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UNDERCOUNT ADJUSTMENT AND APPORTIONMENT

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Introduction

Article I, Section 2, Number 3 of the United States Constitution directs that an enumeration of the population be made within three years after the first meeting of the Congress and within every ten years thereafter for apportionment of Representatives and direct taxes. The current procedure for apportionment of Representatives is specified in 2 U.S.C. section 2a.

The procedure is carried out in four steps:

1. One Representative is allotted to each state
2. The enumerated population of each state is divided in sequence by $\sqrt{1x2}$, $\sqrt{2x3}$, $\sqrt{3x4}$ etc. There numbers are each state's priority claims for its second, third etc. Representatives.
3. All states' priority claims are pooled, sorted in descending order, and numbered consecutively starting with 51.
4. Representatives are awarded to states on the basis of the sequence numbers 51, 52, etc. until the last (435th) Respresentative is assigned.

It has been argued in newspapers, in the statistical community, and in the courts that because the enumeration is known to be in error that the counts be adjusted on the basis of estimated error to obtain a fairer apportionment. Estimates of these errors have been made by the Census Bureau for each Decennial Census since 1950.

Because of the fact that the size of the House of Representatives is fixed by law at 435, a state with a sizeable undercount would not necessarily gain a seat if the counts were adjusted. Three forces would affect adjusted apportionment as compared with the apportionment based on the original counts:

1. The true undercount relative to the true undercount of other states
2. The error of the estimated undercount due to the fact that the estimate is based on a sample, and
3. The proximity to the "boundary" of the sequence number of the last representative assigned to the state. The boundary is the wall between the 435th and 436th sequence numbers assigned as a result of the original enumeration.

The process of enumeration and apportionment or enumeration, undercount adjustment and apportionment is strictly deterministic in nature. Except for the selection of the sample used for undercount estimation, there is no chance involved.

Because of the fact that understanding the effect on a single state is non-intuitive, this paper describes a probabilistic model that makes it possible to study the effects of each of the forces on any state. It also makes it possible to conduct Monte Carlo simulations to examine various aspects of the whole complex process.

The approach is not mathematically rigious. It is heuristic, empirical, and approximate. We believe, however, that a greater understanding of the interplay of the forces may be gleaned from the model.

The Priority Claim Space

A paper 1/ by Cox and Smith starts with "Suppose that there are a number of sources at each of which events occur from time to

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1/ Cox, D.R. and Smith, W.L., The Superposition of Strictly Periodic Sequences of Events, Biometrika, Vol. 40, 1953.

time. Suppose further that the outputs of the various sources are combined into one pooled output. We shall consider the problem of deducing the statistical properties of the pooled output from the statistical properties of the separate outputs. By a statistical property we mean, for example, the frequency distribution of the time interval between successive events."

If we consider each state a source, each priority claim number an event and priority claim space a surrogate for time (albeit running backwards), there is a striking similarity between the Cox and Smith description and the apportionment procedure. In the paper cited and a second [2/] one, Cox and Smith analyse two different cases, the first one in which the sources are strictly periodic, producing consecutive events which delineate equal time intervals, and the second one in which each source produces consecutive events that determine independent identically distributed time intervals. The sources in the second paper are said to produce renewal processes for obvious reasons.

Two remarkable theorems are proven in the two papers. In the 1954 paper, if each source produces identically distributed, independent random variables, sources are independent of one another, have been producing events for a long time, and the number of sources tends to infinity, the time between pooled events tends to an exponential distribution. In the 1953 paper, if the sources are strictly periodic, with periodicities prime to one another, have been producing events for a long time, and the number of sources tends to infinity, the time between pooled events will also tend to the exponential distribution. In the latter case, it is a "local" phenomenon because due to the periodicity of the events at each source, identical sequences are bound to occur.

2/ Cox, D.R. and Smith, W.L., On the Superposition of Renewal Processes, Biometrika, Volume 41, 1954.

Figures 1a and 1b illustrate the concepts in the two papers.

Figure 1a. Superposition of Renewal Processes

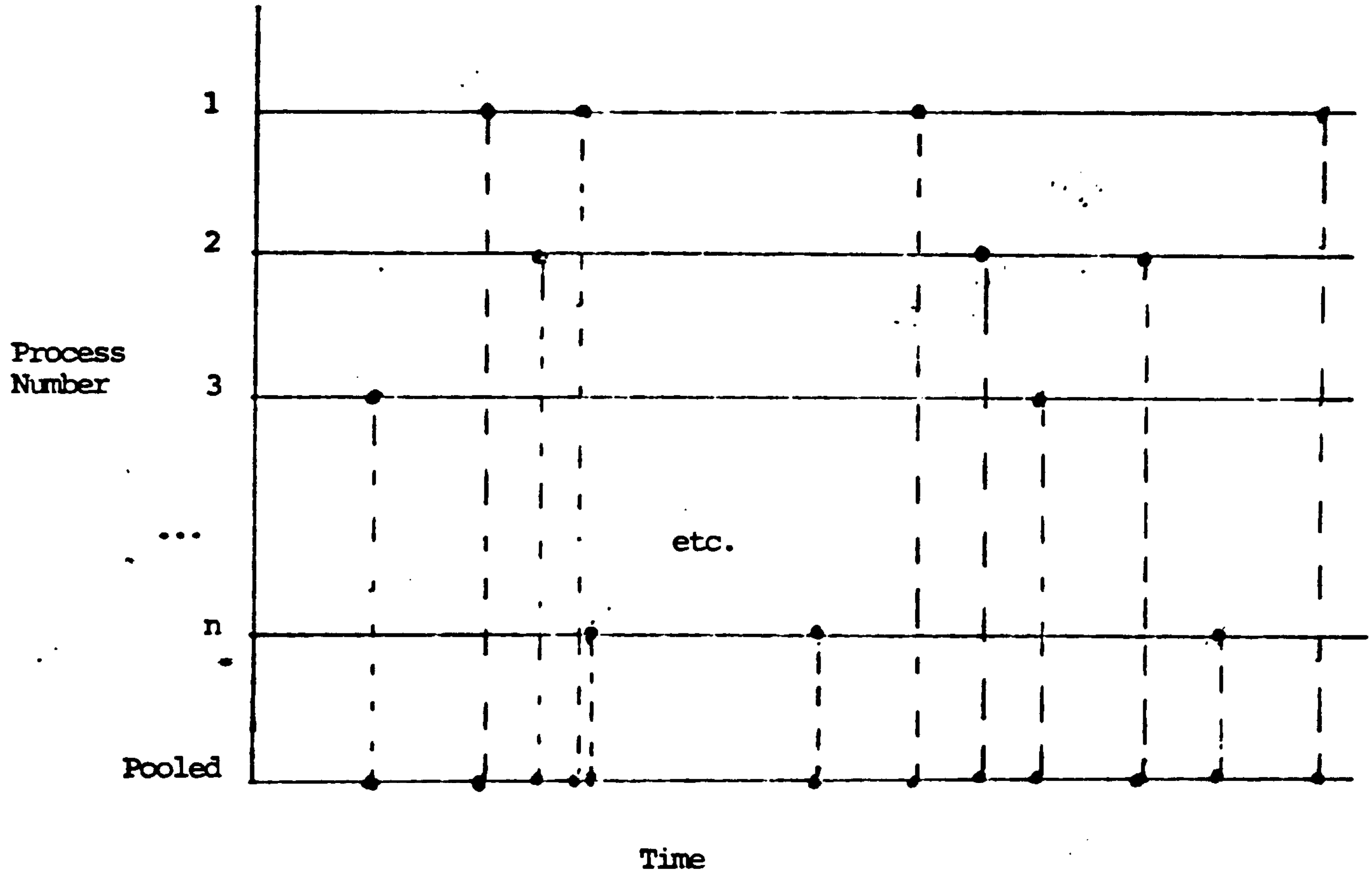
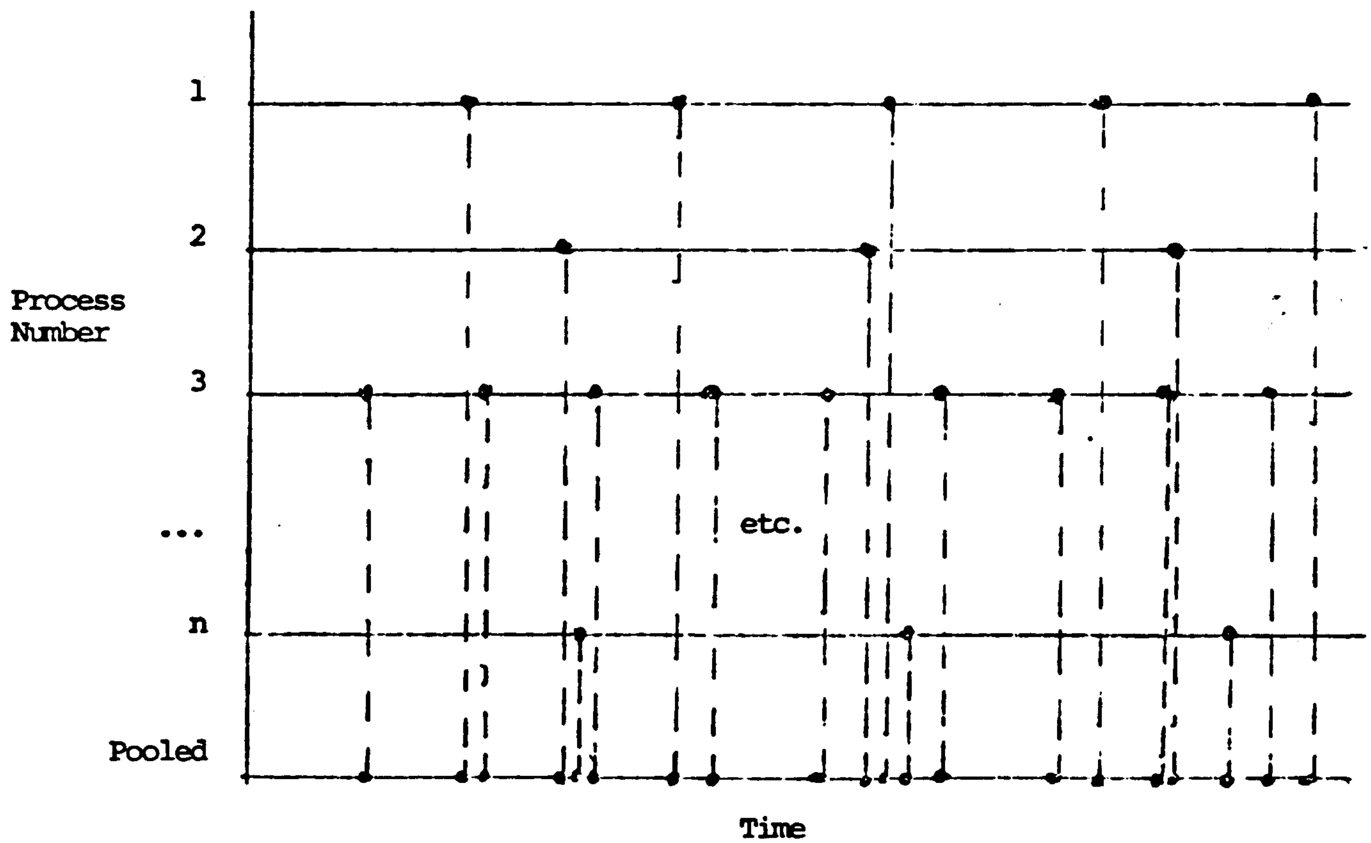


Figure 1b. Superposition of Periodic Processes



The pooled priority claim numbers do not meet the conditions of either paper since the number for each state have increasing denominators so that the first differences are monotonically decreasing. Nevertheless, for large enough denominators, consecutive first differences would not differ appreciably. If in either of the two papers, the pooled output is plotted against the sequence numbers, the scatterplots would be linear. Figure 2 examines this kind of plot for the priority claims vs their sequence numbers. The figure depects every 50th priority claim number between 200 and 700. It is clear that this relationship is not linear over the range shown as was expected. However, in the neighborhood of 435 (the House boundary), say between 350 and 500, it can be considered to be approximately linear.

Notation

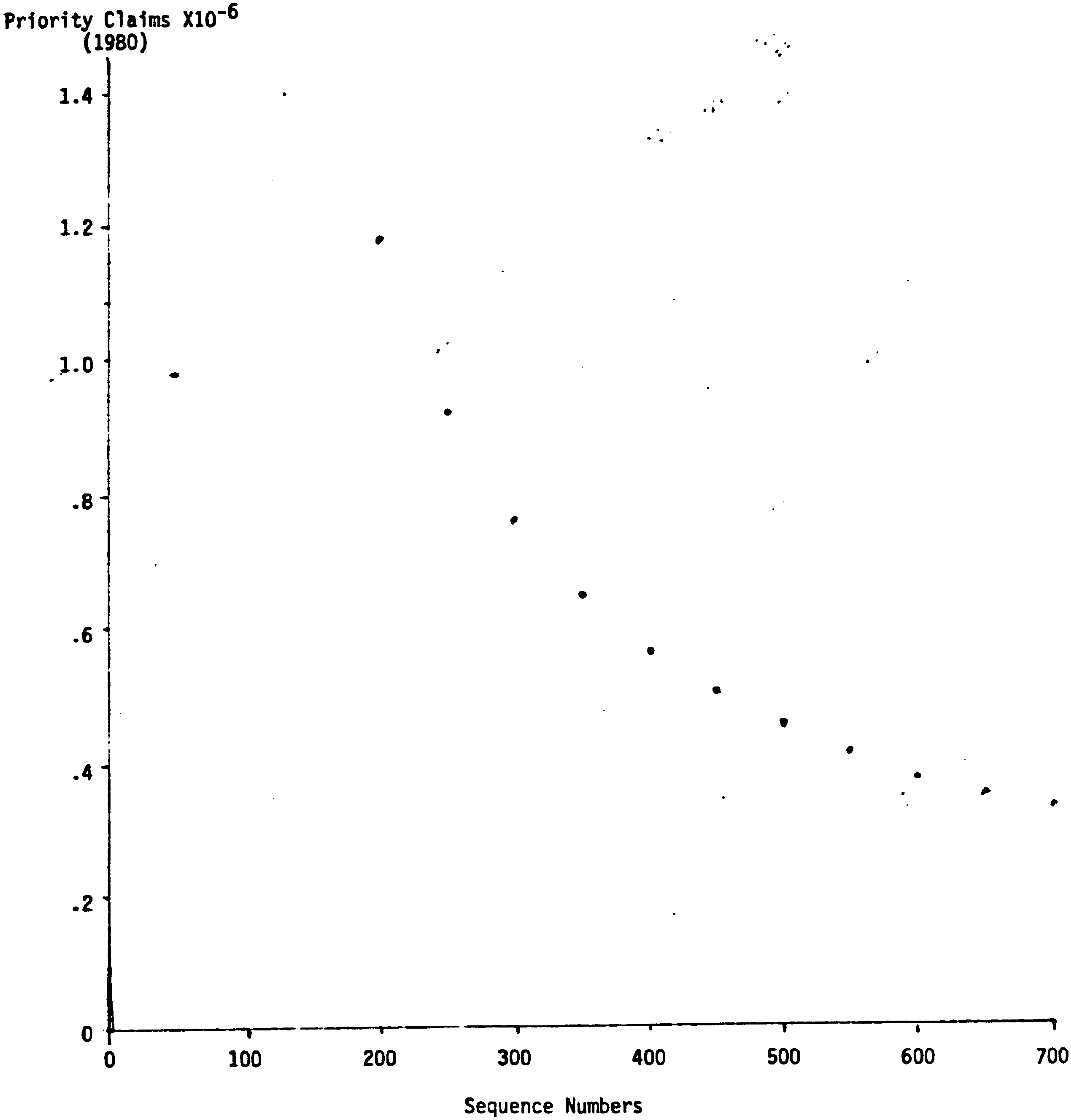
To address the foregoing ideas and to complete the model we define some notation

Let P_{hi} = Population of the i^{th} state in the h^{th} PEP (adjustment). The original census count is designated h=0. Each of the 12 PEP estimated adjustments are numbered from h=1 to h=12.

The following table identifies the PEP by its subscript.

Subscript h	Designation
0	1980 Census
1	PEP 2-8
2	2-9
3	2-20
4	3-8
5	3-9
6	3-20
7	5-8
8	5-9
9	10-8
10	14-8
11	14-9
12	14-20

Figure 2 Priority Claim Numbers vs Sequence Numbers



Let S_{hr} = Number of states with r or more Representatives in the h^{th} PEP

Note that S_{h1} = 50 for all h,

but S_{02} = 44 since there are six states with one Representative

S_{h2} = 44 for h>0 though this is not generally so

N_{hr} = Number of Representatives in the House for states with r or more Representatives.

Again N_{h1} = 435 for all h,

but N_{02} = 429 as is N_{h2} for each h

$C(P_{hi}, X_{hi})$ = Priority claim number for assignment of the $X_{hi}{}^{th}$ Representative to state i in PEP h

$= P_{hi}/\sqrt{X_{hi}(X_{hi}-1)}$, $X_{hi} = 2,3,\ldots,n_{hi},\ldots$

$S(P_{hi}, X_{hi})$ = Sequence number of state i's $X_{hi}{}^{th}$ Representative in PEP h

$C(P_{hi_j}, X_{hi_j})$ = Ordered priority claim number, ordered from highest of all states to lowest

$S(P_{hi_j}, X_{hi_j})$ = 50 + j, the ordered sequence numbers paired with the ordered priority claim numbers.

$t_{hj} = C(P_{hi_j}, X_{hi_j}) - C(P_{hi_{j+1}}, X_{hi_{j+1}})$, the difference between the j^{th} and $(j+1)^{th}$ priority claim number. These are consecutive regardless of state

$T_{hi} = C(P_{hi}, n_{hi}) - C(P_{hi}, n_{hi}+1)$

$= P_{hi}\,[1/\sqrt{n_{hi}(n_{hi}-1)} - 1/\sqrt{(n_{hi}+1)n_{hi}}]$, The difference between consecutive priority claim numbers of state i in PEP h spanning the 435^{th} boundary.

where n_{hi} = state i's last Representative assigned in PEP h so that the $n_{hi}{}^{th}$ Representative is actually assigned while the $(n_{hi}+1)^{th}$ would have been assigned had the House been large enough. Thus the priority claim numbers above straddle the boundary.

Note that $N_{hr} = \sum_{i=1}^{S_{hr}} n_{hi}$.

Let $A_{hi} = P_{hi} - P_{0i}$, the h^{th} PEP adjustment for state i.

$$\bar{A}_{hr} = \frac{1}{S_r} \sum_{i=1}^{S_r} A_{hi}$$

$$\bar{P}_{0r} = \frac{1}{S_r} \sum_{i}^{S_r} P_{0i}$$

$$\underline{P}_{h2} = (P_{h1}, P_{h2}, \ldots, P_{hs_2})$$

$$\underline{A}_{h2} = (A_{h1}, A_{h2}, \ldots, A_{hs_2})$$

Distribution of Priorty Claim Differences

In the foregoing notation, the state by state priority claim numbers for the h^{th} PEP are:

$$\frac{P_{h1}}{\sqrt{2(1)}}, \frac{P_{h1}}{\sqrt{3(2)}}, \ldots, \frac{P_{h1}}{\sqrt{X_{h1}(X_{h-1})}}, \ldots, \frac{P_{h1}}{\sqrt{n_{h1}(n_{h1-1})}}, \ldots$$

$$\frac{P_{h2}}{\sqrt{2(1)}}, \frac{P_{h2}}{\sqrt{3(2)}}, \ldots, \frac{P_{h2}}{\sqrt{X_{h2}(X_{h2-1})}}, \ldots, \frac{P_{h2}}{\sqrt{n_{h2}(n_{h2-1})}}, \ldots$$

$$\frac{P_{hi}}{\sqrt{2(1)}}, \frac{P_{hi}}{\sqrt{3(2)}}, \ldots, \frac{P_{hi}}{\sqrt{X_{hi}(X_{hi-1})}}, \ldots, \frac{P_{hi}}{\sqrt{n_{hi}(n_{hi-1})}}, \ldots$$

$$\frac{P_{hs2}}{\sqrt{2(1)}}, \frac{P_{hs2}}{\sqrt{3(2)}}, \ldots, \frac{P_{hs2}}{\sqrt{X_{hs2}(X_{hs2-1})}}, \ldots, \frac{P_{hs2}}{\sqrt{n_{hs2}(n_{hs2-1})}}, \ldots$$

The pooled claim numbers, sorted in descending order are

$$\frac{P_{hi_1}}{\sqrt{X_{hi_1}(X_{hi_1}-1)}} > \frac{P_{hi_2}}{\sqrt{X_{hi_2}(X_{hi_2}-1)}} >\ldots> \frac{P_{hi_j}}{\sqrt{X_{hi_j}(X_{hi_j}-1)}} >\ldots> \frac{P_{hi_{385}}}{\sqrt{n_{hi_{385}}(n_{hi_{385}}-1)}} >\ldots$$

The associated sequence numbers are

51, 52, ..., $S(P_{hi_j}, X_{hi_j})$,...., 435,...

Table 1 shows the priority claim numbers for sequence numbers 410 to 459 for the 1980 Census. These were selected because they straddled the boundary sequence number 435. The number of them selected was more or less arbitrary. It needed to be large enough of a "sample" but small enough to remain linear in Figure 2.

The numbers in the last column are the differences between the same line, prior column and the line above in the prior column. Notationally

$$t_{oj} = C(P_{oi_{j-1}}, X_{oi_{j-1}}) - C(P_{oi_j}, X_{oi_j})$$

$$\text{with} \quad 410 < S(P_{hi_j}, X_{hi_j}) \leq 459$$

The differences, t_{oj}, are approximately exponentially distributed

$$P(t_{oj} \leq t) = 1-e^{-\lambda_o t} ,$$

with estimated mean

$$(\hat{\lambda}_o)^{-1} = \frac{1}{U-L+1} \sum_{j=L}^{U} t_{oj},$$

where L and U are the lower and upper limits of j. Thus

$$(\hat{\lambda}_o)^{-1} = \frac{1}{U-L+1} [C(P_{oi_{L-1}}, X_{oi_{L-1}}) - C(P_{oi_U} X_{oi_U})]$$

Table 1. PRIORITY CLAIM NUMBERS FOR SEQUENCE NUMBERS 410 TO 459, 1980 CENSUS

SEQUENCE NUMBER	STATE	SEAT NO.	PRIORITY CLAIM	FIRST DIFFERENCE
410	CA	43	556945.9	
411	FL	18	556798.3	147.6
412	MT	2	556273.8	524.5
413	WI	9	554529.0	1744.8
414	OH	20	553895.9	633.1
415	OK	6	552335.5	1560.4
416	PA	22	552090.1	245.4
417	WA	8	551916.2	173.9
418	MA	11	547005.0	4911.2
419	NJ	14	545867.7	1137.3
420	MN	8	544831.8	1035.9
421	CA	44	544140.8	691.0
422	IN	9	541025.1	3115.7
423	N9	33	540288.2	736.9
424	TX	27	537015.7	3272.5
425	CA	43	531911.4	5104.3
426	IA	6	531909.3	2.1
427	IL	22	531234.9	674.4
428	NM	3	530709.7	525.2
429	MI	18	529264.3	1445.4
430	KS	5	528429.4	834.9
431	PA	23	527540.4	889.0
432	CO	6	527426.5	113.9
433	OH	21	526860.1	566.4
434	FL	19	526678.4	181.7
435	NY	34	524156.5	2521.9
436	IN	11	523468.0	688.5
437	GA	11	520997.2	2470.8
438	CA	46	520219.6	777.6
439	AL	8	519831.3	388.3
440	MO	10	518344.1	1487.2
441	TX	28	517481.3	862.8
442	NC	12	511303.4	6177.9
443	AR	5	511056.2	247.2
444	VA	11	509747.7	1308.5
445	CA	47	509030.8	716.9
446	NY	35	508960.4	70.4
447	NJ	15	508175.2	785.2
448	IL	23	507612.5	562.7
449	PA	24	505081.5	2531.0
450	OH	22	502341.4	2740.1
451	MI	19	500633.9	1707.5
452	FL	20	499651.0	982.9
453	MA	12	499345.0	306.0
454	TX	29	499318.3	26.7
455	CA	48	498313.1	1005.2
456	MD	9	496912.9	1400.2
457	AZ	89	496212.2	700.7
458	WI	10	495985.9	226.3
459	LA	9	495442.8	543.1
			MEAN =	1255.17

The mean in Table 1 is 1255.17. Using this as an estimate, the empircial and estimated theoretical "distribution functions" are plotted in Figure 3. The Durbin [3/] Kolmogoroff-Smirnov Test permits a maximum difference in the probabilities of about .152 for a sample of 49 at an α of .05 compared with an observed maximum difference of .082. The table in the Durbin paper lists samle sizes of 45 and 50. For an α of .05, the critical values are .159 and .151 respectively. The value for a sample of 49 was obtained by linear interpolation.

Another estimator of λ_h can also be used. We note that $\frac{1}{T_{hi}}$ represents the rate of occurrence of claim numbers in the claim space in the neighborhood of the boundary for state i in PEP h. The total rate over S_2 states is another estimator of λ_h. This estimator for the Census for h=0, is

$$\hat{\hat{\lambda}}_o^{-1} = 1209.2$$

fairly close to the other estimator

$$\hat{\lambda}_o^{-1} = 1255.17 \; .$$

The estimates of λ_h for the 12 PEP's are consistent with one another and with the 1980 Census value. Computed in the same way as $\hat{\hat{\lambda}}_o^{-1}$, $\hat{\hat{\lambda}}_h^{-1}$ for h=1 to 12 respectively are 1214.78, 1223.59, 1239.10, 1192.18, 1200.96, 1224.73, 1304.99, 1319.73, 1310.08, 1269.46, 1246.53, and 1238.70.

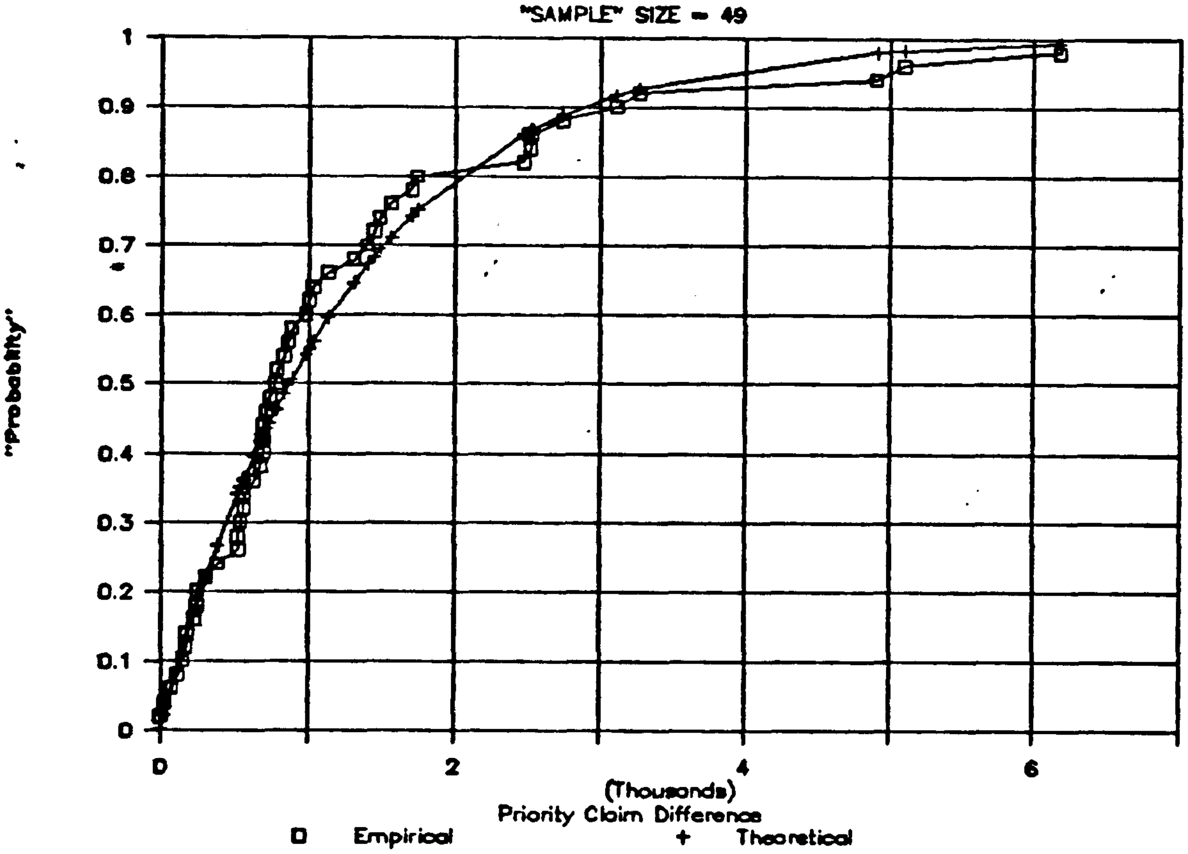
By definition

$$T_{hi} = P_{hi}\left[\frac{1}{\sqrt{n_{hi}(n_{hi}-1)}} - \frac{1}{\sqrt{n_{hi}(n_{hi}+1)}} \right]$$

3/ Durbin, J. Kolmogoroff-Smirnov Tests When Parameters are Estimated with Applications to Tests of Exponentiality and Tests on Spacings.

Fig 3. PRIORITY CLAIM DIFFERENCE D.F.

"SAMPLE" SIZE = 49



Expanding the expression in brackets yields

$$T_{hi} = \frac{P_{hi}}{n_{hi}^{2}} + o(\frac{1}{n_{hi}^{3}})$$

which can also be written as

$$T_{hi} = \frac{\bar{d}_{hi}}{n_{hi}}$$

where $\bar{d}_{hi}$ is the average size of congressional district in state i under PEP h. Since

$$\hat{\hat{\lambda}}_h = \sum_{i=1}^{S_2} \frac{1}{T_{hi}}$$

and

$$\hat{\hat{\lambda}}_h T_{hi} = T_{hi} \sum_i \frac{1}{T_{hi}}$$

or

$$\hat{\hat{\lambda}}_h T_{hi} = \frac{N_{h2}}{n_{hi}} \qquad (1)$$

by assuming that $\bar{d}_{hi} = \bar{d}_h = \frac{\sum_i^{S_2} P_{hi}}{N_2}$, i.e., all congressional districts for states with 2 or more representatives are approximately equal. This also implies that another reasonable estimator of $\lambda_h T_{hi}$ is $(\sum_i^{S_2} P_{hi})/P_{hi}$ since this ratio is approximately equal to Equation (1). Now N_{h2} is equal to N_{02} for all h (and very likely generally true as long as adjustments are as small as they were in the 12 PEP's). Equation (1) plays a role in the next section as an estimator of an important parameter.

Related Distributions' Near the Boundary

For the i^{th} state in PEP h, the difference between consecutive priority claims straddling the boundary is

$$T_{hi} = C(P_{hi}, n_{hi}) - C(P_{hi}, n_{hi}+1)$$

$$= P_{hi} \left[\frac{1}{\sqrt{n_{hi}(n_{hi}-1)}} - \frac{1}{\sqrt{(n_{hi}+1)\, n_{hi}}} \right]$$

If the t_{hj} are exponentially distributed, then the number of priority claims k_{hi} for states other than state i in the range T_{hi} is Poisson

$$P_{k_{hi}}(T_{hi}) = \frac{(\lambda_h T_{hi})^{k_{hi}} \ell^{-\lambda_h T_{hi}}}{k_{hi}!}$$

the paeameter λ_h, being identical to the one in the distribution of t_{hj}. The proximity of the sequence number of state i to the boundary in PEP h, 435-$S(P_{hi}, n_{hi})$ can be measured in terms of its distribution. The conditional distribution of this difference can be considered to be discrete uniform on the k_{hi} states' priority claims in the interval since the difference can be any number between 0 and k_{hi}.

Thus,

$$P(435 - S(P_{hi}, n_{hi}) = w_{hi} | k_{hi}) = \frac{1}{k_{hi}+1}$$

$$w_{hi} = 0,1,2,\ldots,k_{hi}$$

where $$k_{hi} = S(P_{hi}, n_{hi}+1) - S(P_{hi}, n_{hi})-1$$

The mean and variance of w_{hi} conditional on k_{hi} are

$$E(w_{hi} | k_{hi}) = \frac{k_{hi}}{2}$$

and $$\sigma^2 (w_{hi} | k_{hi}) = \frac{k_{hi}(k_{hi}+ 2)}{12}$$

The mean and variance of k_{hi} are

$$E(k_{hi}) = \lambda_h T_{hi} \tag{2}$$

and $$\sigma^2(k_{hi}) = \lambda_h T_{hi} \tag{3}$$

The unconditional mean and variance of w_{hi} are

$$E(w_{hi}) = \frac{\lambda_h T_{hi}}{2} \tag{4}$$

$$\sigma^2(w_{hi}) = E\,\sigma^2(w_{hi} \mid k_{hi}) + \sigma^2(E\,(w_{hi} \mid k_{hi}))$$

$$= \frac{(\lambda_h T_{hi})^2}{12} + \frac{\lambda_h T_{hi}}{2} \tag{5}$$

From the prior section, estimates of $\lambda_0\ T_{0i}$ can serve as estimates of $\lambda_h\ T_{hi}$ for all h.

Equations (2) to (5) apply to the census with known P_{0i} before the application of the apportionment algorithm. This is analogous to the probability of a head after the toss of a coin but before the result is divulged.

The joint distribution of w_{hi} and k_{hi} is triangular in shape since $w_{hi} \leq k_{hi}$. Dropping the subscripts to illustrate the nature of the distribution, we have

$$P(w,k) = \frac{(\lambda\ T)^k\ e^{-\lambda T}}{(k+1)!},\ w=0,1,\ldots,k \text{ and } k=0,1,\ldots \tag{6}$$

$$P(w \leq x \mid k) = \sum_{w=0}^{x} P(w,k) = \frac{(x+1)\ (\lambda T)^k e^{-\lambda T}}{(k+1)!} \tag{7}$$

and $$P(w \leq x) = \sum_{k=0}^{x} \sum_{w=0}^{k} P(w,k) + \sum_{k=x+1}^{\infty} \sum_{w=0}^{x} P(w,k)$$

or $$P(w \le x) = \sum_{i=0}^{x} \frac{1}{\lambda T} \sum_{j=i+1}^{\infty} \frac{(\lambda T)^{j} e^{-\lambda T}}{j!} \tag{8}$$

Since the inner sum in Equation (8) is the upper tail of a Poisson distribution, the equation may also be written as the lower tail of a gamma (or χ^2) distribution

$$P(w \le x) = \sum_{i=0}^{x} \frac{1}{\lambda T} \int_{0}^{T} \frac{\lambda(\lambda y)^{i} e^{-\lambda y}}{i!} dy \tag{9}$$

The Effect of Population Adjustment

Population adjustments to the Census counts cause changes in the sequence numbers 51, 52, ..., 435, ... Such changes should be related to a number of measures that are known prior to the application of the apportionment algorithm. The difference defined by

$$D_{hi} = S(P_{hi}, n_{0i}) - S(P_{0i}, n_{0i}),$$

is the change in sequence number for the last representative assigned in the Census count. Examination of scatter plots of D_{hi} (for each i within each h) showed reasonably good functional relationships between the D_{hi} and population adjustments, average popultion adjustments, priority claim differences, and relative population adjustments. Furthermore, the slopes of the linear regressions were strikingly similar for all PEPs while the intercepts were highly correlated with the average population adjustment within each PEP. The R^2's ranged from .874 to .880.

The relationship that was selected as most reasonable was

$$D_{hi} = b\left(\frac{A_{hi}}{P_{0i}} - \frac{\bar{A}_{h2}}{\bar{P}_{02}}\right) + \varepsilon$$

in which $$\bar{A}_{h2} = \frac{1}{S_{h2}} \sum_{i}^{S_{h2}} A_{hi}$$

and $$\bar{P}_{02} = \frac{1}{S_{02}} \sum_{i}^{S_{02}} P_{0i} \,.$$

This function has an R^2 of .878. A more logical choice for the subtractive term would have been

$$\frac{1}{S_{h2}} \sum_{i}^{S_{h2}} \frac{A_{hi}}{P_{0i}} \,.$$

The chosen term was used because it is much easier to calculate, and as expected the two expressions are quite close to one another. Note that S_{h2} and S_{02} are not necessarily equal in general, though they were for all 12 PEP's as well as the Census. It would take large adjustments, for them to be unequal. As a matter of fact, it is highly unlikely that the states having only one representative in the census count would change after adjustment. Moreover, if the subtractive term uses the more convenient means with S_{h1} and S_{01} (all states) in both numerator and denominator, it would cause little or no violence to the predictive capability of the model.

The regression model is valid over all states with two or more representatives for all 12 PEP's. The logic dictated that the regression equation go through the orgin. The computed regression coefficient is $\hat{b} = -385.086$. This happens to be almost equal to the number of representatives assigned between sequence number 51 and 435 inclusive. It is hard to believe that this is a coincidence. However, the reason for this has escaped us to date. Table 2 (shown in the appendix because of its size) has the relevant data for this regression for all 12 PEP's.

Figure 4 depicts the 528 observations, for 12 PEP's with 44 states each having two or more representatives. The crosses in the Figure show the plot of the regression equation. Figure 5 shows the residuals while Figure 6 shows the emprirical distribution of the residuals. The standard deviation of the residuals is $\hat{\sigma}(\varepsilon)=2.24$. Although the distribution is skewed to the right, subjectively it seems to be reasonably close to normal. No test of significance was performed on this part of the model.

From the definition of P_{hi}

$$S(P_{hi},n_{0i}) = S(P_{0i},n_{0i}) + b\left(\frac{A_{hi}}{P_{0i}} - \frac{\bar{A}_{h2}}{\bar{P}_{02}}\right) + \varepsilon \; . \tag{10}$$

or $$S(P_{hi}, n_{0i}) = S(P_{0i},n_{0i}) + b\, F_{hi} + \varepsilon$$

where $F_{hi} = \dfrac{A_{hi}}{P_{0i}} - \dfrac{\bar{A}_{h2}}{\bar{P}_{02}}$

The mean and variance of $S(P_{hi}, n_{0i})$ conditional on the vector $\underline{A_h} = (A_{hi},A_{h2},\ldots,A_{h3})$ are

$$E(S(P_{hi}, n_{0i}) \mid \underline{A_h}) = S(P_{0i}, n_{0i}) + b\, F_{hi}$$

and $$\sigma^2(S(P_{hi}, n_{0i}) \mid \underline{A_h}) = \sigma^2(\varepsilon) \tag{11}$$

The unconditional mean and variance are

$$E\, S(P_{hi},n_{0i}) = S(P_{0i}, n_{0i}) + b\left(\frac{a_{hi}}{P_{0i}} - \frac{\bar{a}_{h2}}{\bar{P}_{02}}\right) \tag{12}$$

or $$E\, S(P_{hi},n_{0i}) = S(P_{0i},n_{0i}) + b\; f_{hi}$$

Fig 4. SEQUENCE NUMBER DIFFERENCE

All 12 PEP'S

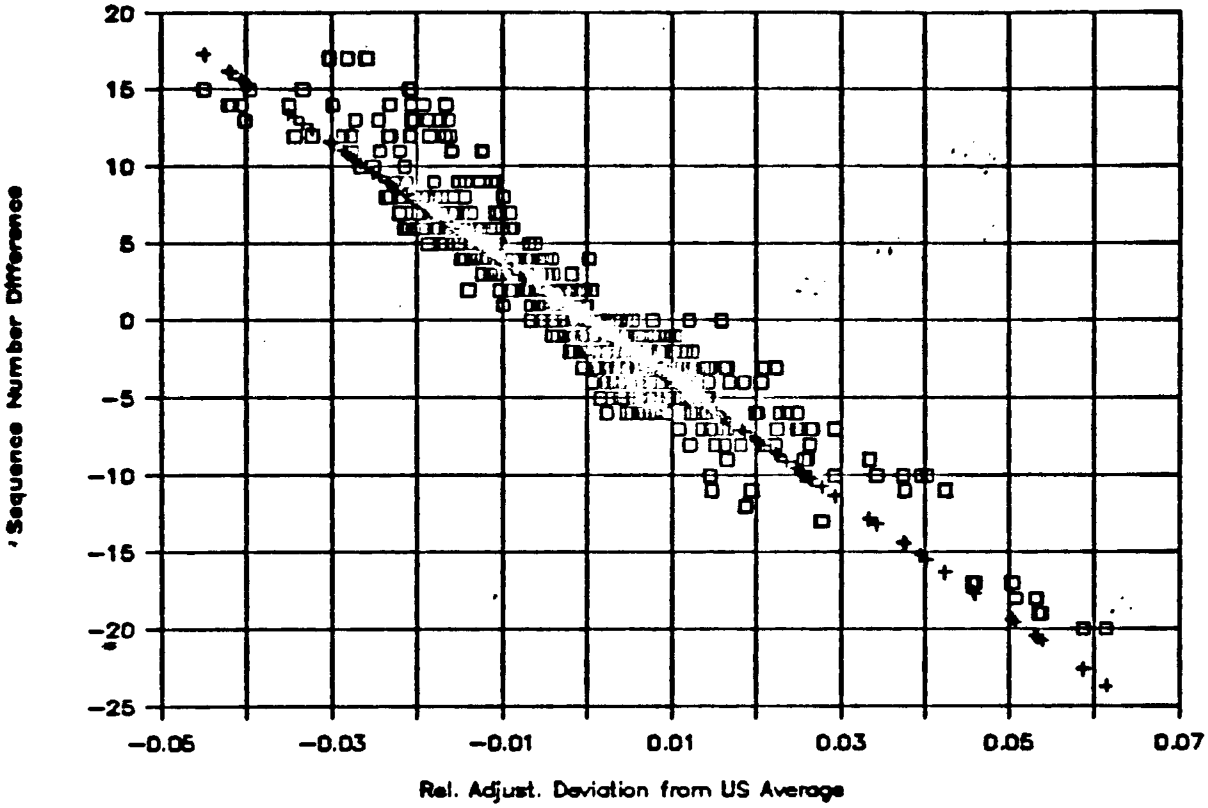


Fig 5. SEQUENCE NO.DIFFERENCE RESIDUALS

All 12 PEP'S

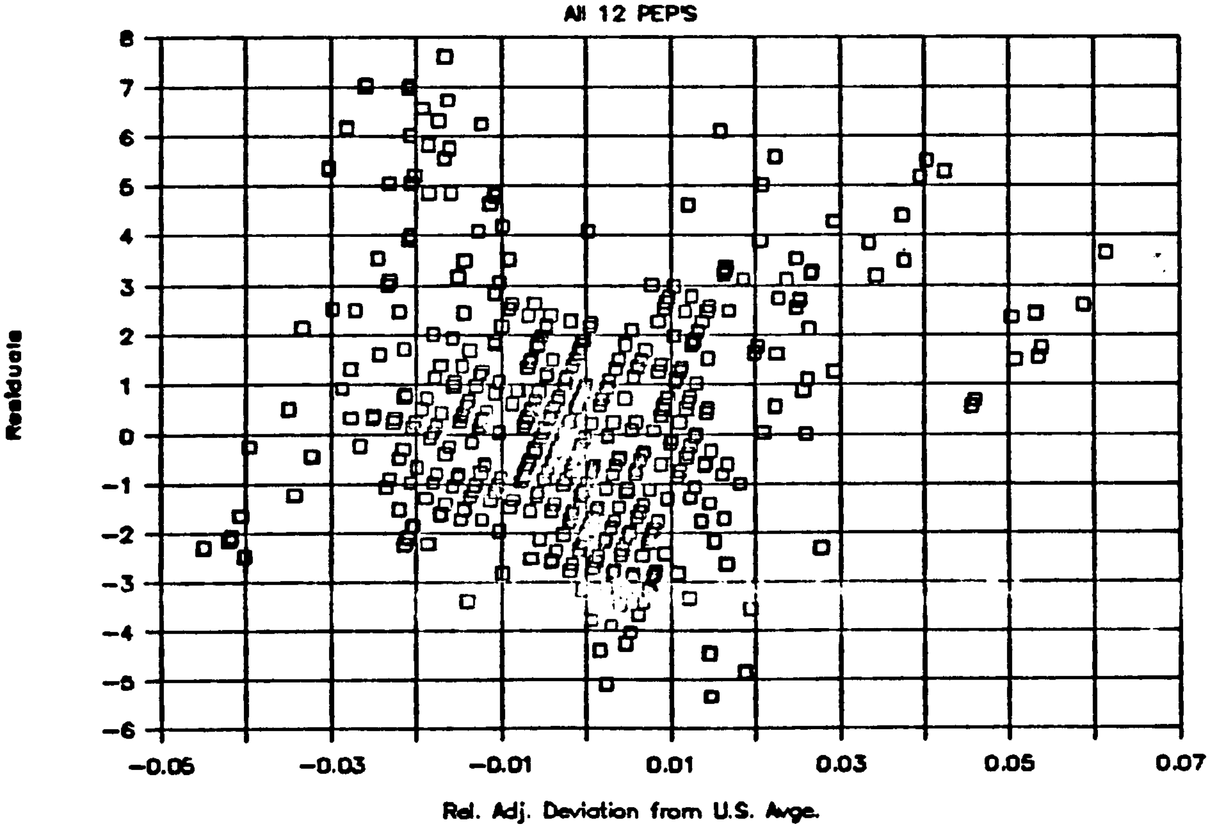
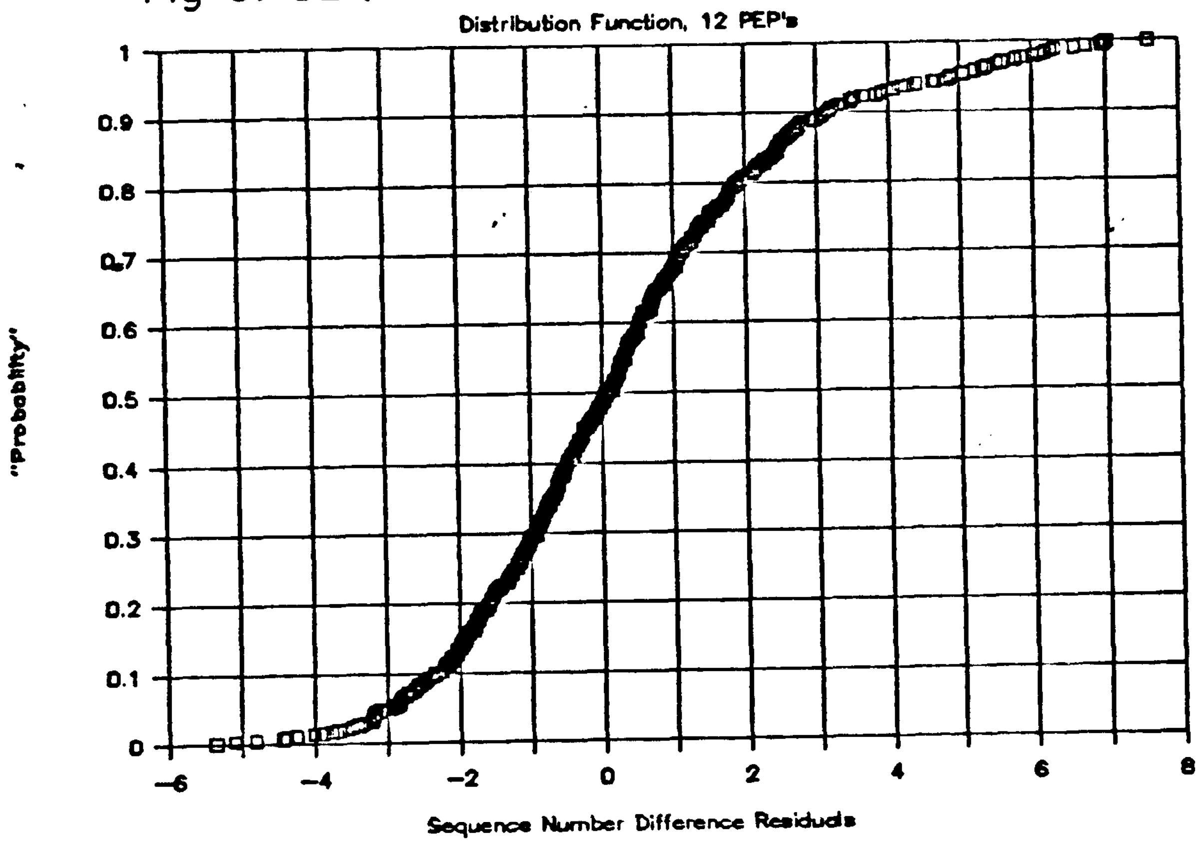


Fig 6. SEQUENCE NO.DIFFERENCE RESIDUALS



where $f_{hi} = E\,F_{hi}$

$$= \frac{a_{hi}}{P_{0i}} - \frac{\bar{a}_{h2}}{\bar{P}_{02}}$$

$$a_{hi} = E\,A_{hi}$$

$$\bar{a}_{h2} = E\,\bar{A}_{h2}$$

and $$\sigma^2(S(P_{hi},n_{0i})) = E\sigma^2(\epsilon) + \sigma^2(ES(P_{hi},n_0) \mid \underline{A_h}) \qquad (13)$$

$$= \sigma^2(\epsilon) + b^2\sigma^2(F_{hi})$$

$$=\sigma^2(\epsilon)+b^2[\frac{\sigma^2(A_{hi})}{P_{0i}^2} - \frac{2\,\sigma^2(A_{hi})}{P_{0i}\bar{P}_{02}S_2} + \frac{\sum_i \sigma^2(A_{hi})}{\bar{P}_{02}^2 S_2^2}] \qquad (14)$$

Where the $\sigma^2(A_{hi})$ are determined by the PEP design and sample sizes.

<u>The Process Count-Apportionment-Adjustment-Reapportionment</u>

Starting with a count of the population in a census, making adjustments based on samples, and using a complex algorithm to apportion congressional seats before and after adjustment can be considered as a stochastic process. At the least, the recount imposes a measure of controlled randomness. This paper has argued that the apportionment algorithm can also be viewed as a quasi stochastic process. Others have argued that the census count itself is a stochastic process and have considered various models of such a process.

To round out the quasi randomness and to facilitate studies which are not tied to the initial count as only a single realization of the count process, we mention an observation in passing that could be useful in future studies. The distribution of the 1980 census state counts are not significantly different from an exponential distribution. This fact may be used to generate any number of sets of fifty state counts. These states would have the colorless names of the digits from 1 to 50 but could be made subject to "adjustment" and "approtionment" as if they were real. Each such realization could become the vector $\underline{P_0}$ on which all other computations are made conditionally.

The fact that the U.S. states populations are exponentially distributed may not be a fundamental demographic characteristic. Nevertheless, it is also true of the Canadian provinces and might, for certain countries meeting certain criteria, be an asymptotic characteristic. Two sinplistic models are the distribution of balls in boxes (people in states) or briths and deaths (in the broad sense of additions and subtractions of all kinds) imposed on some initial conditions for the states. Such models abound in the literature.

We thus have a set of stochastic processes in sequence. The final outcomes can be expressed essentially as a sum of random variables. Thus it is possible to consider the entire process as strictly deterministic at one extreme or strictly stochastic at the other. Intermediate combinations are, of course, possible. If we consider any step in the process stochastic, we can use Monte Carlo simulation, numerical convolutions of the variables, or an analytical procedure using normal approximations. Only Monte Carlo procedures, however, can be used to represent simulated censuses and the whole analysis is conditional on the vector $\underline{P_0}$.

If normal approximations are used, depending on the stage of the process, suitable expectations and variances with the proper conditioning need to be computed.

In the sequence Count - Apportionment - Adjustment - Reapportionment some interesting intermediate sequences occur when the four steps are considered as stochastic processes.

The count alone whether a census or a simulation produces the vector $\underline{P_0}$. Before using the apportionment algorithm the n_{0i} are random variables. At this stage the question of the probability distributions of the n_{0i} can be addressed for example

$$P(n_{0i} = q_{0i})$$
$$P(n_{0i} = Q_{0i})$$
$$P(n_{0i} \neq q_{0i}, Q_{0i})$$

where

$$q_{0i} = [P_{oi} \frac{\sum n_{oi}}{\sum P_{oi}}]$$

$$Q_i = q_{0i} + 1$$

and [x] denotes the largest integer in x. The function in brackets is known as the quota for state i. Although the current algorithm known as Equal Proportions does not quarantee that $\varepsilon = 0$ in $P(n_{0i} = q_{0i}) + P(n_{0i} = q_{0i}) = 1-\varepsilon$, ε is very close to zero as can be demonstrated by Monte Carlo simulation. Pursuing this line of reasoning could shed some more light on alternative apportionment formulas. This paper does not address this problem. Another interesting sequence is the Count - Apportionment-Adjustment sequence. In this sequence, one can postulate knowing $\underline{P_0}$, $\underline{S_0}$, $\underline{A_h}$, and $\underline{V_h}$

$$\text{where } \underline{S_0} = (S(P_{01}, n_{01}), S(P_{02}, n_{02}), \ldots)$$

$$\underline{V_h} = (\sigma^2(A_{h1}), \sigma^2(A_{h2}), \ldots)$$

with $\underline{P_0}$ and $\underline{A_h}$ defined as before.

With this information, one can evaluate the approximate probabilities and expectations of a state's gaining or losing one or more representatives through adjustment.

Still another interesting sequence is the Count-Apportionment-Adjustment-Reapportionment sequence. In this sequence we postulate knowing $\underline{P_0}$, $\underline{S_0}$, $\underline{A_h}$, $\underline{V_h}$, and $\underline{S_h} = (S(P_{h1},n_{h1}), S(P_{h2},n_{h2}),\ldots)$

$$\text{where } \underline{a_h} = E\,\underline{A_h}$$

$$\underline{v_h} = E\,\underline{V_h}\,.$$

Since $\underline{S_h}$ is known, the n_{hi} are all known. Here we can address the question of

$$P(x_{hi} = n_{hi} \mid S(P_{hi},n_{hi}))$$

in which x_{hi} represents one realization of the number of seats for state i when n_{hi} is the correct number for $\underline{a_h}$ known.

The following sections address these questions.

<u>The Count-Apportionment-Adjustment Sequence</u>

In this sequence $\underline{P_0}$, $\underline{S_0}$, $\underline{A_h}$, and $\underline{V_h}$ are known. The probabilities of a loss or a gain can be expressed as

$$P(\text{loss}) = P(435 < S(P_{hi},n_{oi}))$$
$$\text{or } P(\text{loss}) = P(436 \leq S(P_{hi},n_{oi})) \qquad (15)$$

$$\text{and } P(\text{gain}) = P(S(P_{hi},n_{oi}+1) \leq 435)$$
$$\text{or } P(\text{gain}) = P(S(P_{hi},n_{oi}) + k_{hi} + 1 \leq 435. \qquad (16)$$

Using Equation (10), Equation (15) becomes

$$P(\text{loss}) = P(x = 436 - S(P_{oi},n_{oi}) - b\,F_{hi} - \varepsilon - \leq 0) \quad (17)$$

Standardizing the random variable x and assuming approximate normality

$$P(\text{loss}) = \left(\frac{x-Ex}{\sigma(x)} \leq \frac{-Ex}{\sigma(x)}\right)$$

$$= \Phi\left(-\frac{436-S(P_{oi},n_{oi}) - bf_{hi}}{\sqrt{b^2\sigma^2(F_{hi})+\sigma^2(\varepsilon)}}\right) \cdot \qquad (18)$$

where $\Phi(v)$ denotes the integral of the N(0,1) distribution from $-\infty$ to v. Again using Equation (10), Equation (16) becomes

$$P(\text{gain}) = P(0 \leq 434 - S(P_{oi},n_{oi}) - bF_{hi} - \varepsilon - k_{hi} = y). \quad (19)$$

Standardizing y and assuming approximate normality,

$$P(\text{gain}) = P\left(\frac{-Ey}{\sigma(y)} \leq \frac{y - Ey}{\sigma(y)}\right)$$

$$= 1 - \Phi\left(-\frac{Ey}{\sigma(y)}\right) .$$

$$= \Phi\left(\frac{Ey}{\sigma(y)}\right)$$

The expectation of y is

$$Ey = 434 - S(P_{oi},b_{oi}) - bf_{hi} - \lambda_o T_{oi}$$

and its variance is

$$\sigma^2(y) = b^2\sigma^2(F_{hi}) + \lambda_o T_{oi} + \sigma^2(E)$$

$$\text{Thus } P(\text{gain}) = \Phi\left[\frac{434-S(P_{oi},n_{oi})-bfhi - \lambda o T_{oi}}{\sqrt{b^2\sigma^2(F_{hi}) + \lambda o T_{oi} + \sigma^2(\varepsilon)}}\right]. \qquad (20)$$

It is interesting to note that in both Equations (18) and (20), a unit change in the sequence number $S(P_{oi},n_{oi})$ is equivalent in expectation to a population adjustment of 1/b measured in f_{hi} units, that is the deviation of the relative population adjustment from the average. This is approximately one quarter of one percent since b = 385.086. To illustrate, a state with a Census sequence number of 435 for its last representative, getting about one quarter of one percent smaller adjustment than the average (not necessarily a downward adjustment) is at risk of losing a representative. A state with a sequence number of 432 for its last representative would need a whole percentage point smaller adjustment for the same risk.

Thus proximity to the boundary is at least as important as the relative size of adjustment.

Table 3 shows the results of the computation of the probabilities in Equations (18) and (20) for PEP 2-8. These are shown in the last column labeled P(change) with each of the 44 states shown twice in 1980 Census sequence order. The first 44 of the P(change) listings above the line are P(loss), the last 44 are P(gain). The largest P(change) probabilities are close to the 435 boundary. The exceptions are by and large the cases, with large negative values of F_{hi} above the line and large positive ones below it.

Each state is listed once before and once after the boundary. Thus the second column, in sequence number order first lists all $S(P_{oi},n_{oi}) \leq 435$ and below, all $S(P_{oi},n_{oi}+1)>435$ for $i=1,2,...,44$ in both cases. The next column lists the numbers $S(P_{hi},n_{oi})$ and $S(P_{hi},n_{oi}+1)$ for h=1, PEP 2-8. The next column labeled F_{hi} is the deviation of the relative adjustment from the average relative adjustment. The same F_{hi} is listed opposite $S(P_{hi},n_{oi})$ and $S(P_{hi},n_{oi}+1)$.

The next column makes use of the prior column in computing an estimate of the expectations of $S(P_{hi},n_{oi})$ and of $S(P_{hi},n_{oi}+1)$. The column uses

$$\hat{S}(P_{hi},n_{oi}) = S(P_{oi},n_{oi}) + \hat{b}F_{hi} \text{ for } S(P_{oi},n_{oi}) \leq 435$$

and $\hat{S}(P_{hi},n_{oi}+1) = S(P_{oi},n_{oi}) + \lambda_{oi}T_{oi}$ for $S(P_{oi},n_{oi} + 1) > 435$.

TABLE 3. CHANGE IN APPORTIONMENT DUE TO PEP 2-B ADJUSTMENT

STATES	SEQ NO CENSUS	SEQ NO PEP 2-B	Fhi	EXPECTED SEQ NO	P(change)
ME	287	284	0.0097	283.3	0.000
HI	332	332	-0.0013	332.5	0.000
RI	338	338	-0.0023	338.9	0.000
ID	340	337	0.0032	338.8	0.000
AR	344	350	-0.0214	352.2	0.000
NH	349	362	-0.0273	359.5	0.000
NE	358	361	-0.0109	362.2	0.000
AZ	375	374	0.0056	372.8	0.000
AL	378	384	-0.0144	383.6	0.000
UT	381	382	-0.0066	383.6	0.000
OR	385	388	-0.0065	387.5	0.000
MO	390	392	-0.0023	390.9	0.000
IN	392	399	-0.0181	399.0	0.000
GA	393	398	-0.0123	397.7	0.000
SC	396	378	0.0507	376.5	0.000
CT	397	409	-0.0167	403.4	0.000
NV	398	394	0.0205	390.1	0.000
KY	399	416	-0.0259	409.0	0.000
MS	400	401	-0.0019	400.7	0.000
VA	401	404	-0.0047	402.8	0.000
MD	402	396	0.0147	396.3	0.000
WV	403	415	-0.0185	410.1	0.000
LA	404	400	0.0110	399.8	0.000
NC	406	405	0.0010	405.6	0.000
MT	412	408	0.0043	410.3	0.000
WI	413	410	0.0049	411.1	0.000
OK	415	419	-0.0143	420.5	0.000
WA	417	412	0.0055	414.9	0.000
MA	418	425	-0.0221	426.5	0.002
NJ	419	417	0.0040	417.5	0.000
MN	420	420	-0.0006	420.2	0.000
TN	422	437	-0.0396	437.2	0.596
TX	424	426	-0.0062	426.4	0.008
CA	425	422	0.0223	416.4	0.000
IA	426	434	-0.0178	432.9	0.256
IL	427	424	0.0091	423.5	0.000
NM	428	423	0.0141	422.6	0.001
MI	429	429	-0.0015	429.6	0.022
KS	430	432	-0.0043	431.6	0.164
PA	431	435	-0.0102	434.9	0.364
CO	432	433	-0.0038	433.5	0.279
OH	433	431	-0.0009	433.3	0.202
FL	434	428	0.0052	432.0	0.145
NY	435	430	0.0075	432.1	0.111
IN	436	441	-0.0181	443.0	0.120
GA	437	439	-0.0123	441.5	0.158
CA	438	427	0.0223	425.7	0.972
AL	439	443	-0.0144	447.6	0.066
MO	440	438	-0.0023	439.6	0.237
TX	441	440	-0.0062	441.9	0.078
NC	442	445	0.0010	444.5	0.093

TABLE 3. CHANGE IN APPORTIONMENT DUE TO PEP 2-8 ADJUSTMENT

STATES	SEQ NO CENSUS	SEQ NO PEP 2-8	Fhi	EXPECTED SEQ NO	P(change)
AR	443	454	-0.0214	470.7	0.001
VA	444	448	-0.0047	445.7	0.066
NY	446	442	0.0075	444.2	0.015
NJ	447	446	0.0040	447.5	0.024
IL	448	444	0.0091	442.3	0.061
PA	449	455	-0.0102	452.8	0.000
OH	450	452	-0.0009	452.9	0.000
MI	451	456	-0.0015	452.4	0.001
FL	452	451	0.0052	453.5	0.001
MA	453	465	-0.0221	464.5	0.000
MD*	456	450	0.0147	449.4	0.048
AZ	457	457	0.0056	461.7	0.007
WI	458	459	0.0049	457.8	0.001
LA	459	453	0.0110	452.6	0.051
KY	461	476	-0.0259	469.3	0.000
WA	464	463	0.0055	466.8	0.000
TN	467	486	-0.0396	482.8	0.000
SC	469	449	0.0507	446.7	0.179
OR	471	474	-0.0065	473.6	0.000
MN	472	468	-0.0006	471.5	0.000
CT	474	479	-0.0167	473.4	0.000
OK	485	492	-0.0143	488.6	0.000
MS	491	494	-0.0019	483.1	0.000
ME	495	488	0.0097	551.1	0.000
NE	498	506	-0.0109	511.7	0.000
IA	503	513	-0.0178	498.5	0.000
CO	508	510	-0.0038	498.5	0.000
WV	518	529	-0.0185	511.2	0.000
KS	526	526	-0.0043	508.9	0.000
UT	537	542	-0.0066	522.7	0.000
HI	575	575	-0.0013	562.3	0.000
RI	586	588	-0.0023	564.4	0.000
ID	590	586	0.0032	563.5	0.000
NH	604	618	-0.0273	578.7	0.000
NM	605	595	0.0141	546.4	0.000
NV	696	681	0.0205	580.4	0.000
MT	706	703	0.0043	597.7	0.000

The latter equation might be

$$\hat{\hat{S}}(P_{hi}, n_{oi} + 1) = S(P_{oi}, n_{oi}) + \hat{b}' F_{hi}$$

with $\hat{b}' = \hat{b}$ possibly. This has not been investigated. It is worth investigating whether $\hat{S}(P_{hi}, n_{oi} + 1)$ or an equivalent form is superior to $\hat{S}(P_{hi}, n_{oi} + 1)$.

The largest two change probabilities are for California (Census Seq. No. 438), P = .972 and Tennessee (Census Seq. No. 422) P = .596. The former actually gained a seat while the latter lost one in PEP 2-8. There were no other changes. Other probabilities are less than .4 though there are some close to this. The expectation column predict these two state changes correctly as well as a no change prediction for the other states.

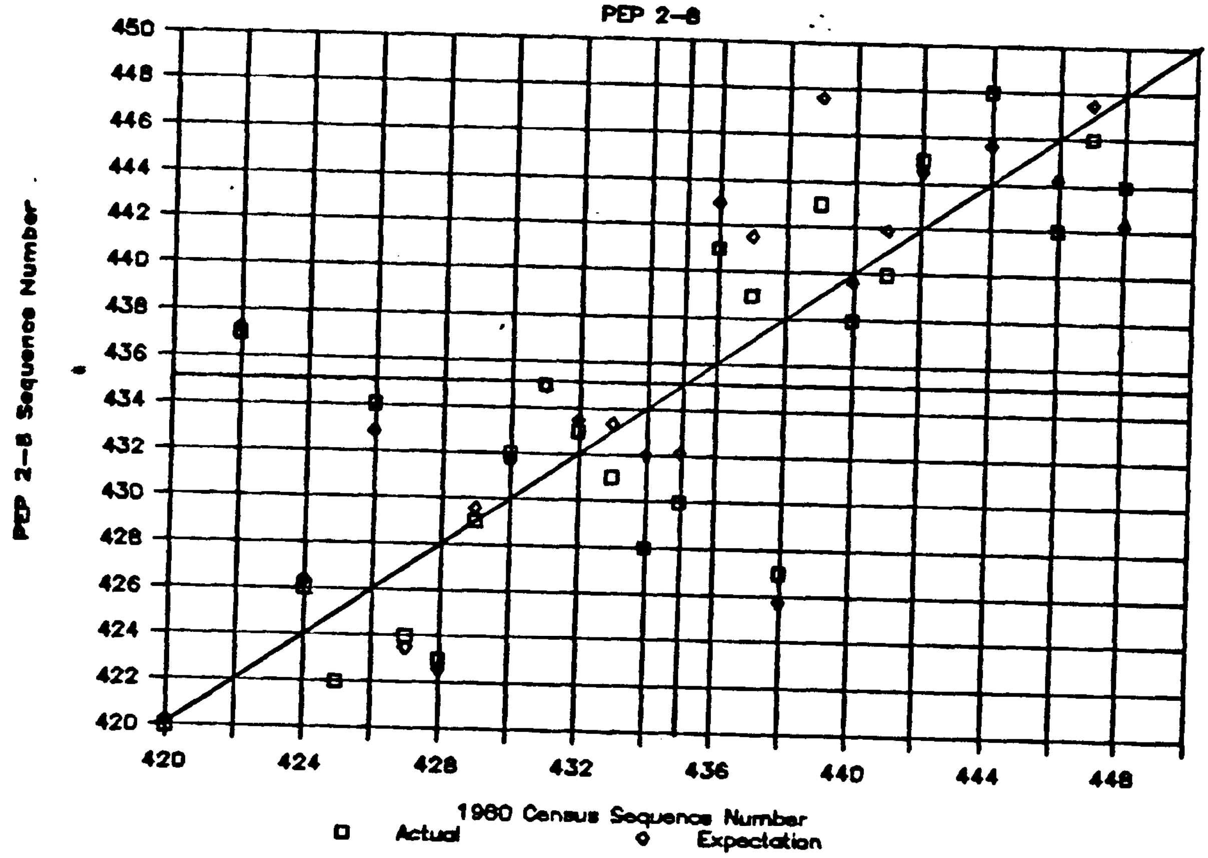
In expectation, the model performs well but although the ranking of the probabilities is correct a higher change probability for Tennessee would have been better.

Results have only been computed for PEP 2-8. The others should be computed to obtain a better evaluation of the model. Figure 7 depicts the actual and expected PEP 2-8 Sequence Numbers against the 1980 Census Sequence Numbers. These are shown in the restricted range of 420 to 450 to display the interesting portion of the entire range. A gain falls in the lower right quadrant while a loss falls in the upper left. The diagonal is the locus of no change. The greater variability in the deivations of actual from expected for 1980 sequence numbers greater than 435, is very likely due to the fact that their estimators have a larger variance. Use of $\hat{S}(P_{hi}, n_{oi} + 1)$ rather than $\hat{S}(P_{hi}, n_{oi} + 1)$ might correct this.

This figure displays some of the critical results shown in Table 3 more graphically.

FIG.7 CHANGE IN SEQUENCE NUMBERS

PEP 2-8



The Count Apportionment-Adjustment-Reapportionment Sequence

We wish to consider now the probability of state i getting the correct numbers of representatives or reapportionment in the context of sampling errors in the adjustment.

$$\text{Let } P'_{hi} = P_{hi} + (B_{hi} - A_{hi}) = P_{oi} + B_{hi} \qquad (21)$$

where $P_{hi} = P_{oi} + A_{hi}$ is now defined as the true adjusted population count in state i when using PEP h.

B_{hi} = One sample value for adjustment among all possible ones when A_{hi} is correct.

That is

$$EB_{hi} = A_{hi}$$

and

$$\sigma^2(B_{hi}) = \text{variance of the estimate } B_{hi}.$$

Equation (21) thus represents an adjustment to the census using the methods of PEP h and an estimate of undercount B_{hi} with variance $\sigma^2(B_{hi})$. The estimate B_{hi} is asymptotically $N(A_{hi}, \sigma^2(B_{hi}))$. The probability of loss refers to sequence numbers truly less than or equal to 435 while the probability of gain referes to sequence numbers truly greater than 435. Deviations from these true sequence numbers are then due to the sampling error of the adjustment.

In this context

n_{hi} = Correct number of representatives for state i if the h^{th} PEP adjustment were known without sampling error

$S(P_{hi}, n_{hi})$ = Sequence number of the last representative assigned to state i using the h^{th} PEP for an adjustment without error

$S(P'_{hi}, n_{hi})$ = Sequence number of the n_{hi}th representative assigned to state i using the h^{th} PEP when the adjustment is made with the estimate having a sampling error.

From equation (10)

$$S(P'_{hi}, n_{hi}) = S(P_{hi}, n_{hi}) + b\left(\frac{B_{hi} - A_{hi}}{P_{hi}} - \frac{\overline{B}_{h2} - \overline{A}_{hi}}{\overline{P}_{h2}}\right) + \varepsilon$$

where $\overline{B}_{h2} = \frac{1}{S^2} \sum_i^{S_2} B_{hi}$

$$\overline{P}_{h2} = \frac{1}{S^2} \sum_i^{S_2} P_{hi}$$

and fof $G_{hi} = \frac{B_{hi} - A_{hi}}{P_{hi}} - \frac{\overline{B}_{h2} - A_{h2}}{\overline{P}_{h2}}$

$$S(P'_{hi}, n_{hi}) = S(P_{hi}, n_{oi}) + bG_{hi} + \varepsilon \qquad (22)$$

$P(\text{loss}) = P(435 < S(P'_{hi}, n_{hi}))$
and $P(\text{gain}) = P(S(P'_{hi}, n_{oi} + 1) \leq 435)$.

Following the logic in the last section,

$$P(\text{loss}) = \Phi\left(-\frac{436 - S(P_{hi}, n_{hi})'}{\sqrt{b^2\sigma^2(G_{hi}) + \sigma^2(\varepsilon)}}\right) . \qquad (23)$$

Since E $G_{hi} = 0$,

$$\sigma^2(G_{hi}) = \frac{\sigma^2(B_{hi})}{P_{hi}^2} - 2\frac{\sigma^2(B_{hi})}{P_{hi}\overline{P}_{h2}S_2} + \frac{\sum_i \sigma^2(B_{hi})}{\overline{P}_{hi}^{\,2}\ S_2^{\,2}}$$

and

$$P(\text{gain}) = \Phi\left[\frac{434 - S(P_{hi}, n_{hi}) - \lambda_o T_{oi}}{\sqrt{b^2\sigma^2(G_{hi}) + \lambda_o T_{oi} + \sigma^2(\varepsilon)}}\right] . \qquad (24)$$

An estimate of $\sigma^2(G_{hi})$ is $\sigma^2(F_{hi})$.

In a [4] declaration submitted in the New York vs the Census Bureau litigation, this same subject was addressed with a Monte Carlo simulation of 1000 replications for each of 12 PEP's. Figure 8 is a reproduction of Figure 1 of that declaration. The terminology is slightly different. The term "Priority Ranks" in the figure is called Sequence Number in this paper. The figure shows that the estimated probability of a correct apportionment in all of the 12 PEP's falls off as the boundry of 435/436 is approached from either direction. For Sequence Numbers (Priority Ranks) greater than 435, the implication is that some of the time one or more extra representatives are incorrectly allotted to a state while the reverse is true for Sequence Numbers less than or equal to 435.

Table 4 shows the computations of the complement of Equation (23) in the second column and the complement of equation (24) in the fifth column which represents the same measures as are shown in Figure 8. The results are shown in order of the assumed correct Sequence Number of PEP 2-8. Results for Sequence Numbers less than or equal to 435 are shown in the first three columns and for greater than 435 in the last three columns.

Table 5 repeats Table 4 in the Sequence Number range [420,450] and also shows the old Monte Carlo results for PEP 2-8. Figure 9 is a plot of the numbers in Table 5. For Sequence Numbers less than or equal to 435, the agreement is quite good. For Sequence Numbers greater than 435, the variability seems to be greater. This may be due to the choice of the estimator of $S(P_{hi}, n_{oi} + 1)$ as discussed in the prior section. An alternative estimator is available which involves the distribution of the difference between two Poison random variables. This has not been explored. There also seems to be a downward bias in the probability estimate.

4/ Declaration of Leon Gilford, 80 Civ. 4550 Maria Cuonio, *et al.*, Plaintiffs vs Malcolm L. Baldridge *et al.*.

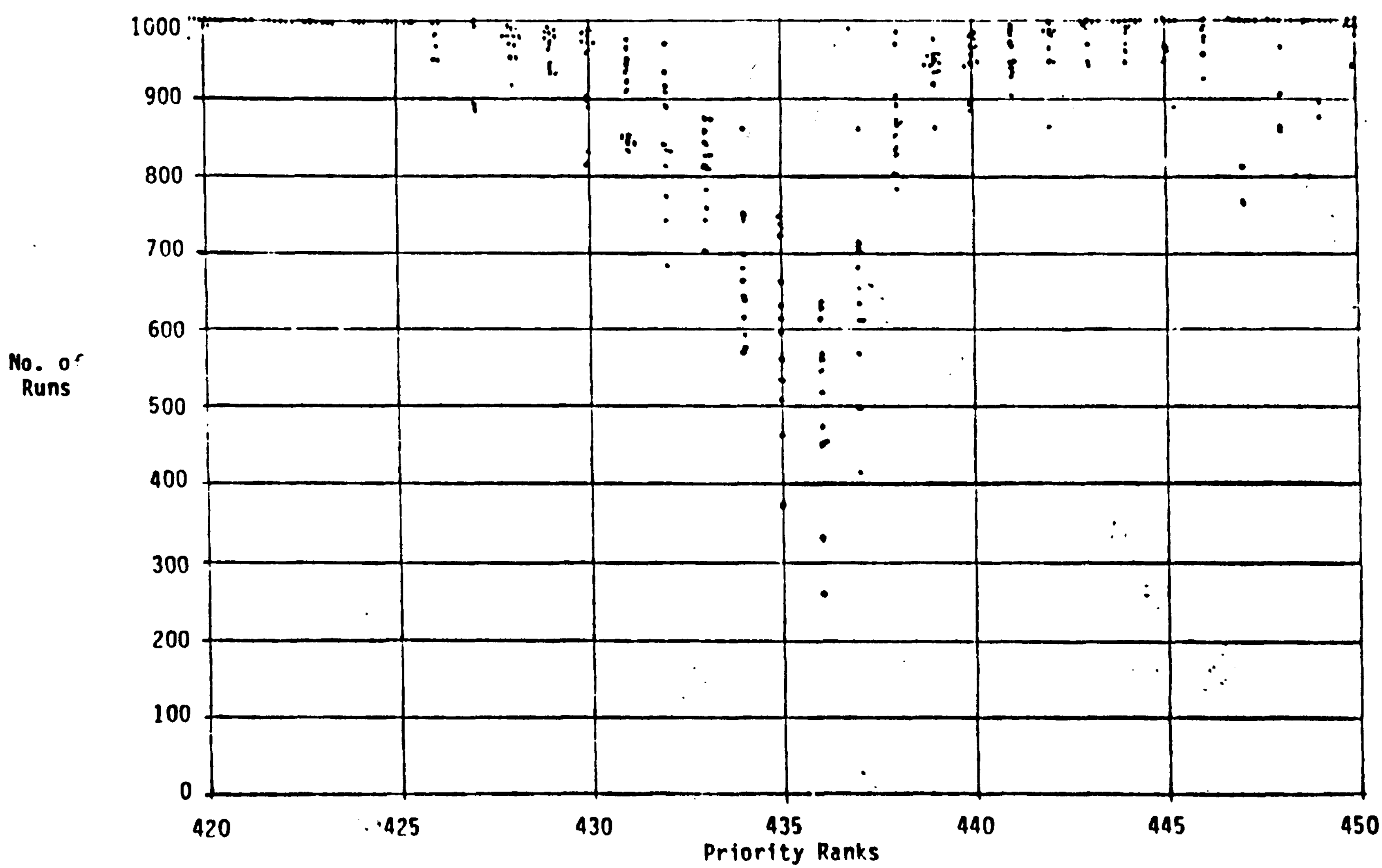


FIGURE 8. NUMBER OF HYPOTHETICAL SAMPLE RUNS IN WHICH THE NUMBER OF REPRESENTATIVES FOR THE STATE WITH THE DESIGNATED PRIORITY RANK AGREED WITH THE ASSUMED TRUE NUMBER

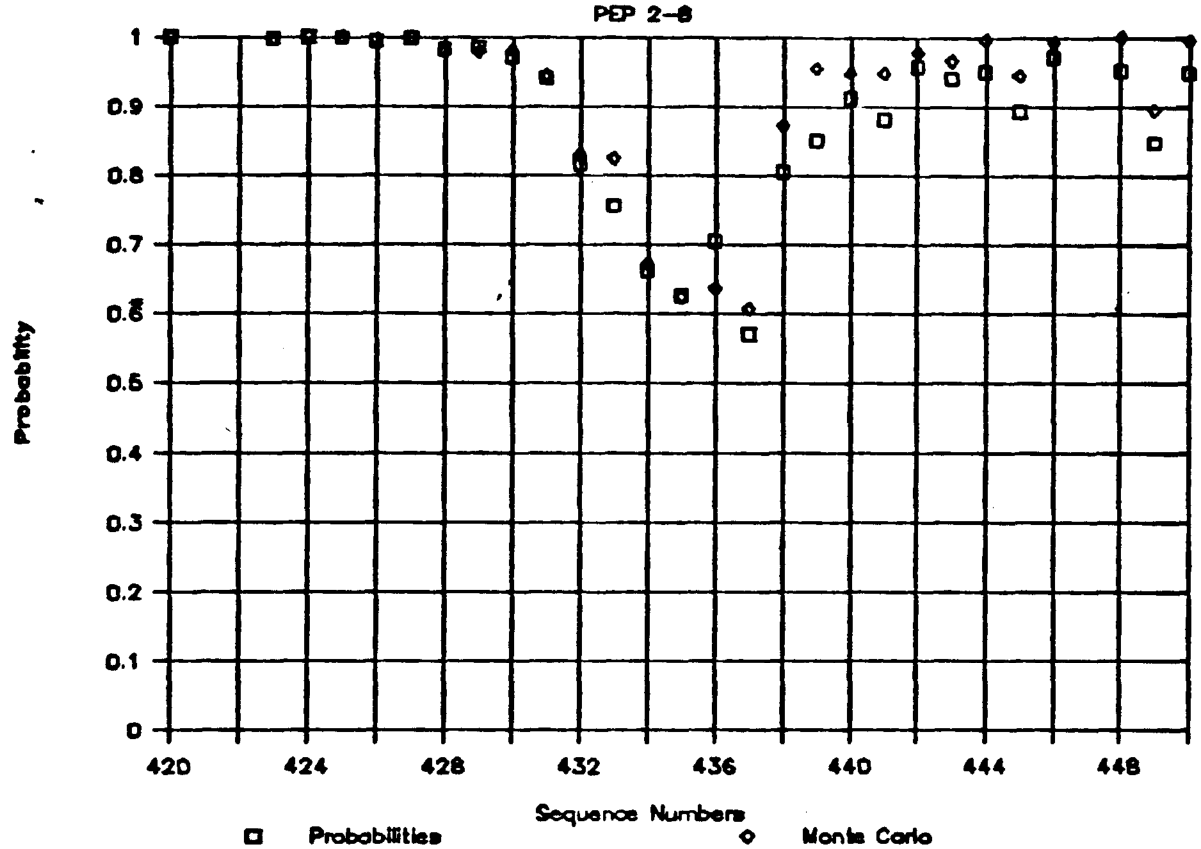
TABLE 4. EFFECT OF SAMPLING ERROR ON THE PROBABILITY OF THE CORRECT NUMBER OF SEATS, PEP 2-8

STATES	P(correct no. seats)	SEQ NO PEP 2-8	STATES	P(correct no. seats)	SEQ NO PEP 2-8
ME	1.000	284	CA	0.704	436
HI	1.000	332	TN	0.570	437
ID	1.000	337	MO	0.804	438
RI	1.000	338	GA	0.850	439
AR	1.000	350	TX	0.912	440
NE	1.000	361	IN	0.881	441
NH	1.000	362	NY	0.958	442
AZ	1.000	374	AL	0.940	443
SC	1.000	378	IL	0.950	444
UT	1.000	382	NC	0.893	445
AL	1.000	384	NJ	0.972	446
TN	1.000	387	VA	0.951	448
OR	1.000	388	SC	0.848	449
MO	1.000	392	MD	0.949	450
NV	1.000	394	FL	0.995	451
MD	1.000	396	OH	0.999	452
GA	1.000	398	LA	0.951	453
IN	1.000	399	AR	0.998	454
LA	1.000	400	PA	1.000	455
MS	1.000	401	MI	0.999	456
VA	1.000	404	AZ	0.995	457
NC	1.000	405	WI	0.999	459
MT	1.000	408	WA	1.000	463
CT	1.000	409	MA	1.000	465
WI	1.000	410	MN	1.000	468
WA	1.000	412	OR	1.000	474
WV	1.000	415	KY	1.000	476
KY	1.000	416	CT	1.000	479
NJ	1.000	417	ME	1.000	488
OK	1.000	419	OK	1.000	492
MN	1.000	420	MS	1.000	494
NM	0.998	423	NE	1.000	506
IL	1.000	424	CO	1.000	510
MA	1.000	425	IA	1.000	513
TX	0.994	426	KS	1.000	526
CA	0.998	427	WV	1.000	529
FL	0.983	428	UT	1.000	542
MI	0.986	429	HI	1.000	575
NY	0.971	430	ID	1.000	586
OH	0.941	431	RI	1.000	588
KS	0.816	432	NM	1.000	595
CO	0.755	433	NH	1.000	618
IA	0.662	434	NV	1.000	681
PA	0.627	435	MT	1.000	703

TABLE 5. COMPARISON OF THE PROBABILITIES OF THE CORRECT NUMBER OF SEATS WITH THE MONTE CARLO RESULTS, PEP 2-8

STATES	P(correct no. seats	MONTE CARLO	SEQ NO PEP 2-8
MN	1.000	1.000	420
NM	0.998	0.999	423
IL	1.000	1.000	424
MA	1.000	1.000	425
TX	0.994	0.996	426
CA	0.998	1.000	427
FL	0.983	0.979	428
MI	0.986	0.980	429
NY	0.971	0.981	430
OH	0.941	0.945	431
KS	0.816	0.829	432
CO	0.755	0.824	433
IA	0.662	0.672	434
PA	0.627	0.625	435
CA	0.704	0.636	436
TN	0.570	0.608	437
MO	0.804	0.872	438
GA	0.850	0.955	439
TX	0.912	0.948	440
IN	0.881	0.948	441
NY	0.958	0.978	442
AL	0.940	0.966	443
IL	0.950	0.996	444
NC	0.893	0.945	445
NJ	0.972	0.993	446
VA	0.951	1.000	448
SC	0.848	0.895	449
MD	0.949	0.995	450

FIG.9 PROBABILITY OF CORRECT NO. SEATS



The agreement generally, seems quite good subjectively, moreover, a comparison of Figures 8 and 9 indicates that the agreement, at least in the pattern, is good.

It would be instructive to make these computations for the other 11 PEPs and to design a test of significance for the whole set.

This analysis established the fact that sampling error affects states that are close to the boundary much more than those that are not. This has implications on whether or not to adjust the counts for apportionment. If it is decided to adjust, the structure of the model in this paper can be adapted to design the recount to yield smaller variances of undercount for states likely to be near the boundary. These would tend to be the larger ones.

Conclusion

The model with all its constituent parts is too rich to enumerate all of its potential. The translation of a complex sequence of events into a probabilistic framework permits one to gain insight not otherwise achievable.

This paper summarizes the results to date in this approach to the undercount adjustment and apportionment. Though it establishes what we set out to do, it is more in the nature of a progress report than a report of final results. There are a number of loose ends remaining that need follow up by anyone whose interest is stimulated. Some of these were alluded to in the report.

Appendix

This appendix contains the data for the 12 PEP's together with the computations for the regression predicting the sequence number changes as functions of population adjustments. The columns have the following meanings (for the 44 states with 2 or more representatives).

Column	Meaning
1	Subscript designiation of the 12 PEPs
2	Official designiation of the 12 PEPs
3	States
4	1980 population counts (repeated for each PEP)
5	PEP population counts
6	Number of seats apportioned in the 1980 Censuses
7	Sequence number of last seat in the 1980 Census
8	Sequence number in the PEP for last seat assigned in the 1980 Census
9	The difference between columns 7 and 8
10	Population adjustment in the PEPs
11	Average population adjustment in each PEP
12	F_{hi}, or the difference between columns 13 and 14
13	The ratio of column 10 to column 4
14	The ratio of column 11 to average state population in the 1980 Census
15	Regression value of the sequence number difference
16	The regression residuals.

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 POi	POP ADJ Phi	SEATS nOi	SEQ '80 S(POi,nOi)	SEQ ADJ S(Phi,nOi)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/POi	DIFRATIO bar:Ah/POD(hi)	REGRESS.	RESID. Dhi-D(hi)
1	2-8	SC	3119208	3314170	6	396	378	-18	194962	59930.27	0.051	0.063	0.012	-19.506	1.506
1	2-8	MD	4216446	4328315	8	402	396	-6	111869	59930.27	0.015	0.027	0.012	-5.654	-0.346
1	2-8	FL	9739992	9905683	19	434	428	-6	165691	59930.27	0.005	0.017	0.012	-1.988	-4.012
1	2-8	WA	4130163	4201690	8	417	412	-5	71527	59930.27	0.005	0.017	0.012	-2.106	-2.894
1	2-8	NY	17557288	17896311	34	435	430	-5	339023	59930.27	0.007	0.019	0.012	-2.873	-2.127
1	2-8	NM	1299968	1333682	3	428	423	-5	33714	59930.27	0.014	0.026	0.012	-5.424	0.424
1	2-8	MT	786690	799391	2	412	408	-4	12701	59930.27	0.004	0.016	0.012	-1.654	-2.346
1	2-8	NV	799184	825059	2	398	394	-4	25875	59930.27	0.021	0.032	0.012	-7.905	3.905
1	2-8	LA	4203972	4300078	8	404	400	-4	96106	59930.27	0.011	0.023	0.012	-4.241	0.241
1	2-8	ME	1124660	1148858	2	287	284	-3	24198	59930.27	0.010	0.022	0.012	-3.723	0.723
1	2-8	WI	4705335	4784191	9	413	410	-3	78856	59930.27	0.005	0.017	0.012	-1.891	-1.109
1	2-8	CA	23668562	24476808	45	425	422	-3	808246	59930.27	0.022	0.034	0.012	-8.587	5.587
1	2-8	ID	943935	958180	2	340	337	-3	14245	59930.27	0.003	0.015	0.012	-1.249	-1.751
1	2-8	IL	11418461	11658112	22	427	424	-3	239651	59930.27	0.009	0.021	0.012	-3.519	0.519
1	2-8	OH	10797419	10915915	21	433	431	-2	118496	59930.27	-0.001	0.011	0.012	0.337	-2.337
1	2-8	NJ	7364158	7480686	14	419	417	-2	116528	59930.27	0.004	0.016	0.012	-1.531	-0.469
1	2-8	AZ	2717866	2765269	5	375	374	-1	47403	59930.27	0.006	0.017	0.012	-2.154	1.154
1	2-8	NC	5874429	5949657	11	406	405	-1	75228	59930.27	0.001	0.013	0.012	-0.369	-0.631
1	2-8	HI	965000	975149	2	332	332	0	10149	59930.27	-0.001	0.011	0.012	0.513	-0.513
1	2-8	MN	4077148	4122914	8	420	420	0	45766	59930.27	-0.001	0.011	0.012	0.240	-0.240
1	2-8	RI	947154	956158	2	338	338	0	9004	59930.27	-0.002	0.010	0.012	0.902	-0.902
1	2-8	MI	9258344	9354474	18	429	429	0	96130	59930.27	-0.001	0.010	0.012	0.564	-0.564
1	2-8	UT	1461037	1468643	3	381	382	1	7606	59930.27	-0.007	0.005	0.012	2.558	-1.558
1	2-8	MS	2520638	2545731	5	400	401	1	25093	59930.27	-0.002	0.010	0.012	0.729	0.271
1	2-8	CO	2888834	2912128	6	432	433	1	23294	59930.27	-0.004	0.008	0.012	1.458	-0.458
1	2-8	MO	4917444	4964266	9	390	392	2	46822	59930.27	-0.002	0.010	0.012	0.896	1.104
1	2-8	TX	14228383	14309406	27	424	426	2	81023	59930.27	-0.006	0.006	0.012	2.370	-0.370
1	2-8	KS	2363208	2381114	5	430	432	2	17906	59930.27	-0.004	0.008	0.012	1.645	0.355
1	2-8	NE	1570006	1571571	3	358	361	3	1565	59930.27	-0.011	0.001	0.012	4.179	-1.179
1	2-8	OR	2632663	2646687	5	385	388	3	14024	59930.27	-0.007	0.005	0.012	2.512	0.488
1	2-8	VA	5346279	5384288	10	401	404	3	38009	59930.27	-0.005	0.007	0.012	1.825	1.175
1	2-8	OK	3025266	3017843	6	415	419	4	-7423	59930.27	-0.014	-0.002	0.012	5.508	-1.508
1	2-8	PA	11866728	11886284	23	431	435	4	19556	59930.27	-0.010	0.002	0.012	3.928	0.072
1	2-8	GA	5464265	5461848	10	393	398	5	-2417	59930.27	-0.012	-0.000	0.012	4.733	0.267
1	2-8	AL	3890061	3880007	7	378	384	6	-10054	59930.27	-0.014	-0.003	0.012	5.558	0.442
1	2-8	AR	2285513	2263733	4	344	350	6	-21780	59930.27	-0.021	-0.010	0.012	8.233	-2.233
1	2-8	MA	5737037	5677995	11	418	425	7	-59042	59930.27	-0.022	-0.010	0.012	8.526	-1.526
1	2-8	IN	5490179	5456021	10	392	399	7	-34158	59930.27	-0.018	-0.006	0.012	6.959	0.041
1	2-8	IA	2913387	2896006	6	426	434	8	-17381	59930.27	-0.018	-0.006	0.012	6.860	1.140
1	2-8	CT	3107576	3092482	6	397	409	12	-15094	59930.27	-0.017	-0.005	0.012	6.433	5.567
1	2-8	WV	1949644	1936644	4	403	415	12	-13000	59930.27	-0.019	-0.007	0.012	7.131	4.869
1	2-8	NH	920610	906427	2	349	362	13	-14183	59930.27	-0.027	-0.015	0.012	10.496	2.504
1	2-8	TN	4590750	4463364	9	422	437	15	-127386	59930.27	-0.040	-0.028	0.012	15.248	-0.248
1	2-8	KY	3661433	3610017	7	399	416	17	-51416	59930.27	-0.026	-0.014	0.012	9.970	7.030
2	2-9	SC	3119208	3326403	6	396	379	-17	207195	81790.36	0.050	0.066	0.016	-19.352	2.352
2	2-9	NV	799184	843642	2	398	388	-10	44458	81790.36	0.039	0.056	0.016	-15.195	5.195
2	2-9	CA	23668562	24673912	45	425	417	-8	1005[illegible]50	81790.36	0.026	0.04[illegible]	0.016	-10.130	2.130
2	2-9	FL	9739992	9962705	19	434	428	-6	222713	81790.36	0.007	0.023	0.016	-2.578	-3.422
2	2-9	NY	17557288	17986996	34	435	429	-6	429708	81790.36	0.008	0.024	0.016	-3.198	-2.802
2	2-9	LA	4203972	4312276	8	404	399	-5	108304	81790.36	0.010	0.026	0.016	-3.694	-1.306
2	2-9	MD	4216446	4339304	8	402	397	-5	122858	81790.36	0.013	0.029	0.016	-4.993	-0.007

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 POi	POP ADJ Phi	SEATS nOi	SEQ '80 S(POi,nOi)	SEQ ADJ S(Phi,nOi)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/POi	DIFRATIO bar:Ah/POD	REGRESS. (hi)	RESID. Dhi-D(hi)
2	2-9	WA	4130163	4199458	8	417	413	-4	69295	81790.36	0.001	0.017	0.016	-0.234	-3.766
2	2-9	IL	11418461	11741166	22	427	423	-4	322705	81790.36	0.012	0.028	0.016	-4.656	0.656
2	2-9	MT	786690	801662	2	412	409	-3	14972	81790.36	0.003	0.019	0.016	-1.102	-1.898
2	2-9	ME	1124660	1149258	2	287	284	-3	24598	81790.36	0.006	0.022	0.016	-2.195	-0.805
2	2-9	NM	1299968	1337236	3	428	425	-3	37268	81790.36	0.012	0.029	0.016	-4.813	1.813
2	2-9	ID	943935	959307	2	340	338	-2	15372	81790.36	0.000	0.016	0.016	-0.044	-1.956
2	2-9	NJ	7364158	7480049	14	419	418	-1	115891	81790.36	-0.000	0.016	0.016	0.167	-1.167
2	2-9	CO	2888834	2931335	6	432	431	-1	42501	81790.36	-0.001	0.015	0.016	0.562	-1.562
2	2-9	AZ	2717866	2787620	5	375	374	-1	69754	81790.36	0.009	0.026	0.016	-3.656	2.656
2	2-9	WI	4705335	4784191	9	413	412	-1	78856	81790.36	0.001	0.017	0.016	-0.226	-0.774
2	2-9	OH	10797419	10928111	21	433	433	0	130692	81790.36	-0.004	0.012	0.016	1.566	-1.566
2	2-9	NC	5874429	5962736	11	406	407	1	88307	81790.36	-0.001	0.015	0.016	0.438	0.562
2	2-9	HI	965000	976712	2	332	333	1	11712	81790.36	-0.004	0.012	0.016	1.553	-0.553
2	2-9	MN	4077148	4138069	8	420	421	1	60921	81790.36	-0.001	0.015	0.016	0.473	0.527
2	2-9	MI	9258344	9389139	18	429	430	1	130795	81790.36	-0.002	0.014	0.016	0.787	0.213
2	2-9	TX	14228383	14427265	27	424	426	2	198882	81790.36	-0.002	0.014	0.016	0.845	1.155
2	2-9	KS	2363208	2385339	5	430	432	2	22131	81790.36	-0.007	0.009	0.016	2.621	-0.621
2	2-9	MS	2520638	2559566	5	400	402	2	38928	81790.36	-0.001	0.015	0.016	0.280	1.720
2	2-9	RI	947154	955215	2	338	340	2	8061	81790.36	-0.008	0.009	0.016	2.950	-0.950
2	2-9	UT	1461037	1478797	3	381	383	2	17760	81790.36	-0.004	0.012	0.016	1.546	0.454
2	2-9	VA	5346279	5407360	10	401	404	3	61081	81790.36	-0.005	0.011	0.016	1.828	1.172
2	2-9	NE	1570006	1574864	3	358	362	4	4858	81790.36	-0.013	0.003	0.016	5.036	-1.036
2	2-9	PA	11866728	11916546	23	431	435	4	49818	81790.36	-0.012	0.004	0.016	4.611	-0.611
2	2-9	OR	2632663	2661388	5	385	389	4	28725	81790.36	-0.005	0.011	0.016	2.026	1.974
2	2-9	MO	4917444	4969316	9	390	394	4	51872	81790.36	-0.006	0.011	0.016	2.165	1.835
2	2-9	GA	5464265	5485548	10	393	398	5	21283	81790.36	-0.012	0.004	0.016	4.727	0.273
2	2-9	MA	5737037	5728378	11	418	424	6	-8659	81790.36	-0.018	-0.002	0.016	6.808	-0.808
2	2-9	AL	3890061	3892815	7	378	385	7	2754	81790.36	-0.015	0.001	0.016	5.955	1.045
2	2-9	OK	3025266	3018609	6	415	422	7	-6657	81790.36	-0.018	-0.002	0.016	7.075	-0.075
2	2-9	AR	2285513	2269627	4	344	352	8	-15886	81790.36	-0.023	-0.007	0.016	8.904	-0.904
2	2-9	IN	5490179	5460497	10	392	400	8	-29682	81790.36	-0.022	-0.005	0.016	8.309	-0.309
2	2-9	IA	2913387	2896006	6	426	437	11	-17381	81790.36	-0.022	-0.006	0.016	8.525	2.475
2	2-9	WV	1949644	1936108	4	403	415	12	-13536	81790.36	-0.023	-0.007	0.016	8.901	3.099
2	2-9	CT	3107576	3103845	6	397	410	13	-3731	81790.36	-0.017	-0.001	0.016	6.690	6.310
2	2-9	TN	4590750	4488596	9	422	436	14	-102154	81790.36	-0.042	-0.022	0.019	16.060	-2.060
2	2-9	NH	920610	908053	2	349	363	14	-12557	81790.36	-0.030	-0.014	0.016	11.480	2.520
2	2-9	KY	3661433	3610074	7	399	416	17	-51359	81790.36	-0.030	-0.014	0.016	11.629	5.371
3	2-20	SC	3119208	3362934	6	396	376	-20	243726	98435.04	0.059	0.078	0.019	-22.595	2.595
3	2-20	NV	799184	848574	2	398	387	-11	49390	98435.04	0.042	0.062	0.019	-16.304	5.304
3	2-20	CA	23668562	24760392	45	425	418	-7	1091830	98435.04	0.027	0.046	0.019	-10.270	3.270
3	2-20	FL	9739992	10006779	19	434	428	-6	266787	98435.04	0.008	0.027	0.019	-3.053	-2.947
3	2-20	LA	4203972	4344365	8	404	398	-6	140393	98435.04	0.014	0.033	0.019	-5.366	-0.634
3	2-20	NY	17557288	18031803	34	435	429	-6	474515	98435.04	0.008	0.027	0.019	-2.913	-3.087
3	2-20	MD	4216446	4350610	8	402	397	-5	134164	98435.04	0.012	0.032	0.019	-4.759	-0.241
3	2-20	WA	4130163	4222592	8	417	412	-5	92429	98435.04	0.003	0.022	0.019	-1.123	-3.877
3	2-20	NM	1299968	1341987	3	428	423	-5	42019	98435.04	0.013	0.032	0.019	-4.953	-0.047
3	2-20	ME	1124660	1152059	2	287	284	-3	27399	98435.04	0.005	0.024	0.019	-1.887	-1.113
3	2-20	ID	943935	962329	2	340	338	-2	18394	98435.04	0.000	0.019	0.019	-0.010	-1.990
3	2-20	AZ	2717866	2802322	5	375	373	-2	84456	98435.04	0.012	0.031	0.019	-4.472	2.472
3	2-20	NJ	7364158	7509603	14	419	417	-2	145445	98435.04	0.000	0.020	0.019	-0.111	-1.889
3	2-20	MT	786690	804796	2	412	410	-2	18106	98435.04	0.004	0.023	0.019	-1.368	-0.632

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 P0i	POP ADJ Phi	SEATS n0i	SEQ '80 S(P0i,n0i)	SEQ ADJ S(Phi,n0i)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/P0i	DIFRATIO bar:Ah/P0	REGRESS. D(hi)	RESID. Dhi-D(hi)
3	2-20	CO	2888834	2939314	6	432	431	-1	50480	98435.04	-0.002	0.017	0.019	0.765	-1.765
3	2-20	IL	11418461	11758411	22	427	426	-1	339950	98435.04	0.010	0.030	0.019	-3.970	2.970
3	2-20	NC	5874429	5985507	11	406	406	0	111078	98435.04	-0.001	0.019	0.019	0.213	-0.213
3	2-20	HI	965000	982873	2	332	332	0	17873	98435.04	-0.001	0.019	0.019	0.362	-0.362
3	2-20	OH	10797419	10948088	21	433	433	0	150669	98435.04	-0.006	0.014	0.019	2.121	-2.121
3	2-20	WI	4705335	4785651	9	413	413	0	80316	98435.04	-0.002	0.017	0.019	0.921	-0.921
3	2-20	MN	4077148	4142497	8	420	421	1	65349	98435.04	-0.003	0.016	0.019	1.322	-0.322
3	2-20	MI	9258344	9410438	18	429	430	1	152094	98435.04	-0.003	0.016	0.019	1.168	-0.168
3	2-20	TX	14228383	14499191	27	424	425	1	270808	98435.04	-0.000	0.019	0.019	0.165	0.835
3	2-20	RI	947154	958985	2	338	340	2	11831	98435.04	-0.007	0.012	0.019	2.684	-0.684
3	2-20	KS	2363208	2393672	5	430	432	2	30464	98435.04	-0.007	0.013	0.019	2.530	-0.530
3	2-20	MS	2520638	2563906	5	400	402	2	43268	98435.04	-0.002	0.017	0.019	0.884	1.116
3	2-20	UT	1461037	1479989	3	381	384	3	18952	98435.04	-0.006	0.013	0.019	2.499	0.501
3	2-20	PA	11866728	11943069	23	431	435	4	76341	98435.04	-0.013	0.006	0.019	5.017	-1.017
3	2-20	OR	2632663	2671585	5	385	389	4	38922	98435.04	-0.005	0.015	0.019	1.801	2.199
3	2-20	MO	4917444	4981497	9	390	394	4	64053	98435.04	-0.006	0.013	0.019	2.478	1.522
3	2-20	VA	5346279	5419583	10	401	405	4	73304	98435.04	-0.006	0.014	0.019	2.214	1.786
3	2-20	AL	3890061	3917039	7	378	383	5	26978	98435.04	-0.013	0.007	0.019	4.824	0.176
3	2-20	GA	5464265	5503578	10	393	399	6	39313	98435.04	-0.012	0.007	0.019	4.724	1.276
3	2-20	MA	5737037	5744774	11	418	424	6	7737	98435.04	-0.018	0.001	0.019	6.975	-0.975
3	2-20	NE	1570006	1578417	3	358	364	6	8411	98435.04	-0.014	0.005	0.019	5.431	0.569
3	2-20	AR	2285513	2284426	4	344	351	7	-1087	98435.04	-0.020	-0.000	0.019	7.678	-0.678
3	2-20	OK	3025266	3030504	6	415	422	7	5238	98435.04	-0.018	0.002	0.019	6.828	0.172
3	2-20	IN	5490179	5467819	10	392	400	8	-22360	98435.04	-0.024	-0.004	0.019	9.063	-1.063
3	2-20	IA	2913387	2897219	6	426	436	10	-16168	98435.04	-0.025	-0.006	0.019	9.632	0.368
3	2-20	CT	3107576	3118575	6	397	408	11	10999	98435.04	-0.016	0.004	0.019	6.131	4.869
3	2-20	NH	920610	912068	2	349	361	12	-8542	98435.04	-0.029	-0.009	0.019	11.068	0.932
3	2-20	WV	1949644	1942108	4	403	415	12	-7536	98435.04	-0.023	-0.004	0.019	8.983	3.017
3	2-20	TN	4590750	4485744	9	422	437	15	-105006	98435.04	-0.033	-0.023	0.011	12.858	2.142
3	2-20	KY	3661433	3629793	7	399	416	17	-31640	98435.04	-0.028	-0.009	0.019	10.822	6.178
4	3-8	SC	3119208	3317900	6	396	377	-19	198692	52080.68	0.053	0.064	0.010	-20.565	1.565
4	3-8	LA	4203972	4304462	8	404	397	-7	100490	52080.68	0.014	0.024	0.010	-5.240	-1.760
4	3-8	FL	9739992	9884595	19	434	428	-6	144603	52080.68	0.005	0.015	0.010	-1.752	-4.248
4	3-8	MD	4216446	4319123	8	402	396	-6	102677	52080.68	0.014	0.024	0.010	-5.412	-0.588
4	3-8	NM	1299968	1332020	3	428	423	-5	32052	52080.68	0.014	0.025	0.010	-5.529	0.529
4	3-8	NY	17557288	17866181	34	435	430	-5	308893	52080.68	0.007	0.018	0.010	-2.810	-2.190
4	3-8	WA	4130163	4195887	8	417	412	-5	65724	52080.68	0.006	0.016	0.010	-2.163	-2.837
4	3-8	MT	786690	798487	2	412	407	-5	11797	52080.68	0.005	0.015	0.010	-1.809	-3.191
4	3-8	WI	4705335	4785099	9	413	409	-4	79764	52080.68	0.007	0.017	0.010	-2.563	-1.437
4	3-8	NV	799184	822213	2	398	394	-4	23029	52080.68	0.019	0.029	0.010	-7.131	3.131
4	3-8	ME	1124660	1148217	2	287	284	-3	23557	52080.68	0.011	0.021	0.010	-4.101	1.101
4	3-8	NC	5874429	5951617	11	406	403	-3	77188	52080.68	0.003	0.013	0.010	-1.095	-1.905
4	3-8	IL	11418461	11665181	22	427	424	-3	246720	52080.68	0.011	0.022	0.010	-4.355	1.355
4	3-8	CA	23668562	24405571	45	425	422	-3	737009	52080.68	0.021	0.031	0.010	-8.026	5.026
4	3-8	ID	943935	956553	2	340	338	-2	12618	52080.68	0.003	0.013	0.010	-1.182	-0.818
4	3-8	OH	10797419	10914072	21	433	431	-2	116653	52080.68	0.001	0.011	0.010	-0.195	-1.805
4	3-8	AZ	2717866	2773885	5	375	373	-2	56019	52080.68	0.010	0.021	0.010	-3.972	1.972
4	3-8	NJ	7364158	7468431	14	419	417	-2	104273	52080.68	0.004	0.014	0.010	-1.487	-0.513
4	3-8	RI	947154	956563	2	338	337	-1	9409	52080.68	-0.000	0.010	0.010	0.140	-1.140
4	3-8	HI	965000	973143	2	332	331	-1	8143	52080.68	-0.002	0.008	0.010	0.716	-1.716
4	3-8	MI	9258344	9335928	18	429	429	0	77584	52080.68	-0.002	0.008	0.010	0.738	-0.738

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 POi	POP ADJ Phi	SEATS nOi	SEQ '80 S(POi,nOi)	SEQ ADJ S(Phi,nOi)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/POi	DIFRATIO bar:Ah/PO	REGRESS. D(hi)	RESID. Dhi-D(hi)
4	3-8	MN	4077148	4118554	8	420	420	0	41406	52080.68	-0.000	0.010	0.010	0.054	-0.054
4	3-8	UT	1461037	1467747	3	381	382	1	6710	52080.68	-0.006	0.005	0.010	2.197	-1.197
4	3-8	CO	2888834	2901640	6	432	433	1	12806	52080.68	-0.006	0.004	0.010	2.258	-1.258
4	3-8	MS	2520638	2545228	5	400	402	2	24590	52080.68	-0.001	0.010	0.010	0.209	1.791
4	3-8	TX	14228383	14270590	27	424	426	2	42207	52080.68	-0.007	0.003	0.010	2.823	-0.823
4	3-8	MO	4917444	4955711	9	390	392	2	38267	52080.68	-0.003	0.008	0.010	0.969	1.031
4	3-8	KS	2363208	2376165	5	430	432	2	12957	52080.68	-0.005	0.005	0.010	1.854	0.146
4	3-8	OR	2632663	2643859	5	385	388	3	11196	52080.68	-0.006	0.004	0.010	2.328	0.672
4	3-8	NE	1570006	1570371	3	358	361	3	365	52080.68	-0.010	0.000	0.010	3.876	-0.876
4	3-8	OK	3025266	3015205	6	415	419	4	-10061	52080.68	-0.014	-0.003	0.010	5.246	-1.246
4	3-8	PA	11866728	11846230	23	431	435	4	-20498	52080.68	-0.012	-0.002	0.010	4.630	-0.630
4	3-8	AL	3890061	3880560	7	378	383	5	-9501	52080.68	-0.013	-0.002	0.010	4.906	0.094
4	3-8	IN	5490179	5455524	10	392	398	6	-34655	52080.68	-0.017	-0.006	0.010	6.396	-0.396
4	3-8	AR	2285513	2262397	4	344	350	6	-23116	52080.68	-0.020	-0.010	0.010	7.860	-1.860
4	3-8	MA	5737037	5677298	11	418	425	7	-59739	52080.68	-0.021	-0.010	0.010	7.975	-0.975
4	3-8	GA	5464265	5440800	10	393	400	7	-23465	52080.68	-0.015	-0.004	0.010	5.619	1.381
4	3-8	VA	5346279	5352942	10	401	408	7	6663	52080.68	-0.009	0.001	0.010	3.485	3.515
4	3-8	IA	2913387	2893358	6	426	434	8	-20029	52080.68	-0.017	-0.007	0.010	6.613	1.387
4	3-8	NH	920610	906955	2	349	359	10	-13655	52080.68	-0.025	-0.015	0.010	9.677	0.323
4	3-8	WV	1949644	1938186	4	403	415	12	-11458	52080.68	-0.016	-0.006	0.010	6.228	5.772
4	3-8	CT	3107576	3076773	6	397	410	13	-30803	52080.68	-0.020	-0.010	0.010	7.782	5.218
4	3-8	TN	4590750	4462549	9	422	436	14	-128201	52080.68	-0.042	-0.028	0.014	16.156	-2.156
4	3-8	KY	3661433	3604103	7	399	416	17	-57330	52080.68	-0.026	-0.016	0.010	9.995	7.005
5	3-9	SC	3119208	3330163	6	396	378	-18	210955	73903.20	0.053	0.068	0.015	-20.417	2.417
5	3-9	NV	799184	840745	2	398	388	-10	41561	73903.20	0.037	0.052	0.015	-14.399	4.399
5	3-9	CA	23668562	24601507	45	425	418	-7	932945	73903.20	0.025	0.039	0.015	-9.552	2.552
5	3-9	NY	17557288	17956518	34	435	429	-6	399230	73903.20	0.008	0.023	0.015	-3.130	-2.870
5	3-9	LA	4203972	4316711	8	404	398	-6	112739	73903.20	0.012	0.027	0.015	-4.700	-1.300
5	3-9	FL	9739992	9941468	19	434	428	-6	201476	73903.20	0.006	0.021	0.015	-2.339	-3.661
5	3-9	MD	4216446	4330107	8	402	397	-5	113661	73903.20	0.012	0.027	0.015	-4.754	-0.246
5	3-9	MT	786690	800740	2	412	408	-4	14050	73903.20	0.003	0.018	0.015	-1.251	-2.749
5	3-9	IL	11418461	11749424	22	427	423	-4	330963	73903.20	0.014	0.029	0.015	-5.535	1.535
5	3-9	ME	1124660	1148619	2	287	284	-3	23959	73903.20	0.007	0.021	0.015	-2.577	-0.423
5	3-9	WA	4130163	4193657	8	417	414	-3	63494	73903.20	0.001	0.015	0.015	-0.293	-2.707
5	3-9	NM	1299968	1335558	3	428	425	-3	35590	73903.20	0.013	0.027	0.015	-4.916	1.916
5	3-9	AZ	2717866	2796237	5	375	372	-3	78371	73903.20	0.014	0.029	0.015	-5.477	2.477
5	3-9	WI	4705335	4785099	9	413	411	-2	79764	73903.20	0.002	0.017	0.015	-0.901	-1.099
5	3-9	NJ	7364158	7467772	14	419	417	-2	103614	73903.20	-0.001	0.014	0.015	0.209	-2.209
5	3-9	ID	943935	957678	2	340	338	-2	13743	73903.20	-0.000	0.015	0.015	0.020	-2.020
5	3-9	NC	5874429	5964746	11	406	404	-2	90317	73903.20	0.001	0.015	0.015	-0.294	-1.706
5	3-9	OH	10797419	10926238	21	433	432	-1	128819	73903.20	-0.003	0.012	0.015	1.032	-2.032
5	3-9	CO	2888834	2920873	6	432	431	-1	32039	73903.20	-0.004	0.011	0.015	1.356	-2.356
5	3-9	MI	9258344	9370570	18	429	430	1	112226	73903.20	-0.002	0.012	0.015	0.959	0.041
5	3-9	UT	1461037	1477903	3	381	382	1	16866	73903.20	-0.003	0.012	0.015	1.181	-0.181
5	3-9	MN	4077148	4133699	8	420	421	1	56551	73903.20	-0.001	0.014	0.015	0.285	0.715
5	3-9	RI	947154	955619	2	338	339	1	8465	73903.20	-0.006	0.009	0.015	2.185	-1.185
5	3-9	HI	965000	974701	2	332	333	1	9701	73903.20	-0.005	0.010	0.015	1.755	-0.755
5	3-9	MS	2520638	2559065	5	400	402	2	38427	73903.20	0.001	0.015	0.015	-0.244	2.244
5	3-9	TX	14228383	14387682	27	424	426	2	159299	73903.20	-0.003	0.011	0.015	1.315	0.685
5	3-9	NE	1570006	1573661	3	358	361	3	3655	73903.20	-0.012	0.002	0.015	4.730	-1.730
5	3-9	KS	2363208	2380331	5	430	433	3	17123	73903.20	-0.007	0.007	0.015	2.836	0.164

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 P0i	POP ADJ Phi	SEATS n0i	SEQ '80 S(P0i,n0i)	SEQ ADJ S(Phi,n0i)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/P0i	DIFRATIO bar:Ah/POD(hi)	REGRESS.	RESID. Dhi-D(hi)
5	3-9	MO	4917444	4960742	9	390	394	4	43298	73903.20	-0.006	0.009	0.015	2.236	1.764
5	3-9	OR	2632663	2658535	5	385	389	4	25872	73903.20	-0.005	0.010	0.015	1.842	2.158
5	3-9	MA	5737037	5727773	11	418	424	6	-9264	73903.20	-0.016	-0.002	0.015	6.249	-0.249
5	3-9	VA	5346279	5376011	10	401	407	6	29732	73903.20	-0.009	0.006	0.015	3.485	2.515
5	3-9	GA	5464265	5464384	10	393	399	6	119	73903.20	-0.015	0.000	0.015	5.618	0.382
5	3-9	PA	11866728	11876188	23	431	437	6	9460	73903.20	-0.014	0.001	0.015	5.320	0.680
5	3-9	AL	3890061	3893386	7	378	385	7	3325	73903.20	-0.014	0.001	0.015	5.298	1.702
5	3-9	AR	2285513	2268294	4	344	351	7	-17219	73903.20	-0.022	-0.008	0.015	8.528	-1.528
5	3-9	OK	3025266	3015969	6	415	422	7	-9297	73903.20	-0.018	-0.003	0.015	6.810	0.190
5	3-9	IN	5490179	5459995	10	392	400	8	-30184	73903.20	-0.020	-0.005	0.015	7.744	0.256
5	3-9	IA	2913387	2893358	6	426	436	10	-20029	73903.20	-0.021	-0.007	0.015	8.274	1.726
5	3-9	NH	920610	908581	2	349	360	11	-12029	73903.20	-0.028	-0.013	0.015	10.658	0.342
5	3-9	WV	1949644	1937652	4	403	415	12	-11992	73903.20	-0.021	-0.006	0.015	7.995	4.005
5	3-9	TN	4590750	4487767	9	422	435	13	-102983	73903.20	-0.040	-0.022	0.018	15.475	-2.475
5	3-9	CT	3107576	3088168	6	397	412	15	-19408	73903.20	-0.021	-0.006	0.015	8.032	6.968
5	3-9	KY	3661433	3604170	7	399	416	17	-57263	73903.20	-0.030	-0.016	0.015	11.649	5.351
6	3-20	SC	3119208	3366650	6	396	376	-20	247442	90515.11	0.061	0.079	0.018	-23.657	3.657
6	3-20	NV	799184	845656	2	398	388	-10	46472	90515.11	0.040	0.058	0.018	-15.501	5.501
6	3-20	LA	4203972	4348857	8	404	395	-9	144885	90515.11	0.017	0.034	0.018	-6.380	-2.620
6	3-20	CA	23668562	24687816	45	425	418	-7	1019254	90515.11	0.025	0.043	0.018	-9.692	2.692
6	3-20	FL	9739992	9985520	19	434	428	-6	245528	90515.11	0.007	0.025	0.018	-2.816	-3.184
6	3-20	NY	17557288	18001263	34	435	429	-6	443975	90515.11	0.007	0.025	0.018	-2.846	-3.154
6	3-20	MT	786690	803893	2	412	407	-5	17203	90515.11	0.004	0.022	0.018	-1.529	-3.471
6	3-20	MD	4216446	4341398	8	402	398	-4	124952	90515.11	0.012	0.030	0.018	-4.520	0.520
6	3-20	WA	4130163	4216774	8	417	413	-4	86611	90515.11	0.003	0.021	0.018	-1.184	-2.816
6	3-20	IL	11418461	11766850	22	427	424	-3	348389	90515.11	0.013	0.031	0.018	-4.858	1.858
6	3-20	AZ	2717866	2811025	5	375	372	-3	93159	90515.11	0.016	0.034	0.018	-6.308	3.308
6	3-20	NM	1299968	1340314	3	428	425	-3	40346	90515.11	0.013	0.031	0.018	-5.060	2.060
6	3-20	ME	1124660	1151423	2	287	284	-3	26763	90515.11	0.006	0.024	0.018	-2.272	-0.728
6	3-20	ID	943935	960694	2	340	338	-2	16759	90515.11	-0.000	0.018	0.018	0.054	-2.054
6	3-20	NC	5874429	5987293	11	406	404	-2	112864	90515.11	0.001	0.019	0.018	-0.507	-1.493
6	3-20	NJ	7364158	7497216	14	419	417	-2	133058	90515.11	0.000	0.018	0.018	-0.066	-1.934
6	3-20	OH	10797419	10946193	21	433	432	-1	148774	90515.11	-0.004	0.014	0.018	1.585	-2.585
6	3-20	WI	4705335	4786560	9	413	412	-1	81225	90515.11	-0.001	0.017	0.018	0.244	-1.244
6	3-20	CO	2888834	2928879	6	432	431	-1	40045	90515.11	-0.004	0.014	0.018	1.553	-2.553
6	3-20	HI	965000	980799	2	332	332	0	15799	90515.11	-0.002	0.016	0.018	0.587	-0.587
6	3-20	MN	4077148	4138130	8	420	421	1	60982	90515.11	-0.003	0.015	0.018	1.132	-0.132
6	3-20	RI	947154	959387	2	338	339	1	12233	90515.11	-0.005	0.013	0.018	1.918	-0.918
6	3-20	MI	9258344	9391797	18	429	430	1	133453	90515.11	-0.003	0.014	0.018	1.341	-0.341
6	3-20	TX	14228383	14459292	27	424	426	2	230909	90515.11	-0.002	0.016	0.018	0.642	1.358
6	3-20	MS	2520638	2563415	5	400	402	2	42777	90515.11	-0.001	0.017	0.018	0.356	1.644
6	3-20	UT	1461037	1479094	3	381	384	3	18057	90515.11	-0.006	0.012	0.018	2.132	0.868
6	3-20	KS	2363208	2388642	5	430	433	3	25434	90515.11	-0.007	0.011	0.018	2.747	0.253
6	3-20	NE	1570006	1577211	3	358	362	4	7205	90515.11	-0.013	0.005	0.018	5.124	-1.124
6	3-20	OR	2632663	2668734	5	385	389	4	36071	90515.11	-0.004	0.014	0.018	1.615	2.385
6	3-20	PA	11866728	11902607	23	431	435	4	35879	90515.11	-0.015	0.003	0.018	5.727	-1.727
6	3-20	MO	4917444	4972828	9	390	394	4	55384	90515.11	-0.007	0.011	0.018	2.554	1.446
6	3-20	MA	5737037	5744186	11	418	423	5	7149	90515.11	-0.017	0.001	0.018	6.412	-1.412
6	3-20	AL	3890061	3917646	7	378	383	5	27585	90515.11	-0.011	0.007	0.018	4.161	0.839
6	3-20	AR	2285513	2283101	4	344	350	6	-2412	90515.11	-0.019	-0.001	0.018	7.298	-1.298
6	3-20	GA	5464265	5482471	10	393	399	6	18206	90515.11	-0.015	0.003	0.018	5.608	0.392

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 POi	POP ADJ Phi	SEATS nOi	SEQ '80 S(POi,nOi)	SEQ ADJ S(Phi,nOi)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/POi	DIFRATIO bar:Ah/PO	REGRESS. D(hi)	RESID. Dhi-D(hi)
6	3-20	OK	3025266	3027835	6	415	422	7	2569	90515.11	-0.017	0.001	0.018	6.564	0.436
6	3-20	VA	5346279	5387358	10	401	408	7	41079	90515.11	-0.010	0.008	0.018	3.933	3.067
6	3-20	IN	5490179	5467317	10	392	400	8	-22862	90515.11	-0.022	-0.004	0.018	8.495	-0.495
6	3-20	NH	920610	912601	2	349	359	10	-8009	90515.11	-0.027	-0.009	0.018	10.242	-0.242
6	3-20	IA	2913387	2894572	6	426	437	11	-18815	90515.11	-0.024	-0.006	0.018	9.378	1.622
6	3-20	WV	1949644	1943662	4	403	415	12	-5982	90515.11	-0.021	-0.003	0.018	8.073	3.927
6	3-20	TN	4590750	4484931	9	422	436	14	-105819	90515.11	-0.041	-0.023	0.018	15.652	-1.652
6	3-20	CT	3107576	3103238	6	397	411	14	-4338	90515.11	-0.019	-0.001	0.018	7.429	6.571
6	3-20	KY	3661433	3623860	7	399	416	17	-37573	90515.11	-0.028	-0.010	0.018	10.843	6.157
7	5-B	WA	4130163	4283789	8	417	406	-11	153626	90130.59	0.019	0.037	0.018	-7.462	-3.538
7	5-B	NV	799184	840821	2	398	388	-10	41637	90130.59	0.034	0.052	0.018	-13.201	3.201
7	5-B	ID	943935	988388	2	340	330	-10	44453	90130.59	0.029	0.047	0.018	-11.273	1.273
7	5-B	FL	9739992	10166367	19	434	424	-10	426375	90130.59	0.026	0.044	0.018	-9.995	-0.005
7	5-B	AZ	2717866	2856921	5	375	366	-9	139055	90130.59	0.033	0.051	0.018	-12.840	3.840
7	5-B	NM	1299968	1352070	3	428	420	-8	52102	90130.59	0.022	0.040	0.018	-8.572	0.572
7	5-B	SC	3119208	3253625	6	396	389	-7	134417	90130.59	0.025	0.043	0.018	-9.732	2.732
7	5-B	CO	2888834	2998616	6	432	426	-6	109782	90130.59	0.020	0.038	0.018	-7.772	1.772
7	5-B	TX	14228383	14639510	27	424	419	-5	411127	90130.59	0.011	0.029	0.018	-4.265	-0.735
7	5-B	MT	786690	806774	2	412	407	-5	20084	90130.59	0.008	0.026	0.018	-2.969	-2.031
7	5-B	UT	1461037	1490449	3	381	377	-4	29412	90130.59	0.002	0.020	0.018	-0.890	-3.110
7	5-B	OR	2632663	2693344	5	385	381	-4	60681	90130.59	0.005	0.023	0.018	-2.014	-1.986
7	5-B	MD	4216446	4338196	8	402	399	-3	121750	90130.59	0.011	0.029	0.018	-4.257	1.257
7	5-B	KS	2363208	2407267	5	430	428	-2	44059	90130.59	0.001	0.019	0.018	-0.317	-1.683
7	5-B	MS	2520638	2596972	5	400	398	-2	76334	90130.59	0.012	0.030	0.018	-4.800	2.800
7	5-B	NC	5874429	6005549	11	406	405	-1	131120	90130.59	0.005	0.022	0.018	-1.733	0.733
7	5-B	IN	5490179	5621245	10	392	391	-1	131066	90130.59	0.006	0.024	0.018	-2.331	1.331
7	5-B	NY	17557288	17870501	34	435	434	-1	313213	90130.59	0.000	0.018	0.018	-0.008	-0.992
7	5-B	NJ	7364158	7480190	14	419	418	-1	116032	90130.59	-0.002	0.016	0.018	0.795	-1.795
7	5-B	HI	965000	984593	2	332	332	0	19593	90130.59	0.002	0.020	0.018	-0.956	0.956
7	5-B	CA	23668562	24373925	45	425	425	0	705363	90130.59	0.012	0.030	0.018	-4.614	4.614
7	5-B	LA	4203972	4286482	8	404	404	0	82510	90130.59	0.002	0.020	0.018	-0.696	0.696
7	5-B	ME	1124660	1147414	2	287	287	0	22754	90130.59	0.002	0.020	0.018	-0.929	0.929
7	5-B	RI	947154	959338	2	338	339	1	12184	90130.59	-0.005	0.013	0.018	1.909	-0.909
7	5-B	OK	3025266	3049244	6	415	416	1	23978	90130.59	-0.010	0.008	0.018	3.810	-2.810
7	5-B	OH	10797419	10911827	21	433	435	2	114408	90130.59	-0.007	0.011	0.018	2.782	-0.782
7	5-B	IL	11418461	11553854	22	427	429	2	135393	90130.59	-0.006	0.012	0.018	2.296	-0.296
7	5-B	AR	2285513	2318834	4	344	346	2	33321	90130.59	-0.003	0.015	0.018	1.248	0.752
7	5-B	MN	4077148	4119626	8	420	422	2	42478	90130.59	-0.007	0.010	0.018	2.850	-0.850
7	5-B	GA	5464265	5537553	10	393	395	2	73288	90130.59	-0.004	0.013	0.018	1.697	0.303
7	5-B	VA	5346279	5439743	10	401	403	2	93464	90130.59	-0.000	0.017	0.018	0.130	1.870
7	5-B	MI	9258344	9373506	18	429	431	2	115162	90130.59	-0.005	0.012	0.018	2.072	-0.072
7	5-B	WI	4705335	4721516	9	413	417	4	16181	90130.59	-0.014	0.003	0.018	5.538	-1.538
7	5-B	NE	1570006	1590660	3	358	362	4	20654	90130.59	-0.005	0.013	0.018	1.796	2.204
7	5-B	NH	920610	931344	2	349	354	5	10734	90130.59	-0.006	0.012	0.018	2.372	2.628
7	5-B	MO	4917444	4943710	9	390	396	6	26266	90130.59	-0.012	0.005	0.018	4.805	1.195
7	5-B	IA	2913387	2933860	6	426	433	7	20473	90130.59	-0.011	0.007	0.018	4.156	2.844
7	5-B	PA	11866728	11847508	23	431	439	8	-19220	90130.59	-0.019	-0.002	0.018	7.436	0.514
7	5-B	AL	3890061	3879983	7	378	386	8	-10078	90130.59	-0.020	-0.003	0.018	7.860	0.140
7	5-B	MA	5737037	5708805	11	418	427	9	-28232	90130.59	-0.023	-0.005	0.018	8.757	0.243
7	5-B	CT	3107576	3124597	6	397	408	11	17021	90130.59	-0.012	0.005	0.018	4.753	6.247
7	5-B	KY	3661433	3667319	7	399	411	12	5886	90130.59	-0.016	0.002	0.018	6.243	5.757

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 POi	POP ADJ Phi	SEATS nOi	SEQ '80 S(POi,nOi)	SEQ ADJ S(Phi,nOi)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/POi	DIFRATIO bar:Ah/PO	REGRESS. D(hi)	RESID. Dhi-D(hi)
7	5-8	WV	1949644	1930327	4	403	415	12	-19317	90130.59	-0.028	-0.010	0.018	10.678	1.322
7	5-8	TN	4590750	4485907	9	422	437	15	-104843	90130.59	-0.045	-0.023	0.022	17.281	-2.281
8	5-9	NV	799184	859325	2	398	380	-18	60141	112055.1	0.053	0.075	0.022	-20.447	2.447
8	5-9	FL	9739992	10226444	19	434	421	-13	486452	112055.1	0.028	0.050	0.022	-10.701	-2.299
8	5-9	AZ	2717866	2880360	5	375	364	-11	162494	112055.1	0.038	0.060	0.022	-14.492	3.492
8	5-9	WA	4130163	4281463	8	417	407	-10	151300	112055.1	0.014	0.037	0.022	-5.575	-4.425
8	5-9	ID	943935	989582	2	340	331	-9	45647	112055.1	0.026	0.048	0.022	-10.091	1.091
8	5-9	NM	1299968	1355899	3	428	420	-8	55931	112055.1	0.021	0.043	0.022	-8.037	0.037
8	5-9	TX	14228383	14759063	27	424	416	-8	530680	112055.1	0.015	0.037	0.022	-5.831	-2.169
8	5-9	CO	2888834	3018413	6	432	426	-6	129579	112055.1	0.023	0.045	0.022	-8.742	2.742
8	5-9	SC	3119208	3265538	6	396	390	-6	146330	112055.1	0.025	0.047	0.022	-9.534	3.534
8	5-9	UT	1461037	1500886	3	381	377	-4	39849	112055.1	0.005	0.027	0.022	-1.972	-2.028
8	5-9	MT	786690	809072	2	412	408	-4	22382	112055.1	0.006	0.028	0.022	-2.425	-1.575
8	5-9	MD	4216446	4349139	8	402	399	-3	132693	112055.1	0.009	0.031	0.022	-3.587	0.587
8	5-9	MS	2520638	2611013	5	400	397	-3	90375	112055.1	0.014	0.036	0.022	-5.275	2.275
8	5-9	NY	17557288	17958647	34	435	434	-1	401359	112055.1	0.001	0.023	0.022	-0.272	-0.728
8	5-9	NC	5874429	6019022	11	406	405	-1	144593	112055.1	0.002	0.025	0.022	-0.947	-0.053
8	5-9	OR	2632663	2707216	5	385	384	-1	74553	112055.1	0.006	0.028	0.022	-2.374	1.374
8	5-9	IN	5490179	5625813	10	392	391	-1	135634	112055.1	0.003	0.025	0.022	-0.982	-0.018
8	5-9	ME	1124660	1147828	2	287	287	0	23168	112055.1	-0.002	0.021	0.022	0.599	-0.599
8	5-9	LA	4203972	4296275	8	404	404	0	92303	112055.1	-0.000	0.022	0.022	0.076	-0.076
8	5-9	NJ	7364158	7479318	14	419	419	0	115160	112055.1	-0.007	0.016	0.022	2.509	-2.509
8	5-9	CA	23668562	24568212	45	425	425	0	899650	112055.1	0.016	0.038	0.022	-6.106	6.106
8	5-9	KS	2363208	2411717	5	430	430	0	48509	112055.1	-0.002	0.021	0.022	0.627	-0.627
8	5-9	HI	965000	986124	2	332	333	1	21124	112055.1	-0.000	0.022	0.022	0.102	0.898
8	5-9	AR	2285513	2324880	4	344	345	1	39367	112055.1	-0.005	0.017	0.022	1.898	-0.898
8	5-9	IL	11418461	11639057	22	427	428	1	220596	112055.1	-0.003	0.019	0.022	1.092	-0.092
8	5-9	GA	5464265	5561556	10	393	395	2	97291	112055.1	-0.004	0.018	0.022	1.675	0.325
8	5-9	OK	3025266	3050086	6	415	417	2	24820	112055.1	-0.014	0.008	0.022	5.372	-3.372
8	5-9	VA	5346279	5463289	10	401	403	2	117010	112055.1	-0.000	0.022	0.022	0.103	1.897
8	5-9	MI	9258344	9407742	18	429	431	2	149398	112055.1	-0.006	0.016	0.022	2.317	-0.317
8	5-9	OH	10797419	10923983	21	433	436	3	126564	112055.1	-0.010	0.012	0.022	4.018	-1.018
8	5-9	MN	4077148	4134647	8	420	424	4	57499	112055.1	-0.008	0.014	0.022	3.101	0.899
8	5-9	RI	947154	958391	2	338	342	4	11237	112055.1	-0.010	0.012	0.022	3.963	0.037
8	5-9	NE	1570006	1593988	3	358	362	4	23982	112055.1	-0.007	0.015	0.022	2.649	1.351
8	5-9	WI	4705335	4721516	9	413	418	5	16181	112055.1	-0.019	0.003	0.022	7.207	-2.207
8	5-9	NH	920610	932986	2	349	355	6	12376	112055.1	-0.009	0.013	0.022	3.355	2.645
8	5-9	MO	4917444	4948854	9	390	398	8	31410	112055.1	-0.016	0.006	0.022	6.072	1.928
8	5-9	AL	3890061	3892997	7	378	387	9	2936	112055.1	-0.021	0.001	0.022	8.241	0.759
8	5-9	PA	11866728	11877050	23	431	440	9	10322	112055.1	-0.021	0.001	0.022	8.196	0.804
8	5-9	MA	5737037	5760173	11	418	427	9	23136	112055.1	-0.018	0.004	0.022	6.978	2.022
8	5-9	CT	3107576	3136759	6	397	406	9	29183	112055.1	-0.013	0.009	0.022	4.915	4.085
8	5-9	IA	2913387	2933860	6	426	435	9	20473	112055.1	-0.015	0.007	0.022	5.825	3.175
8	5-9	WV	1949644	1929721	4	403	415	12	-19923	112055.1	-0.032	-0.010	0.022	12.467	-0.467
8	5-9	KY	3661433	3667009	7	399	412	13	5576	112055.1	-0.021	0.002	0.022	7.945	5.055
8	5-9	TN	4590750	4511838	9	422	437	15	-78912	112055.1	-0.021	-0.017	0.004	7.975	7.025
9	10-8	MT	786690	803923	2	412	400	-12	17233	16279.65	0.019	0.022	0.003	-7.196	-4.804
9	10-8	WA	4130163	4204009	8	417	406	-11	73846	16279.65	0.015	0.018	0.003	-5.646	-5.354
9	10-8	ID	943935	971455	2	340	331	-9	27520	16279.65	0.026	0.029	0.003	-9.894	0.894
9	10-8	FL	9739992	9876934	19	434	427	-7	136942	16279.65	0.011	0.014	0.003	-4.175	-2.825
9	10-8	NM	1299968	1333275	3	428	421	-7	33307	16279.65	0.022	0.026	0.003	-8.627	1.627

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

REP h	REP	STS j	POP '80 P0i	POP ADJ Phi	SEATS n0i	SEQ '80 S(P0i,n0i)	SEQ ADJ S(Phi,n0i)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/P0i	DIFRATIO bar:Ah/P0	REGRESS. D(hi)	RESID. Bhi-D(hi)
9	10-8	MD	4216446	4291222	8	402	395	-7	74776	16279.65	0.015	0.018	0.003	-5.590	-1.410
9	10-8	CO	2888834	2935075	6	432	426	-6	46241	16279.65	0.013	0.016	0.003	-4.925	-1.075
9	10-8	AZ	2717866	2790880	5	375	369	-6	73014	16279.65	0.024	0.027	0.003	-9.106	3.106
9	10-8	SC	3119208	3191081	6	396	390	-6	71873	16279.65	0.020	0.023	0.003	-7.634	1.634
9	10-8	IN	5490179	5573542	10	392	387	-5	83363	16279.65	0.012	0.015	0.003	-4.608	-0.392
9	10-8	NC	5874429	5951662	11	406	402	-4	77233	16279.65	0.010	0.013	0.003	-3.823	-0.177
9	10-8	OR	2632663	2657919	5	385	382	-3	25256	16279.65	0.006	0.010	0.003	-2.455	-0.545
9	10-8	UT	1461037	1466806	3	381	378	-3	5769	16279.65	0.001	0.004	0.003	-0.281	-2.719
9	10-8	HI	965000	974713	2	332	329	-3	9713	16279.65	0.007	0.010	0.003	-2.637	-0.363
9	10-8	MN	4077148	4092346	8	420	418	-2	15198	16279.65	0.001	0.004	0.003	-0.196	-1.804
9	10-8	KS	2363208	2384627	5	430	428	-2	21419	16279.65	0.006	0.009	0.003	-2.251	0.251
9	10-8	NE	1570006	1576922	3	358	356	-2	6916	16279.65	0.001	0.004	0.003	-0.457	-1.543
9	10-8	MS	2520638	2545183	5	400	399	-1	24545	16279.65	0.007	0.010	0.003	-2.510	1.510
9	10-8	CA	23668562	23975958	45	425	424	-1	307396	16279.65	0.010	0.013	0.003	-3.762	2.762
9	10-8	NV	799184	808559	2	398	397	-1	9375	16279.65	0.009	0.012	0.003	-3.278	2.278
9	10-8	ME	1124660	1138586	2	287	286	-1	13926	16279.65	0.009	0.012	0.003	-3.529	2.529
9	10-8	WI	4705335	4703058	9	413	413	0	-2277	16279.65	-0.004	-0.000	0.003	1.426	-1.426
9	10-8	NY	17557288	17649140	34	435	435	0	91852	16279.65	0.002	0.005	0.003	-0.775	0.775
9	10-8	VA	5346279	5392552	10	401	401	0	46273	16279.65	0.005	0.009	0.003	-2.094	2.094
9	10-8	OH	10797419	10803257	21	433	433	0	5838	16279.65	-0.003	0.001	0.003	1.031	-1.031
9	10-8	NJ	7364158	7376197	14	419	419	0	12039	16279.65	-0.002	0.002	0.003	0.610	-0.610
9	10-8	TX	14228383	14257991	27	424	425	1	29608	16279.65	-0.001	0.002	0.003	0.438	0.562
9	10-8	LA	4203972	4215907	8	404	405	1	11935	16279.65	-0.000	0.003	0.003	0.146	0.854
9	10-8	AR	2285513	2285270	4	344	345	1	-243	16279.65	-0.003	-0.000	0.003	1.280	-0.280
9	10-8	OK	3025266	3003971	6	415	417	2	-21295	16279.65	-0.010	-0.007	0.003	3.950	-1.950
9	10-8	IL	11418461	11426594	22	427	429	2	8133	16279.65	-0.003	0.001	0.003	0.965	1.035
9	10-8	RI	947154	939519	2	338	341	3	-7635	16279.65	-0.011	-0.008	0.003	4.344	-1.344
9	10-8	MI	9258344	9252240	18	429	432	3	-6104	16279.65	-0.004	-0.001	0.003	1.493	1.507
9	10-8	MO	4917444	4890199	9	390	394	4	-27245	16279.65	-0.009	-0.006	0.003	3.373	0.627
9	10-8	MA	5737037	5665354	11	418	423	5	-71683	16279.65	-0.016	-0.012	0.003	6.051	-1.051
9	10-8	IA	2913387	2903087	6	426	431	5	-10300	16279.65	-0.007	-0.004	0.003	2.601	2.399
9	10-8	GA	5464265	5413506	10	393	398	5	-50759	16279.65	-0.013	-0.009	0.003	4.817	0.183
9	10-8	PA	11866728	11728624	23	431	437	6	-138104	16279.65	-0.015	-0.012	0.003	5.721	0.279
9	10-8	NH	920610	913701	2	349	355	6	-6909	16279.65	-0.011	-0.008	0.003	4.129	1.871
9	10-8	AL	3890061	3844577	7	378	384	6	-45484	16279.65	-0.015	-0.012	0.003	5.742	0.258
9	10-8	KY	3661433	3633443	7	399	408	9	-27990	16279.65	-0.011	-0.008	0.003	4.183	4.817
9	10-8	CT	3107576	3066917	6	397	410	13	-40659	16279.65	-0.016	-0.013	0.003	6.278	6.722
9	10-8	WV	1949644	1908116	4	403	416	13	-41528	16279.65	-0.025	-0.021	0.003	9.442	3.558
9	10-8	TN	4590750	4444731	9	422	436	14	-146019	16279.65	-0.035	-0.032	0.003	13.488	0.512
10	14-8	SC	3119208	3234299	6	396	379	-17	115091	-45715.2	0.046	0.037	-0.009	-17.689	0.689
10	14-8	MD	4216446	4254937	8	402	394	-8	38491	-45715.2	0.018	0.009	-0.009	-6.996	-1.004
10	14-8	WI	4705335	4739499	9	413	405	-8	34164	-45715.2	0.016	0.007	-0.009	-6.277	-1.723
10	14-8	NC	5874429	5864556	11	406	400	-6	-9873	-45715.2	0.007	-0.002	-0.009	-2.833	-3.167
10	14-8	UT	1461037	1459520	3	381	376	-5	-1517	-45715.2	0.008	-0.001	-0.009	-3.081	-1.919
10	14-8	ID	943935	946492	2	340	335	-5	2557	-45715.2	0.012	0.003	-0.009	-4.524	-0.476
10	14-8	LA	4203972	4185817	8	404	399	-5	-18155	-45715.2	0.005	-0.004	-0.009	-1.818	-3.182
10	14-8	MT	786690	785850	2	412	407	-5	-840	-45715.2	0.008	-0.001	-0.009	-3.069	-1.931
10	14-8	OH	10797419	10750393	21	433	428	-5	-47026	-45715.2	0.005	-0.004	-0.009	-1.803	-3.197
10	14-8	MI	9258344	9217382	18	429	425	-4	-40962	-45715.2	0.005	-0.004	-0.009	-1.777	-2.223
10	14-8	ME	1124660	1133443	2	287	283	-4	8783	-45715.2	0.017	0.008	-0.009	-6.488	2.488
10	14-8	MA	4130163	4112177	8	417	414	-3	-17986	-45715.2	0.005	-0.004	-0.009	-1.804	-1.196

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 POi	POP ADJ Phi	SEATS nOi	SEQ '80 S(POi,nOi)	SEQ ADJ S(Phi,nOi)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/POi	DIFRATIO bar:Ah/POD	REGRESS. (hi)	RESID. Dhi-D(hi)
10	14-8	MN	4077148	4083163	8	420	417	-3	6015	-45715.2	0.011	0.001	-0.009	-4.049	1.049
10	14-8	IL	11418461	11327722	22	427	424	-3	-90739	-45715.2	0.001	-0.008	-0.009	-0.420	-2.580
10	14-8	FL	9739992	9647620	19	434	431	-3	-92372	-45715.2	-0.000	-0.009	-0.009	0.171	-3.171
10	14-8	NE	1570006	1557977	3	358	355	-3	-12029	-45715.2	0.001	-0.008	-0.009	-0.530	-2.470
10	14-8	CA	23668562	23747739	45	425	423	-2	79177	-45715.2	0.012	0.003	-0.009	-4.769	2.769
10	14-8	NM	1299968	1287809	3	428	426	-2	-12159	-45715.2	-0.000	-0.009	-0.009	0.121	-2.121
10	14-8	AZ	2717866	2716404	5	375	373	-2	-1462	-45715.2	0.009	-0.001	-0.009	-3.273	1.273
10	14-8	NV	799184	799035	2	398	396	-2	-149	-45715.2	0.009	-0.000	-0.009	-3.409	1.409
10	14-8	KS	2363208	2343775	5	430	429	-1	-19433	-45715.2	0.001	-0.008	-0.009	-0.314	-0.686
10	14-8	NJ	7364158	7349244	14	419	418	-1	-14914	-45715.2	0.007	-0.002	-0.009	-2.701	1.701
10	14-8	HI	965000	955198	2	332	332	0	-9802	-45715.2	-0.001	-0.010	-0.009	0.431	-0.431
10	14-8	RI	947154	940363	2	338	338	0	-6791	-45715.2	0.002	-0.007	-0.009	-0.720	0.720
10	14-8	MO	4917444	4911352	9	390	390	0	-6092	-45715.2	0.008	-0.001	-0.009	-3.004	3.004
10	14-8	IA	2913387	2875557	6	426	427	1	-37830	-45715.2	-0.004	-0.013	-0.009	1.520	-0.520
10	14-8	NY	17557288	17383936	34	435	436	1	-173352	-45715.2	-0.001	-0.010	-0.009	0.322	0.678
10	14-8	PA	11866728	11733989	23	431	432	1	-132739	-45715.2	-0.002	-0.011	-0.009	0.827	0.173
10	14-8	VA	5346279	5300230	10	401	403	2	-46049	-45715.2	0.000	-0.009	-0.009	-0.164	2.164
10	14-8	OR	2632663	2602181	5	385	387	2	-30482	-45715.2	-0.003	-0.012	-0.009	0.978	1.022
10	14-8	CO	2888834	2842810	6	432	435	3	-46024	-45715.2	-0.007	-0.016	-0.009	2.654	0.346
10	14-8	IN	5490179	5385405	10	392	395	3	-104774	-45715.2	-0.010	-0.019	-0.009	3.868	-0.868
10	14-8	MA	5737037	5610009	11	418	422	4	-127028	-45715.2	-0.013	-0.022	-0.009	5.046	-1.046
10	14-8	GA	5464265	5346937	10	393	397	4	-117328	-45715.2	-0.012	-0.021	-0.009	4.788	-0.788
10	14-8	MS	2520638	2498395	5	400	404	4	-22243	-45715.2	0.000	-0.009	-0.009	-0.082	4.082
10	14-8	NH	920610	900058	2	349	353	4	-20552	-45715.2	-0.013	-0.022	-0.009	5.116	-1.116
10	14-8	AL	3890061	3807843	7	378	383	5	-82218	-45715.2	-0.012	-0.021	-0.009	4.658	0.342
10	14-8	AR	2285513	2234157	4	344	349	5	-51356	-45715.2	-0.013	-0.022	-0.009	5.172	-0.172
10	14-8	OK	3025266	2946071	6	415	420	5	-79195	-45715.2	-0.017	-0.026	-0.009	6.600	-1.600
10	14-8	WV	1949644	1912683	4	403	409	6	-36961	-45715.2	-0.010	-0.019	-0.009	3.820	2.180
10	14-8	TX	14228383	13778896	27	424	433	9	-449487	-45715.2	-0.023	-0.032	-0.009	8.685	0.315
10	14-8	CT	3107576	3046416	6	397	406	9	-61160	-45715.2	-0.011	-0.020	-0.009	4.098	4.902
10	14-8	TN	4590750	4410031	9	422	434	12	-180719	-45715.2	-0.034	-0.039	-0.005	13.229	-1.229
10	14-8	KY	3661433	3567481	7	399	413	14	-93952	-45715.2	-0.017	-0.026	-0.009	6.401	7.599
11	14-9	SC	3119208	3246235	6	396	379	-17	127027	-24802.9	0.046	0.041	-0.005	-17.571	0.571
11	14-9	WI	4705335	4739499	9	413	405	-8	34164	-24802.9	0.012	0.007	-0.005	-4.684	-3.316
11	14-9	NV	799184	816468	2	398	391	-7	17284	-24802.9	0.027	0.022	-0.005	-10.217	3.217
11	14-9	MD	4216446	4265835	8	402	395	-7	49389	-24802.9	0.017	0.012	-0.005	-6.399	-0.601
11	14-9	MT	786690	788038	2	412	407	-5	1348	-24802.9	0.007	0.002	-0.005	-2.548	-2.452
11	14-9	UT	1461037	1469576	3	381	376	-5	8539	-24802.9	0.011	0.006	-0.005	-4.139	-0.861
11	14-9	OH	10797419	10761895	21	433	428	-5	-35524	-24802.9	0.002	-0.003	-0.005	-0.621	-4.379
11	14-9	MN	4077148	4098277	8	420	416	-4	21129	-24802.9	0.010	0.005	-0.005	-3.884	-0.116
11	14-9	MI	9258344	9250276	18	429	425	-4	-8068	-24802.9	0.004	-0.001	-0.005	-1.553	-2.447
11	14-9	ME	1124660	1133820	2	287	283	-4	9160	-24802.9	0.013	0.008	-0.005	-5.025	1.025
11	14-9	ID	943935	947605	2	340	336	-4	3670	-24802.9	0.009	0.004	-0.005	-3.386	-0.614
11	14-9	FL	9739992	9702921	19	434	431	-3	-37071	-24802.9	0.001	-0.004	-0.005	-0.423	-2.577
11	14-9	IL	11418461	11407278	22	427	424	-3	-11183	-24802.9	0.004	-0.001	-0.005	-1.511	-1.489
11	14-9	CA	23668562	23935429	45	425	422	-3	266867	-24802.9	0.016	0.011	-0.005	-6.230	3.230
11	14-9	AZ	2717866	2738360	5	375	373	-2	20494	-24802.9	0.012	0.008	-0.005	-4.792	2.792
11	14-9	NM	1299968	1291060	3	428	426	-2	-8908	-24802.9	-0.002	-0.007	-0.005	0.750	-2.750
11	14-9	WA	4130163	4110050	8	417	415	-2	-20113	-24802.9	0.000	-0.005	-0.005	-0.013	-1.987
11	14-9	NC	5874429	5877425	11	406	404	-2	2996	-24802.9	0.005	0.001	-0.005	-2.085	0.085
11	14-9	NE	1570006	1561192	3	358	357	-1	-8814	-24802.9	-0.001	-0.006	-0.005	0.273	-1.273

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

REP h	REP	STS i	POP '80 P0i	POP ADJ Phi	SEATS n0i	SEQ '80 S(P0i,n0i)	SEQ ADJ S(Phi,n0i)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/P0i	DIFRATIO bar:Ah/P0	REGRESS. D(hi)	RESID. Dhi-D(hi)
11	14-9	LA	4203972	4196851	8	404	403	-1	-7121	-24802.9	0.003	-0.002	-0.005	-1.236	0.236
11	14-9	KS	2363208	2347907	5	430	429	-1	-15301	-24802.9	-0.002	-0.006	-0.005	0.605	-1.605
11	14-9	MO	4917444	4916254	9	390	390	0	-1190	-24802.9	0.005	-0.000	-0.005	-1.795	1.795
11	14-9	NJ	7364158	7348474	14	419	419	0	-15684	-24802.9	0.003	-0.002	-0.005	-1.068	1.068
11	14-9	VA	5346279	5323100	10	401	401	0	-23179	-24802.9	0.001	-0.004	-0.005	-0.219	0.219
11	14-9	MS	2520638	2512079	5	400	400	0	-8559	-24802.9	0.002	-0.003	-0.005	-0.581	0.581
11	14-9	NY	17557288	17468342	34	435	436	1	-88946	-24802.9	-0.000	-0.005	-0.005	0.062	0.938
11	14-9	RI	947154	939383	2	338	339	1	-7771	-24802.9	-0.003	-0.008	-0.005	1.271	-0.271
11	14-9	HI	965000	956720	2	332	333	1	-8280	-24802.9	-0.004	-0.009	-0.005	1.416	-0.416
11	14-9	PA	11866728	11763321	23	431	433	2	-103407	-24802.9	-0.004	-0.009	-0.005	1.467	0.533
11	14-9	MA	5737037	5659372	11	418	420	2	-77665	-24802.9	-0.009	-0.014	-0.005	3.325	-1.325
11	14-9	OR	2632663	2614882	5	385	388	3	-17781	-24802.9	-0.002	-0.007	-0.005	0.712	2.288
11	14-9	CO	2888834	2861295	6	432	435	3	-27539	-24802.9	-0.005	-0.010	-0.005	1.783	1.217
11	14-9	IN	5490179	5389839	10	392	396	4	-100340	-24802.9	-0.013	-0.018	-0.005	5.150	-1.150
11	14-9	IA	2913387	2875557	6	426	430	4	-37830	-24802.9	-0.008	-0.013	-0.005	3.112	0.888
11	14-9	GA	5464265	5370092	10	393	398	5	-94173	-24802.9	-0.012	-0.017	-0.005	4.748	0.252
11	14-9	AR	2285513	2239942	4	344	349	5	-45571	-24802.9	-0.015	-0.020	-0.005	5.790	-0.790
11	14-9	AL	3890061	3820235	7	378	384	6	-69826	-24802.9	-0.013	-0.018	-0.005	5.024	0.976
11	14-9	OK	3025266	2946844	6	415	421	6	-78422	-24802.9	-0.021	-0.026	-0.005	8.094	-2.094
11	14-9	NH	920610	901668	2	349	356	7	-18942	-24802.9	-0.016	-0.021	-0.005	6.035	0.965
11	14-9	TX	14228383	13890196	27	424	432	8	-338187	-24802.9	-0.019	-0.024	-0.005	7.265	0.735
11	14-9	CT	3107576	3057298	6	397	406	9	-50278	-24802.9	-0.011	-0.016	-0.005	4.342	4.658
11	14-9	WV	1949644	1912188	4	403	412	9	-37456	-24802.9	-0.014	-0.019	-0.005	5.510	3.490
11	14-9	TN	4590750	4434256	9	422	434	12	-156494	-24802.9	-0.032	-0.034	-0.002	12.438	-0.438
11	14-9	KY	3661433	3567659	7	399	413	14	-93774	-24802.9	-0.021	-0.026	-0.005	7.974	6.026
12	14-20	SC	3119208	3281862	6	396	377	-19	162654	-8680.5	0.054	0.052	-0.002	-20.742	1.742
12	14-20	MD	4216446	4276896	8	402	395	-7	60450	-8680.5	0.016	0.014	-0.002	-6.182	-0.818
12	14-20	NV	799184	821234	2	398	391	-7	22050	-8680.5	0.029	0.028	-0.002	-11.286	4.286
12	14-20	FL	9739992	9746240	19	434	428	-6	6248	-8680.5	0.002	0.001	-0.002	-0.908	-5.092
12	14-20	MT	786690	791057	2	412	406	-6	4367	-8680.5	0.007	0.006	-0.002	-2.799	-3.201
12	14-20	WI	4705335	4740968	9	413	407	-6	35633	-8680.5	0.009	0.008	-0.002	-3.577	-2.423
12	14-20	UT	1461037	1470772	3	381	376	-5	9735	-8680.5	0.008	0.007	-0.002	-3.227	-1.773
12	14-20	NC	5874429	5899525	11	406	402	-4	25096	-8680.5	0.006	0.004	-0.002	-2.306	-1.694
12	14-20	LA	4203972	4228070	8	404	400	-4	24098	-8680.5	0.007	0.006	-0.002	-2.868	-1.132
12	14-20	ME	1124660	1136593	2	287	283	-4	11933	-8680.5	0.012	0.011	-0.002	-4.747	0.747
12	14-20	MI	9258344	9270978	18	429	425	-4	12634	-8680.5	0.003	0.001	-0.002	-1.186	-2.814
12	14-20	MN	4077148	4102679	8	420	417	-3	25531	-8680.5	0.008	0.006	-0.002	-3.072	0.072
12	14-20	ID	943935	950557	2	340	337	-3	6622	-8680.5	0.009	0.007	-0.002	-3.362	0.362
12	14-20	WA	4130163	4132475	8	417	414	-3	2312	-8680.5	0.002	0.001	-0.002	-0.876	-2.124
12	14-20	CA	23668562	24018863	45	425	422	-3	350301	-8680.5	0.017	0.015	-0.002	-6.360	3.360
12	14-20	IL	11418461	11423435	22	427	424	-3	4974	-8680.5	0.002	0.000	-0.002	-0.829	-2.171
12	14-20	AZ	2717866	2752654	5	375	372	-3	34788	-8680.5	0.015	0.013	-0.002	-5.590	2.590
12	14-20	OH	10797419	10781745	21	433	431	-2	-15674	-8680.5	0.000	-0.001	-0.002	-0.102	-1.898
12	14-20	NM	1299968	1295592	3	428	426	-2	-4376	-8680.5	-0.002	-0.003	-0.002	0.635	-2.635
12	14-20	NE	1570006	1564690	3	358	357	-1	-5316	-8680.5	-0.002	-0.003	-0.002	0.643	-1.643
12	14-20	MO	4917444	4928215	9	390	390	0	10771	-8680.5	0.004	0.002	-0.002	-1.504	1.504
12	14-20	HI	965000	962707	2	332	332	0	-2293	-8680.5	-0.001	-0.002	-0.002	0.254	-0.254
12	14-20	NJ	7364158	7376830	14	419	419	0	12672	-8680.5	0.003	0.002	-0.002	-1.324	1.324
12	14-20	KS	2363208	2356056	5	430	430	0	-7152	-8680.5	-0.001	-0.003	-0.002	0.505	-0.505
12	14-20	NY	17557288	17510442	34	435	435	0	-46846	-8680.5	-0.001	-0.003	-0.002	0.367	-0.367
12	14-20	MS	2520638	2516300	5	400	401	1	-4338	-8680.5	-0.000	-0.002	-0.002	0.002	0.998

Table 2. REGRESSION OF SEQUENCE NUMBER DIFFERENCE vs RELATIVE ADJUSTMENT DEVIATION FROM AVERAGE RELATIVE ADJUSTMENT

PEP h	PEP	STS i	POP '80 P0i	POP ADJ Phi	SEATS n0i	SEQ '80 S(P0i,n0i)	SEQ ADJ S(Phi,n0i)	SEQDIF Dhi	POP DIF Ahi	AVGPOPDIF A bar h	X-value differ.	RELADJ Ahi/P0i	DIFRATIO bar:Ah/P0	REGRESS. D(hi)	RESID. Dhi-D(hi)
12	14-20	RI	947154	943048	2	338	339	1	-4106	-8680.5	-0.003	-0.004	-0.002	1.008	-0.008
12	14-20	VA	5346279	5334277	10	401	403	2	-12002	-8680.5	-0.001	-0.002	-0.002	0.204	1.796
12	14-20	PA	11866728	11789261	23	431	433	2	-77467	-8680.5	-0.005	-0.007	-0.002	1.853	0.147
12	14-20	OR	2632663	2624861	5	385	387	2	-7802	-8680.5	-0.001	-0.003	-0.002	0.480	1.520
12	14-20	MA	5737037	5675444	11	418	420	2	-61593	-8680.5	-0.009	-0.011	-0.002	3.473	-1.473
12	14-20	CO	2888834	2869023	6	432	434	2	-19811	-8680.5	-0.005	-0.007	-0.002	1.980	0.020
12	14-20	GA	5464265	5388033	10	393	398	5	-76232	-8680.5	-0.012	-0.014	-0.002	4.711	0.289
12	14-20	AR	2285513	2254683	4	344	349	5	-30830	-8680.5	-0.012	-0.013	-0.002	4.534	0.466
12	14-20	TX	14228383	13958899	27	424	429	5	-269484	-8680.5	-0.017	-0.019	-0.002	6.633	-1.633
12	14-20	AL	3890061	3843447	7	378	383	5	-46614	-8680.5	-0.010	-0.012	-0.002	3.954	1.046
12	14-20	IN	5490179	5397001	10	392	397	5	-93178	-8680.5	-0.015	-0.017	-0.002	5.875	-0.875
12	14-20	NH	920610	905632	2	349	355	6	-14978	-8680.5	-0.015	-0.016	-0.002	5.604	0.396
12	14-20	IA	2913387	2876769	6	426	432	6	-36618	-8680.5	-0.011	-0.013	-0.002	4.179	1.821
12	14-20	OK	3025266	2958441	6	415	421	6	-66825	-8680.5	-0.020	-0.022	-0.002	7.845	-1.845
12	14-20	WV	1949644	1918131	4	403	411	8	-31513	-8680.5	-0.014	-0.016	-0.002	5.563	2.437
12	14-20	CT	3107576	3071513	6	397	405	8	-36063	-8680.5	-0.010	-0.012	-0.002	3.808	4.192
12	14-20	KY	3661433	3587015	7	399	412	13	-74418	-8680.5	-0.019	-0.020	-0.002	7.166	5.834
12	14-20	TN	4590750	4431468	9	422	436	14	-159282	-8680.5	-0.023	-0.035	-0.011	8.944	5.056
			5057870.	5107531.						49660.11					0.302
															2.261

DEVIRegression Output:

Constant	0
Std Err of Y Est	2.259
R Squared	0.878
No. of Observatio	528
Degrees of Freedo	527

X Coeffici-385.1
Std Err of 6.211