E+00 GAMMA2 = -9.423792E-03

Figure 90. Exponential scores versus observed scores for week J4

NUMBER OF ORDERED PAIRS = 29



X-SCALE : '*' = 0.335E-01 UNITS
Y-SCALE : '*' = 0.655E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.001960E+00 GAMMA2 = -1.076772E-01

Figure 91. Exponential scores versus observed scores for week JF

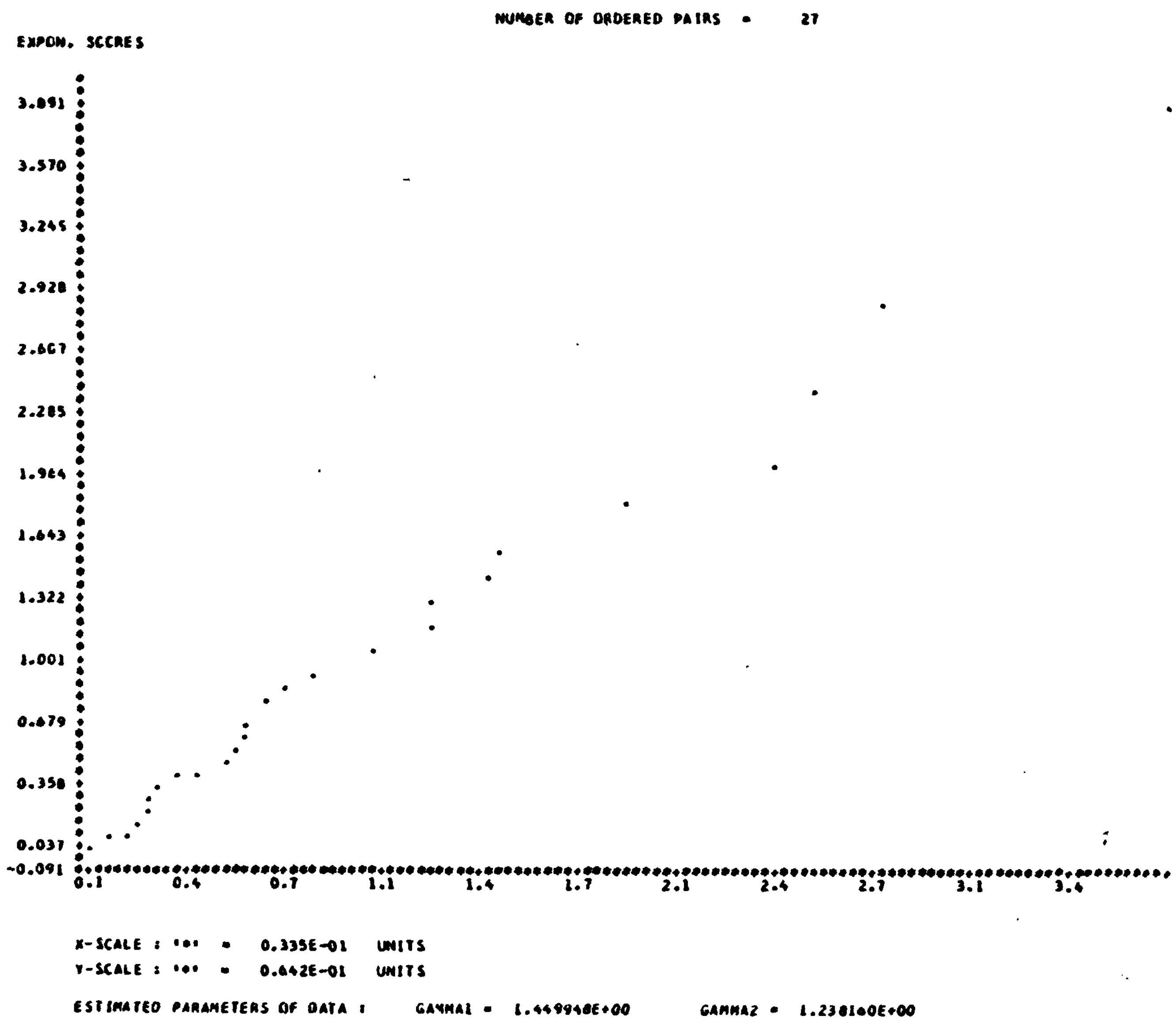
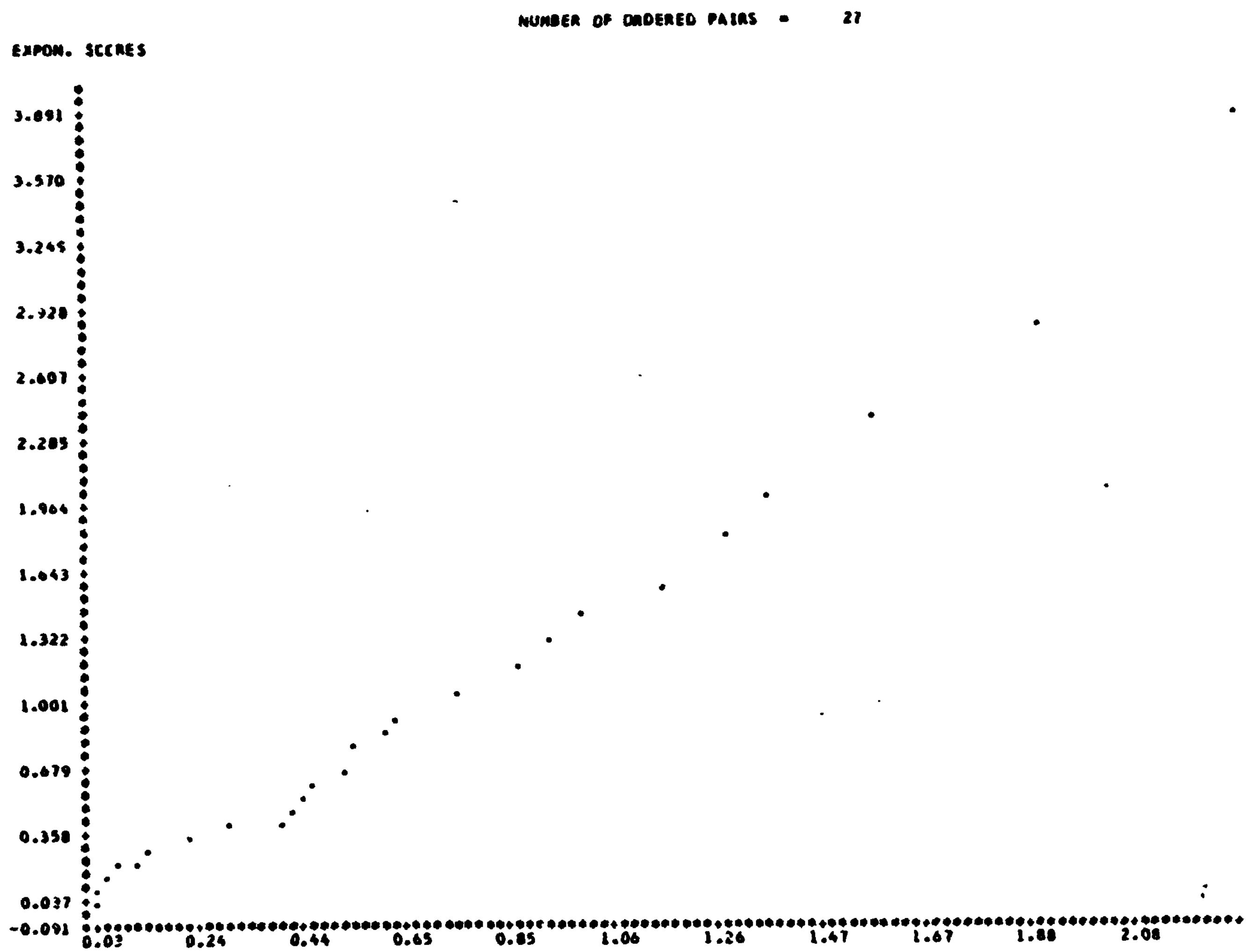


Figure 92. Exponential scores versus observed scores for week F1



X-SCALE : '*' = 0.205E-01 UNITS
Y-SCALE : '*' = 0.642E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.098998E+00 GAMMA2 = 4.708149E-01

Figure 93. Exponential scores versus observed scores for week F2

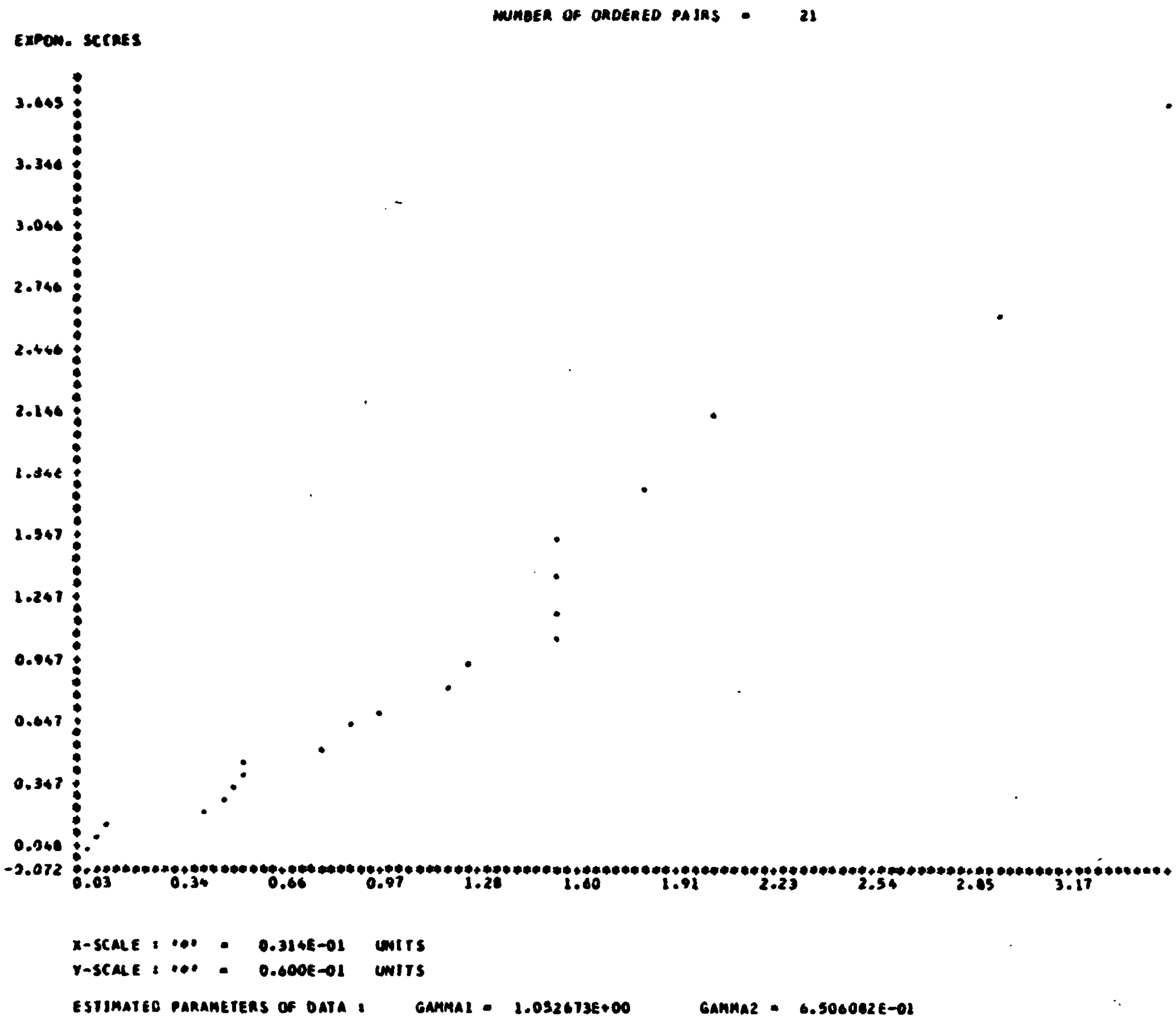


Figure 94. Exponential scores versus observed scores for week F3

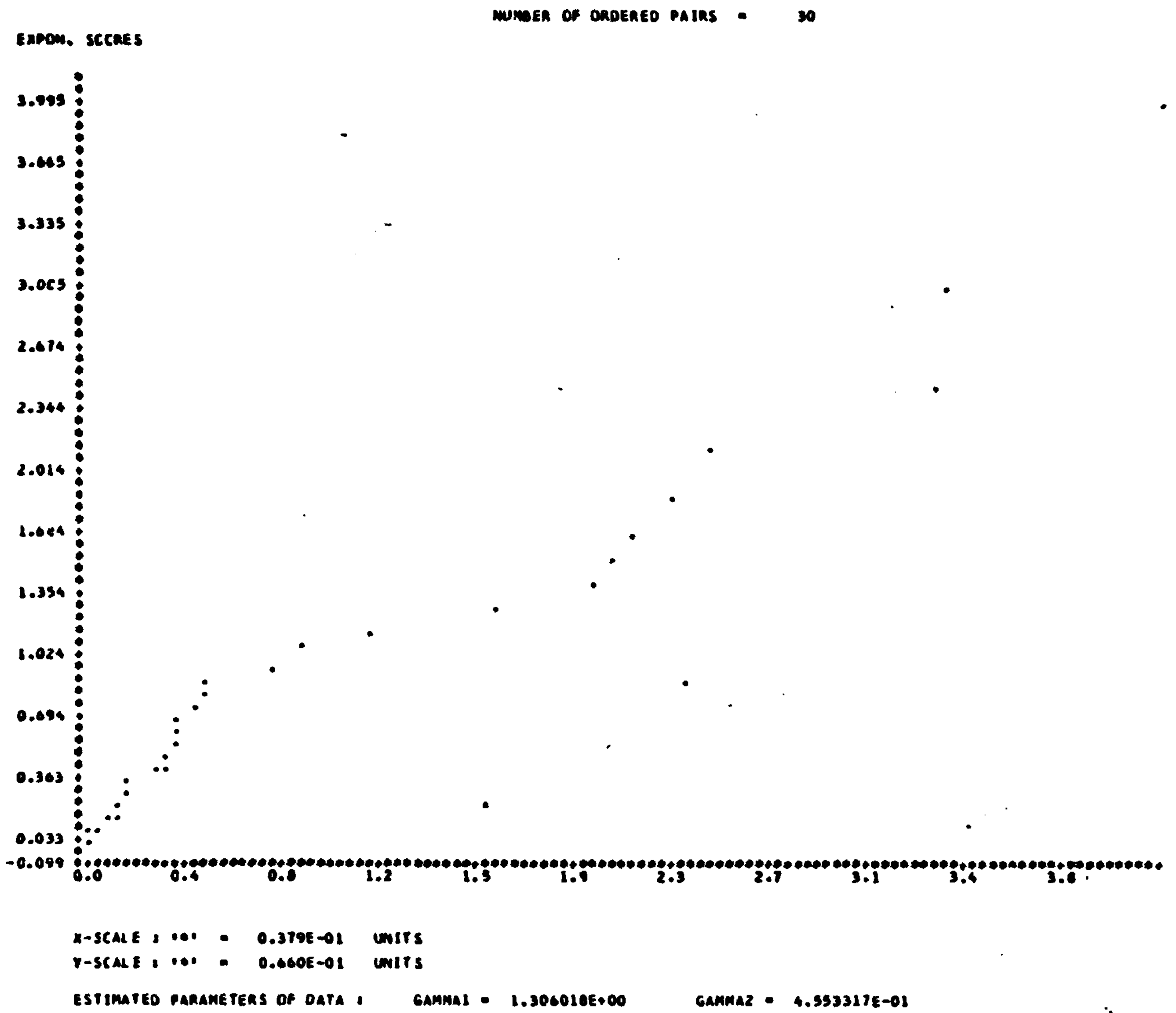
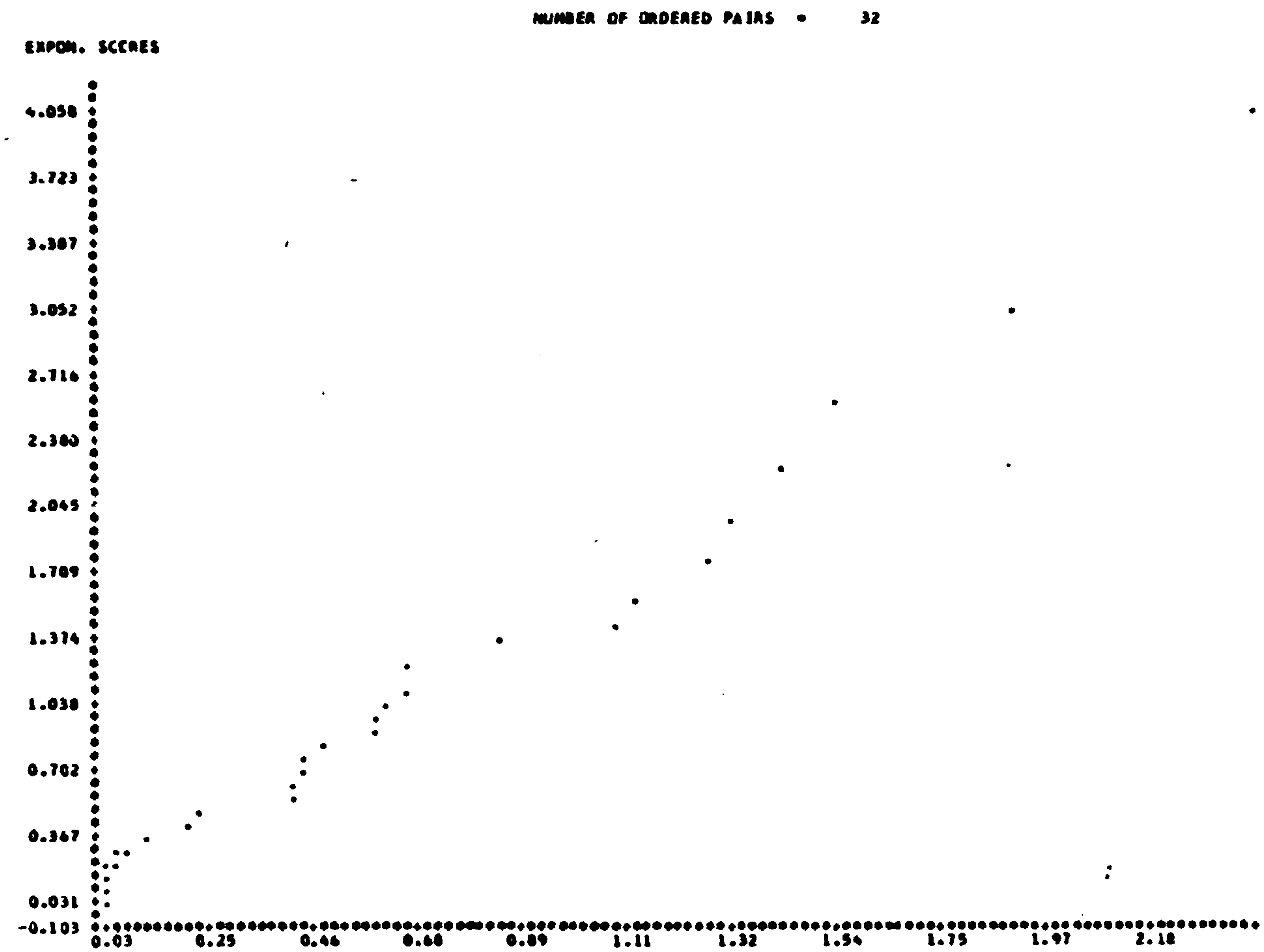


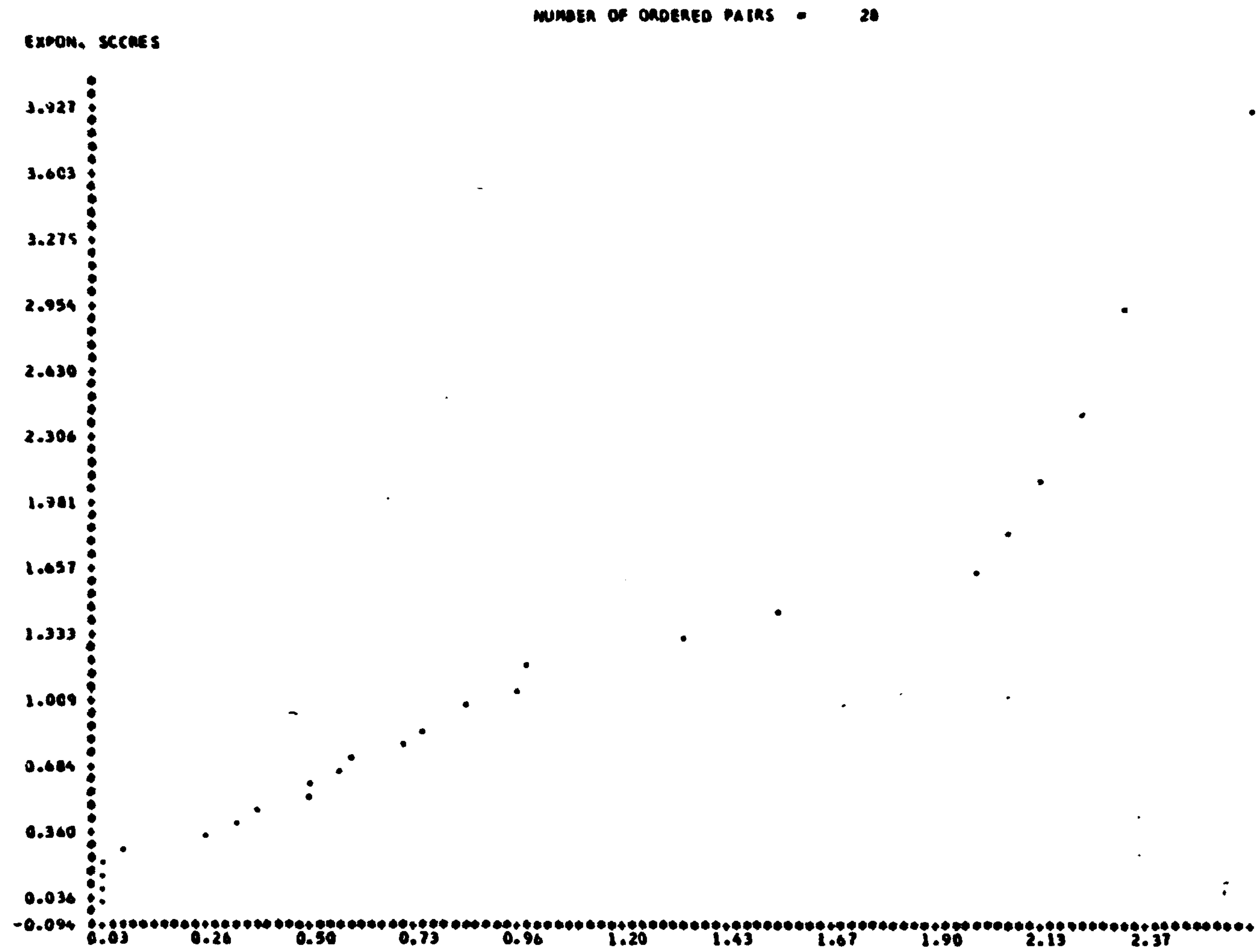
Figure 95. Exponential scores versus observed scores for week FM



X-SCALE : '*' = 0.215E-01 UNITS
Y-SCALE : '*' = 0.671E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.247642E+00 GAMMA2 = 8.420682E-01

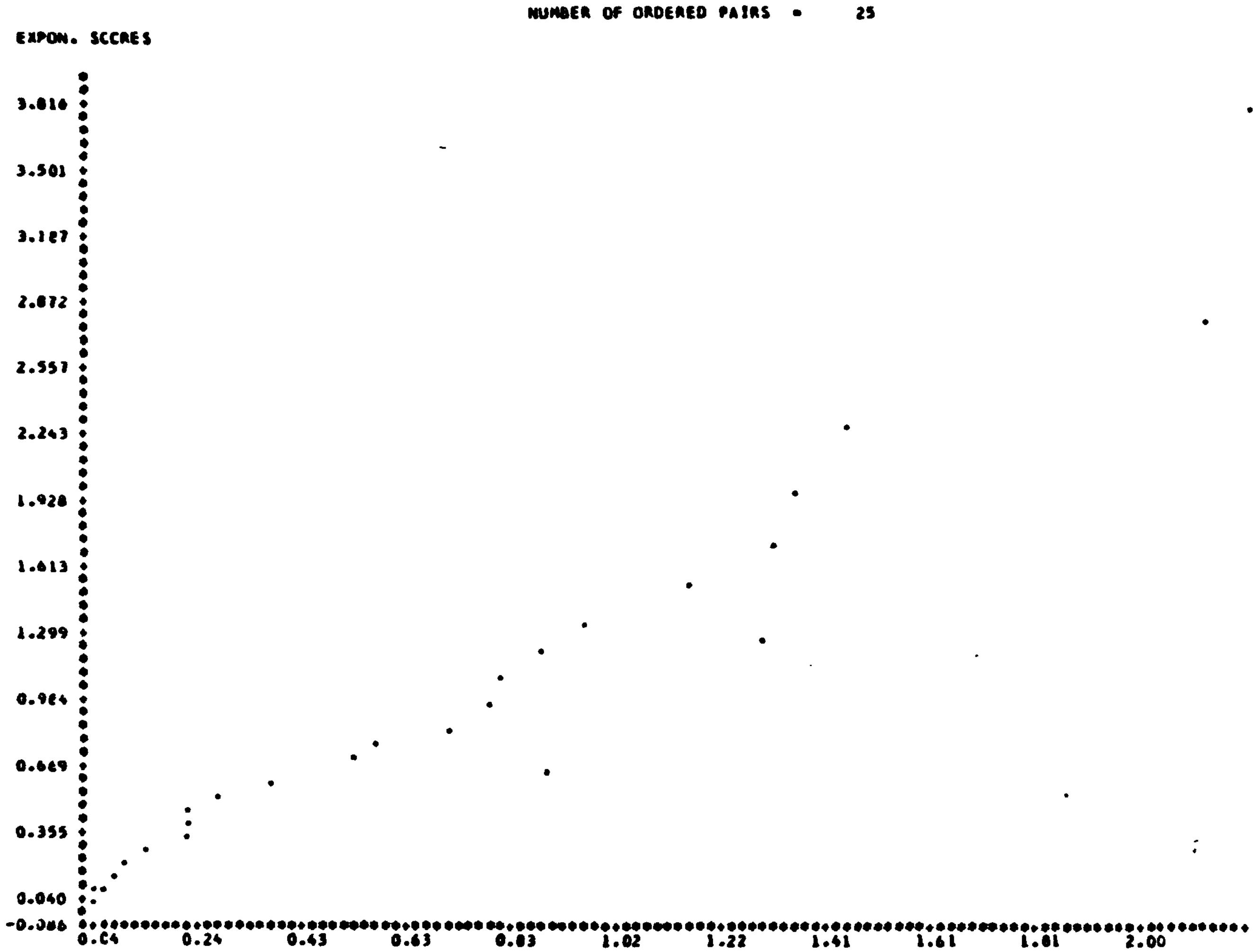
Figure 96. Exponential scores versus observed scores for week M1



X-SCALE : '*' = 0.234E-01 UNITS
Y-SCALE : '*' = 0.649E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 0.310531E-01 GAMMA2 = -0.126241E-01

Figure 97. Exponential scores versus observed scores for week M2



X-SCALE : '*' = 0.196E-01 UNITS
Y-SCALE : '*' = 0.629E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.072556E+00 GAMMA2 = 1.695281E-01

Figure 98. Exponential scores versus observed scores for week M3

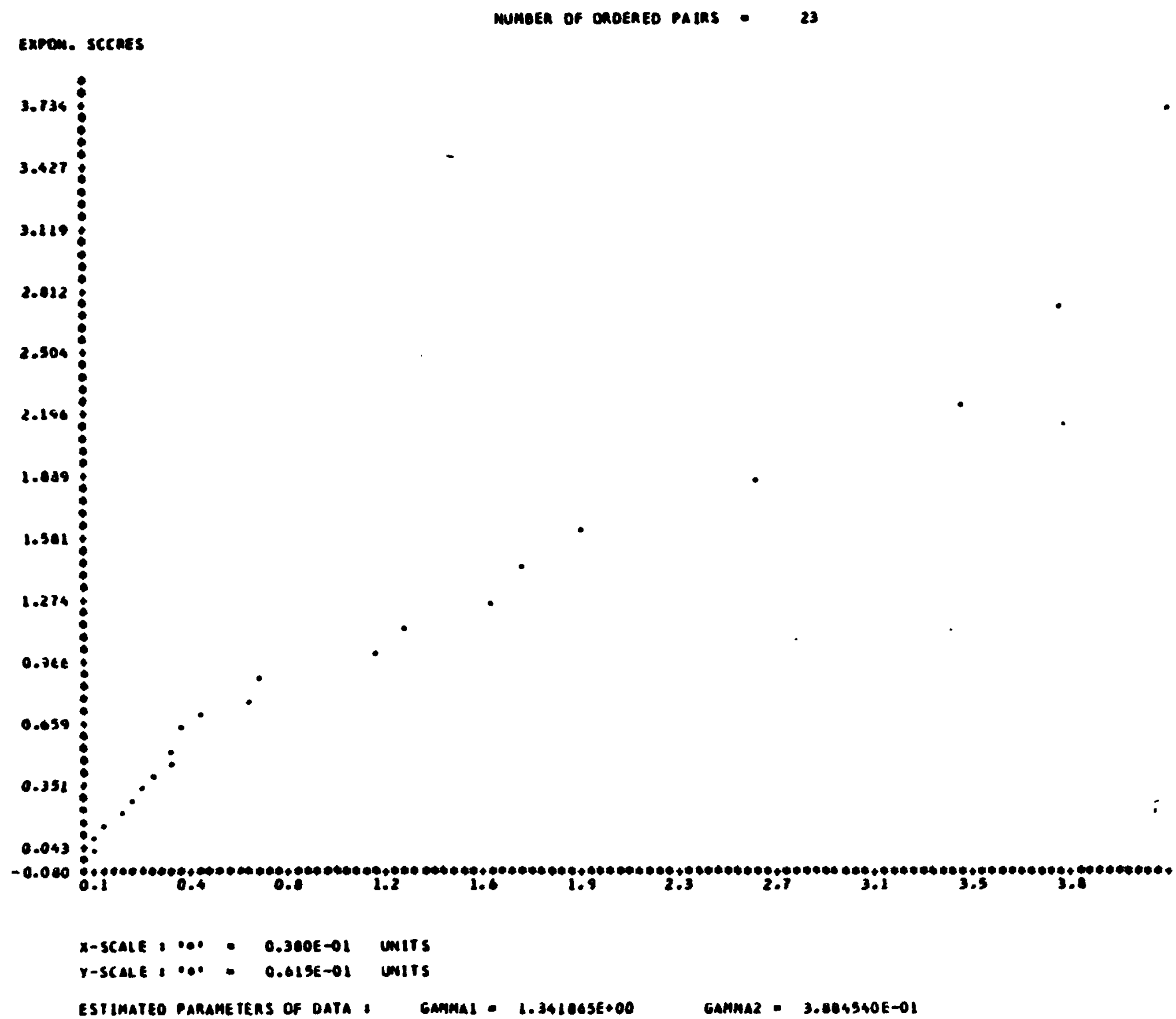


Figure 99. Exponential scores versus observed scores for week M4

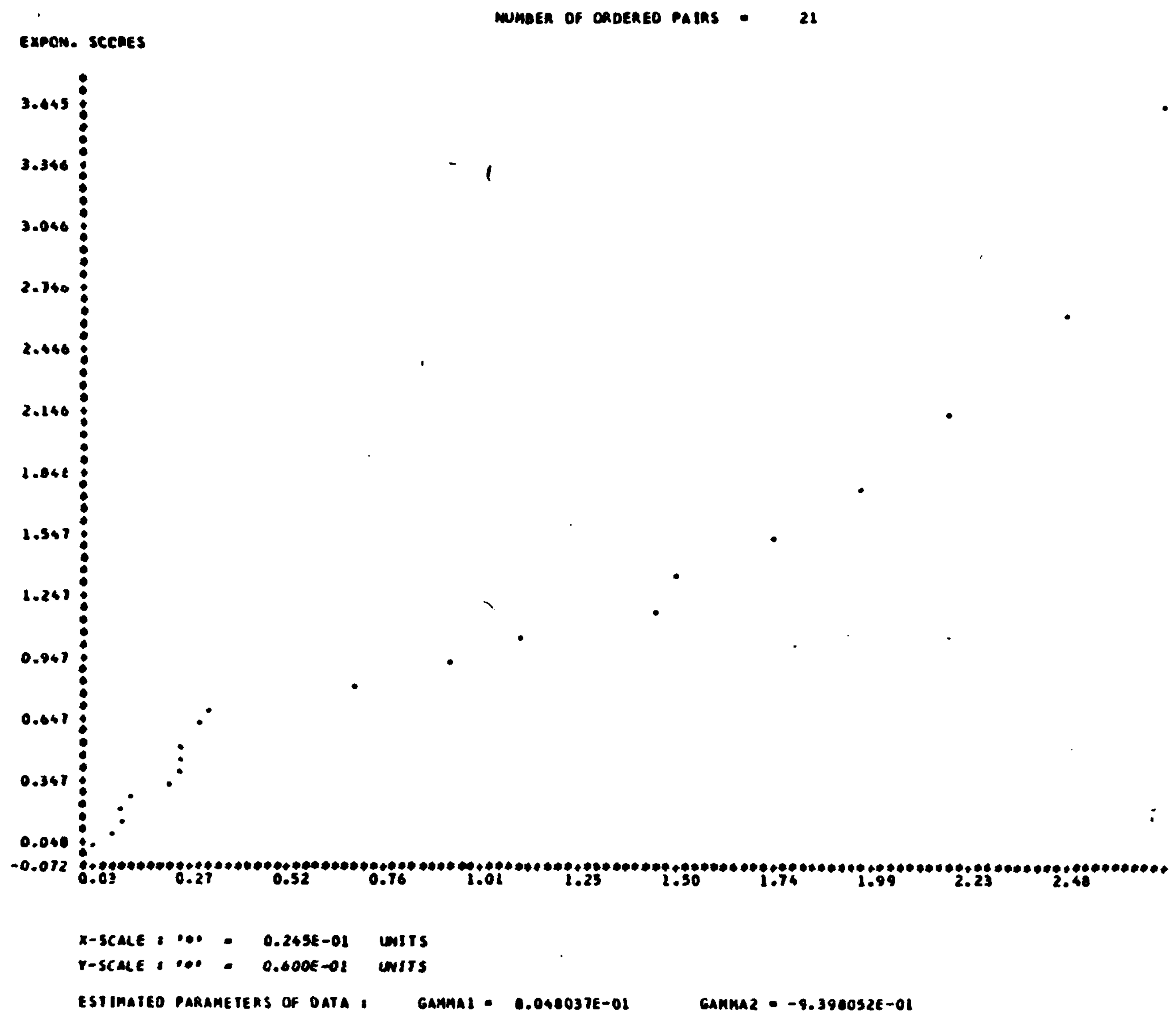


Figure 100. Exponential scores versus observed scores for week A1

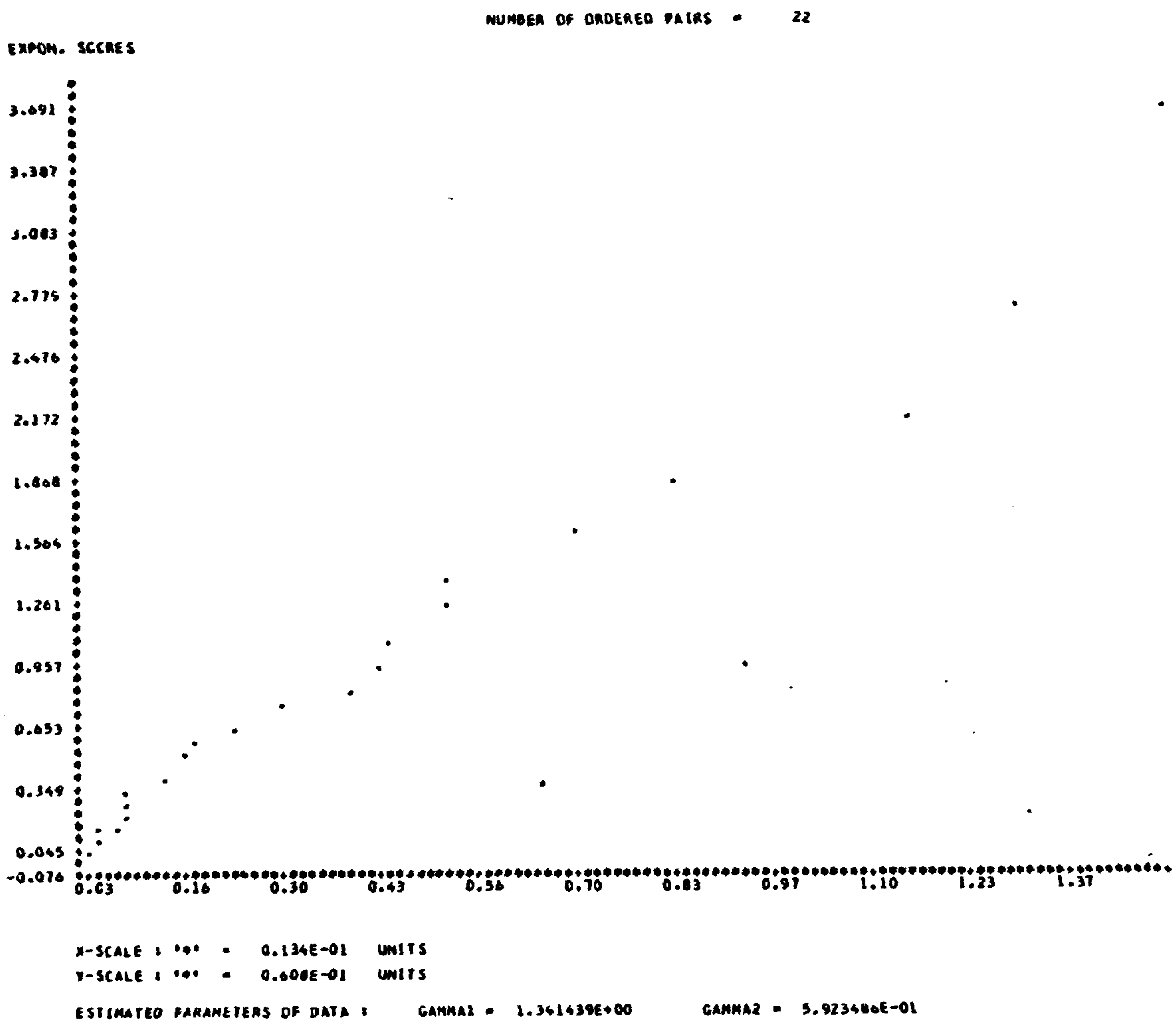
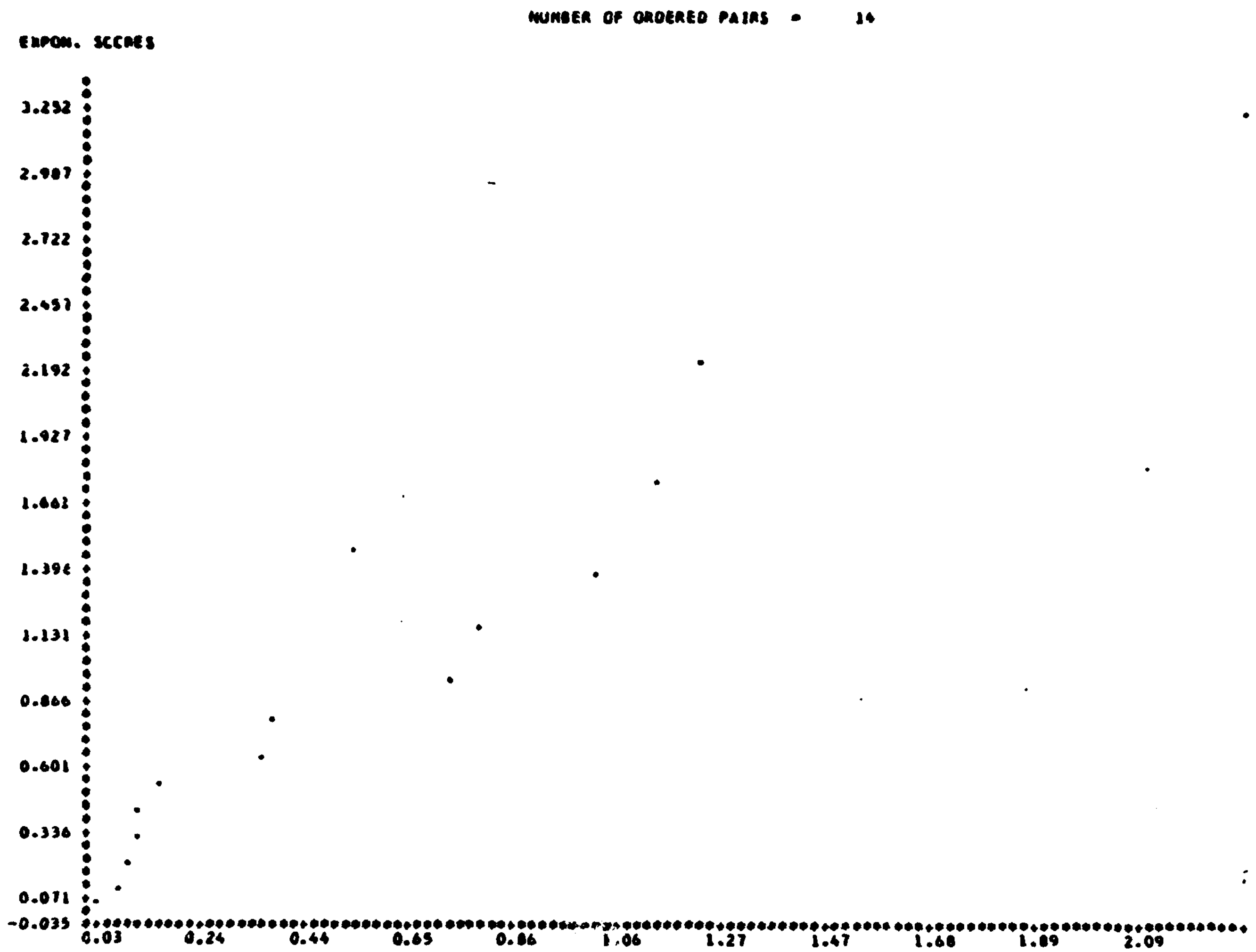


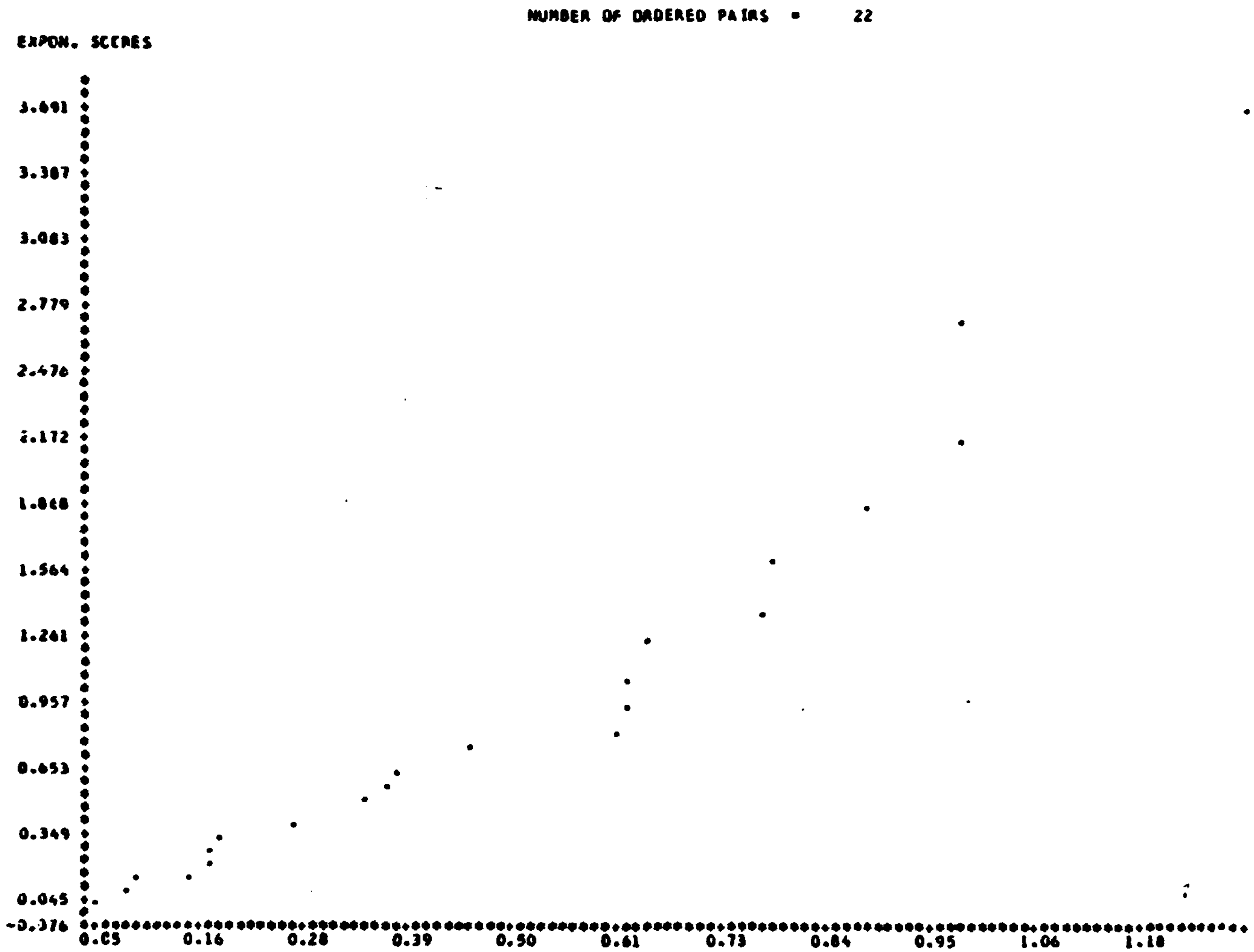
Figure 101. Exponential scores versus observed scores for week A2



X-SCALE : '*' = 0.206E-01 UNITS
Y-SCALE : '*' = 0.530E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.466[illegible]2E+00 GAMMA2 = 1.485915E+00

Figure 102. Exponential scores versus observed scores for week A3

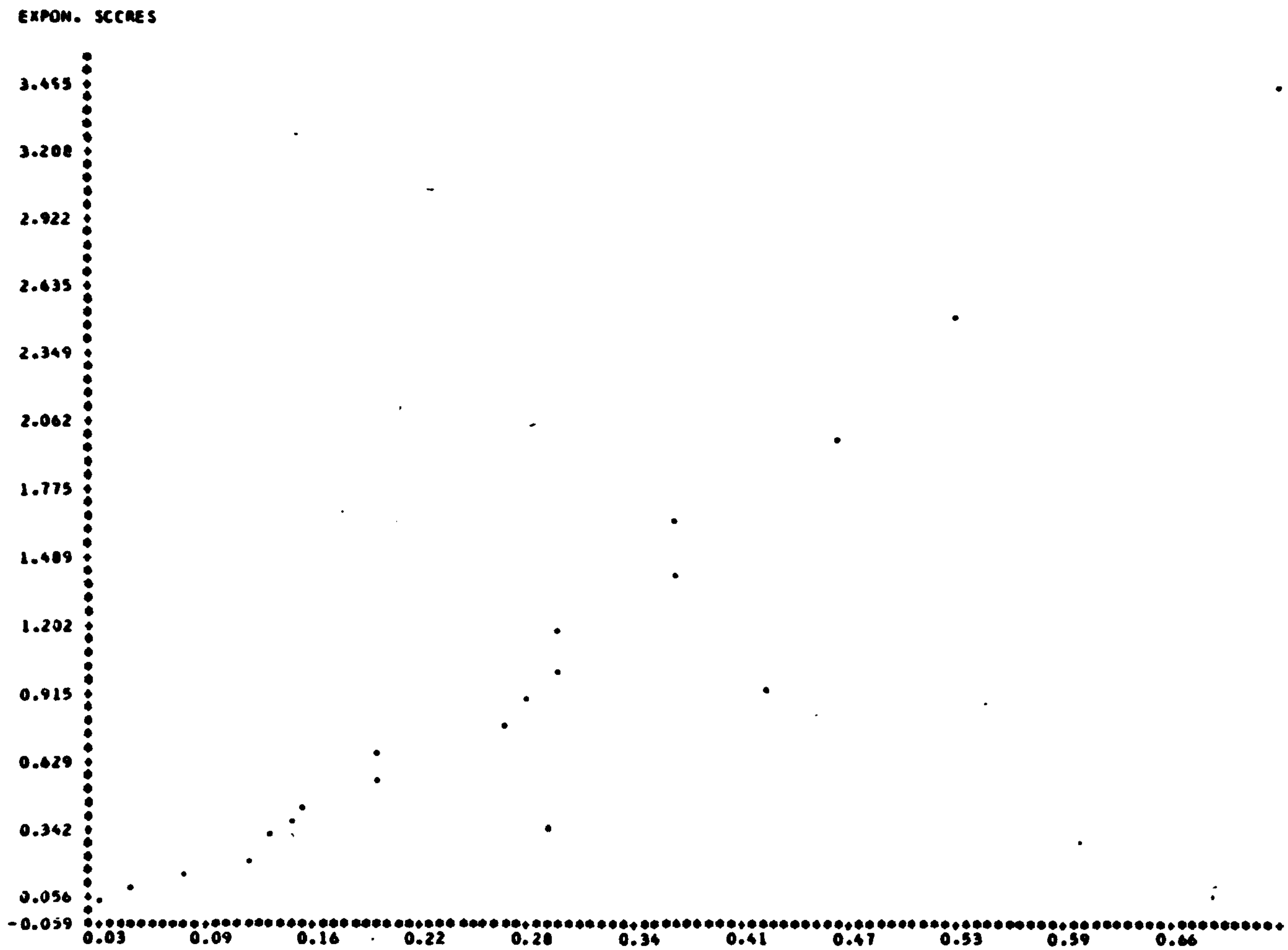


X-SCALE : '*' = 0.113E-01 UNITS
Y-SCALE : '*' = 0.608E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 5.609644E-01 GAMMA2 = -7.214982E-01

Figure 103. Exponential scores versus observed scores for week A4

NUMBER OF ORDERED PAIRS = 18



X-SCALE : '*' = C.627E-02 UNITS
Y-SCALE : '*' = 0.573E-01 UNITS

ESTIMATED PARAMETERS OF DATA : GAMMA1 = 1.031787E+00 GAMMA2 = 5.543498E-01

Figure 104. Exponential scores versus observed scores for week AM

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