

**ESTIMATING ULTIMATE LOSSES FOR CLAIMS WITH LONG TAIL
BY SAS PROGRAM BASED UPON
LOSS DEVELOPMENT FACTOR METHOD**

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INTRODUCTION

Estimating ultimate losses for claims with long tail, e.g. workers' compensation, vehicle accident losses, etc., is very basic and important to risk management. The loss development factor method is a useful forecasting statistical method that can be utilized in this estimation process. Therefore, it is a necessary element of our job to create a SAS program for this method.

In the program <rtntnfk> we used some macro language skills to move values of an array around.

The author would like to thank Dr. Zhongmin "James" Li for his valuable comments.

LOSS DEVELOPMENT FACTOR METHOD

To get a better understanding of this method, let us look at a faked and illustrative example. Table 1 presents a summary of compensation losses for the past fourteen fiscal years, FY 1981 through FY 1994. The data was taken from the data set SASDATA.

The table columns illustrate how the total payments for claims occurring in each fiscal year were distributed. The last column shows the aggregate amount paid as of August 31, 1994, for claims originating in each of the last thirteen fiscal years. We will forecast the ultimate cost of claims for each fiscal year (FY 1981 through FY 1994) using the following loss development factor method steps.

- Step 1. Form Table 1 using the data set SASDATA.
- Step 2. Create Table 2 by reorganizing the historical data in Table 1. Cumulative losses for the age interval, measured in 12-months increments, are shown.
- Step 3. Age-to-age factors in Table 3 were calculated by dividing the cumulative total paid for one 12-months period by the cumulative total paid for the previous 12-months period.

Then, the average, the average of all age-to-age factors in the column and the three-year average, the average of the three most recent age-to-

age factors are calculated. The three-year average will be used in the following program.

The age-to-ultimate loss development factors are shown on the bottom line of Table 3. These loss development factors were computed by multiplying the selected age-to-age factor for a given age transition period by the next age-to-ultimate loss development factor. For example, the 12 months-to-ultimate loss development factor 4.58889 equals the 12 months-to-24 months, age-to-age factor 2.39085 times the 24 months-to-ultimate loss development factor 1.91935. Here, we suppose the 168 months-to-ultimate loss development factor is 1.00366.

- Step 4. The estimated ultimate cost of claims, column 4 of Table 4, is the product of columns 2 and 3 of Table 4. The estimated incurred-but-not-reported losses, the last column, is the difference between columns 4 and 2.

SAS Program

A SAS program <rtntnfk> is attached.

Table 1
Compensation Payments
by Fiscal Year of Injury and Payment Period

Injured in fiscal year	Total payment in fiscal year 81	Total payment in fiscal year 82	Total payment in fiscal year 83	Total payment in fiscal year 84	Total payment in fiscal year 85	Total payment in fiscal year 86	Total payment in fiscal year 87	Total payment in fiscal year 88
81	\$201,841.98	\$346,708.28	\$148,439.74	\$121,178.34	\$40,859.78	\$35,880.81	\$18,446.14	\$7,281.50
82	\$0.00	\$344,786.85	\$379,549.14	\$186,758.02	\$179,154.78	\$61,839.99	\$34,016.99	\$52,499.18
83	\$0.00	\$0.00	\$340,782.39	\$373,292.04	\$238,602.29	\$150,025.16	\$85,208.43	\$70,604.22
84	\$0.00	\$0.00	\$0.00	\$457,276.76	\$448,112.73	\$308,635.01	\$173,756.39	\$189,351.65
85	\$0.00	\$0.00	\$0.00	\$0.00	\$416,288.95	\$647,853.88	\$416,588.36	\$249,955.92
86	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$545,752.64	\$586,350.96	\$468,769.27
87	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$636,359.06	\$1,151,344.87
88	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,109,888.29
89	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
90	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
91	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
92	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
93	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
94	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Sum	\$201,841.98	\$691,495.13	\$868,771.27	\$1,138,505.16	\$1,323,018.53	\$1,749,987.49	\$1,950,726.33	\$3,299,694.90

Table 1
Compensation Payments
by Fiscal Year of Injury and Payment Period

Total payment in fiscal year 89	Total payment in fiscal year 90	Total payment in fiscal year 91	Total payment in fiscal year 92	Total payment in fiscal year 93	Total payment in fiscal year 94	Total payment from incident fy up to 08/31/94
\$3,467.50	\$3,467.50	\$3,467.50	\$3,467.50	\$3,458.00	\$3,429.50	\$941,394.07
\$21,307.47	\$17,712.01	\$32,620.71	\$17,335.10	\$16,178.19	\$16,362.69	\$1,360,121.12
\$107,795.20	\$33,763.52	\$24,237.47	\$22,704.68	\$44,044.69	\$14,823.61	\$1,505,883.70
\$86,793.30	\$44,608.75	\$66,337.84	\$71,098.47	\$46,317.87	\$43,982.24	\$1,936,271.01
\$68,065.57	\$146,929.45	\$66,423.91	\$39,549.06	\$68,562.52	\$19,465.69	\$2,139,683.31
\$370,367.87	\$187,358.81	\$84,863.03	\$281,852.03	\$63,157.63	\$75,799.43	\$2,664,271.67
\$411,755.77	\$252,258.32	\$186,542.85	\$96,598.82	\$64,249.09	\$75,232.90	\$2,874,341.68
\$1,658,735.94	\$861,426.37	\$-142,898.98	\$235,391.01	\$123,876.78	\$120,768.46	\$3,967,187.87
\$1,092,004.29	\$1,153,012.40	\$876,481.51	\$475,669.99	\$161,907.66	\$334,719.71	\$4,093,795.56
\$0.00	\$1,361,299.83	\$1,960,939.26	\$717,937.13	\$504,368.13	\$430,216.24	\$4,974,760.59
\$0.00	\$0.00	\$1,136,827.49	\$1,749,543.94	\$812,023.17	\$516,222.09	\$4,214,616.69
\$0.00	\$0.00	\$0.00	\$1,270,017.06	\$1,721,748.13	\$780,606.68	\$3,772,371.87
\$0.00	\$0.00	\$0.00	\$0.00	\$1,670,445.41	\$2,134,663.62	\$3,805,109.03
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,847,148.72	\$1,847,148.72
\$3,820,292.91	\$4,061,836.96	\$4,295,842.59	\$4,981,164.79	\$5,300,337.27	\$6,413,441.58	\$40,096,956.89

Table 2
Compensation Claim Cumulative Payment History
FY 1981 - 1994

Injured in fiscal year	Payment in 12 months	Payment in 24 months	Payment in 36 months	Payment in 48 months	Payment in 60 months	Payment in 72 months	Payment in 84 months	Payment in 96 months
81	\$201,841.98	\$548,550.26	\$696,990.00	\$818,168.34	\$859,028.12	\$894,908.93	\$913,355.07	\$920,636.57
82	\$344,786.85	\$724,335.99	\$911,094.01	\$1,090,248.79	\$1,152,088.78	\$1,186,105.77	\$1,238,604.95	\$1,259,912.42
83	\$340,782.39	\$714,074.43	\$952,676.72	\$1,102,701.88	\$1,187,910.31	\$1,258,514.53	\$1,366,309.73	\$1,400,073.25
84	\$457,276.76	\$905,389.49	\$1,214,024.50	\$1,387,780.89	\$1,577,132.54	\$1,663,925.84	\$1,708,534.59	\$1,774,872.43
85	\$416,288.95	\$1,064,142.83	\$1,480,731.19	\$1,730,687.11	\$1,798,752.68	\$1,945,682.13	\$2,012,106.04	\$2,051,655.10
86	\$545,752.64	\$1,132,103.60	\$1,600,872.87	\$1,971,240.74	\$2,158,599.55	\$2,243,462.58	\$2,525,314.61	\$2,588,472.24
87	\$636,359.06	\$1,787,703.93	\$2,199,459.70	\$2,451,718.02	\$2,638,260.87	\$2,734,859.69	\$2,799,108.78	\$2,874,341.68
88	\$1,109,888.29	\$2,768,624.23	\$3,630,050.60	\$3,487,151.62	\$3,722,542.63	\$3,846,419.41	\$3,967,187.87	\$0.00
89	\$1,092,004.29	\$2,245,016.69	\$3,121,498.20	\$3,597,168.19	\$3,759,075.85	\$4,093,795.56	\$0.00	\$0.00
90	\$1,361,299.83	\$3,322,239.09	\$4,040,176.22	\$4,544,544.35	\$4,974,760.59	\$0.00	\$0.00	\$0.00
91	\$1,136,827.49	\$2,886,371.43	\$3,698,394.60	\$4,214,616.69	\$0.00	\$0.00	\$0.00	\$0.00
92	\$1,270,017.06	\$2,991,765.19	\$3,772,371.87	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
93	\$1,670,445.41	\$3,805,109.03	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
94	\$1,847,148.72	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Table 2
Compensation Claim Cumulative Payment History
FY 1981 - 1994

Payment in 108 months	Payment in 120 months	Payment in 132 months	Payment in 144 months	Payment in 156 months	Payment in 168 months
\$924,104.07	\$927,571.57	\$931,039.07	\$934,506.57	\$937,964.57	\$941,394.07
\$1,277,624.43	\$1,310,245.14	\$1,327,580.24	\$1,343,758.43	\$1,360,121.12	\$0.00
\$1,424,310.72	\$1,447,015.40	\$1,491,060.09	\$1,505,883.70	\$0.00	\$0.00
\$1,845,970.90	\$1,892,288.77	\$1,936,271.01	\$0.00	\$0.00	\$0.00
\$2,120,217.62	\$2,139,683.31	\$0.00	\$0.00	\$0.00	\$0.00
\$2,664,271.67	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Table 3
Compensation Age to Age Development Factors

Injured in fiscal year	12 to 24 months	24 to 36 months	36 to 48 months	48 to 60 months	60 to 72 months	72 to 84 months	84 to 96 months	96 to 108 months
81	2.71772	1.27060	1.17386	1.04994	1.04177	1.02061	1.00797	1.00377
82	2.10082	1.25783	1.19664	1.05672	1.02953	1.04426	1.01720	1.01406
83	2.09540	1.33414	1.15748	1.07727	1.05944	1.08565	1.02471	1.01731
84	1.97996	1.34089	1.14312	1.13644	1.05503	1.02681	1.03883	1.04006
85	2.55626	1.39148	1.16881	1.03933	1.08168	1.03414	1.01966	1.03342
86	2.07439	1.41407	1.23135	1.09505	1.03931	1.12563	1.02501	1.02928
87	2.80927	1.23033	1.11469	1.07609	1.03661	1.02349	1.02688	0.00000
88	2.49451	1.31114	0.96063	1.06750	1.03328	1.03140	0.00000	0.00000
89	2.05587	1.39041	1.15239	1.04501	1.08904	0.00000	0.00000	0.00000
90	2.44049	1.21610	1.12484	1.09467	0.00000	0.00000	0.00000	0.00000
91	2.53897	1.28133	1.13958	0.00000	0.00000	0.00000	0.00000	0.00000
92	2.35569	1.26092	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
93	2.27790	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
94	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Av81-93	2.34594	1.30827	1.14213	1.07380	1.05174	1.04900	1.02289	1.02298
Av91-93	2.39085	1.25278	1.13893	1.06906	1.05298	1.06017	1.02385	1.03425
A-u ldf	4.58889	1.91935	1.53207	1.34518	1.25828	1.19498	1.12715	1.10090

Av81-93: The average of all age-to-age factors.

Av91-93: The average of the 3 most recent age-to-age factors.

A-u ldf: The age-to-ultimate loss development factor.

Table 3
Compensation Age to Age Development Factors

108 to 120 months	120 to 132 months	132 to 144 months	144 to 156 months	156 to 168 months	168 month to ultimate
1.00375	1.00374	1.00372	1.00370	1.00366	1.00366
1.02553	1.01323	1.01219	1.01218	0.00000	0.00000
1.01594	1.03044	1.00994	0.00000	0.00000	0.00000
1.02509	1.02324	0.00000	0.00000	0.00000	0.00000
1.00918	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
1.01590	1.01766	1.00862	1.00794	1.00366	1.00366
1.01674	1.02230	1.00862	1.00794	1.00366	1.00366
1.06444	1.04691	1.02407	1.01532	1.00733	1.00366

Av81-93: The average of all age-to-age factors.

Av91-93: The average of the 3 most recent age-to-age factors.

A-u ldf: The age-to-ultimate loss development factor.

Table 4
Estimated Ultimate Incurred Compensation Losses
=====

Injured in fiscal year	Total payment as of 08/31/94	Loss development factor	Ultimate cost of claims	Incurred but not reported losses
81	\$941,394.07	1.00366	\$944,836.11	\$3,442.04
82	\$1,360,121.12	1.00733	\$1,370,085.38	\$9,964.26
83	\$1,505,883.70	1.01532	\$1,528,957.98	\$23,074.28
84	\$1,936,271.01	1.02407	\$1,982,881.31	\$46,610.30
85	\$2,139,683.31	1.04691	\$2,240,062.20	\$100,378.89
86	\$2,664,271.67	1.06444	\$2,835,946.40	\$171,674.73
87	\$2,874,341.68	1.10090	\$3,164,352.30	\$290,010.62
88	\$3,967,187.87	1.12715	\$4,471,616.21	\$504,428.34
89	\$4,093,795.56	1.19498	\$4,891,985.65	\$798,190.09
90	\$4,974,760.59	1.25828	\$6,259,658.80	\$1,284,898.21
91	\$4,214,616.69	1.34518	\$5,669,417.73	\$1,454,801.04
92	\$3,772,371.87	1.53207	\$5,779,544.38	\$2,007,172.51
93	\$3,805,109.03	1.91935	\$7,303,348.96	\$3,498,239.93
94	\$1,847,148.72	4.58889	\$8,476,367.23	\$6,629,218.51

```

/RM3DZZ1L JOB (1),'DAGAN',MSGCLASS=X,REGION=6M,
/          CLASS=A,TIME=99,NOTIFY=RM3DZZ1
/          EXEC SASL15,CLASS=R,ODEST=RMT6
/*          EXEC SAS
/*ASLIST DD SYSOUT=X
/*YSIN DD *
*****;
* prog: rtntnfk ;
*****;
options nodate ps=52 ls=150;
libname fk 'rms.mgmt.fake' disp=shr;
footnote "Prg: rtntnfk; &sysdate.";
data a0(drop=fyinj fypay);
  set fk.sasdata;
  where "31AUG80"d<inc_date<"01SEP94"d;
  fyinj=input(fyinj,7.);
  fypay=input(fypay,7.);
data a(keep=totpay fyinj fypay);
  set a0;
  fyinj=fyinj;
  fypay=fypay;
  if fypay<fyinj then delete;
proc sort; by fypay fyinj;
***** Table 1 *****;
macro createlm;
  %do j=81 %to 94;
    data fy&j;
      set a;
      by fypay fyinj;
      where fypay=&j;
    proc summary;
      var totpay;
      by fyinj;
      output out=p&j sum=tm&j;
      data pm&j(keep=fyinj tm&j);
        set p&j;
      %end;
    proc sort;
      by fyinj;
  %mend createlm;
%createlm
data m1;
  merge pm81 pm82 pm83 pm84 pm85 pm86 pm87 pm88 pm89 pm90 pm91
        pm92 pm93 pm94;
  by fyinj;
  array dltms{14} tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88 tm89
                 tm90 tm91 tm92 tm93 tm94;
  do j=1 to 14;
    if dltms{j}=. then dltms{j}=0;
  end;
  drop j;
data m1ext;
  set m1;
  yinj=put(fyinj,7.);
  alltp=tm81+tm82+tm83+tm84+tm85+tm86+tm87+tm88+tm89+tm90
        +tm91+tm92+tm93+tm94;
proc sort;
  by yinj;
proc report data=m1ext split="*" headline headskip center nowindows;
  title "Table 1";

```

```

title2 "Compensation Payments";
title3 "by Fiscal Year of Injury and Payment Period";
title4 "=====";
column yinj tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88 tm89
      tm90 tm91 tm92 tm93 tm94 alltp;
define yinj/display format=$7. width=7 "Injured*in*fiscal*year";
define tm81/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 81";
define tm82/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 82";
define tm83/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 83";
define tm84/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 84";
define tm85/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 85";
define tm86/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 86";
define tm87/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 87";
define tm88/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 88";
define tm89/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 89";
define tm90/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 90";
define tm91/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 91";
define tm92/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 92";
define tm93/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 93";
define tm94/sum format=dollar15.2 width=15
  "Total payment*in*fiscal year 94";
define alltp/sum format=dollar20.2 width=20
  "Total payment*from incident fy*up to 08/31/94";
rbreak after/ol ul summarize;
compute after;
  yinj="Sum";
endcomp;

```

***** Table 2 *****;

```
%macro create2m;
```

```
  data m2;
```

```
    set m1;
```

```
    %do i=81 %to 94;
```

```
      if tm&i=. then tm&i=0;
```

```
    %end;
```

```
    dump=tm81;
```

```
    %do i=82 %to 94;
```

```
      tm&i=tm&i+dump;
```

```
      dump=tm&i;
```

```
    %end;
```

```
    drop dump;
```

```
    %do j=95 %to 107;
```

```
      tm&j=0;
```

```
    %end;
```

```
    %do j=81 %to 94;
```

```
      %do i=82 %to 94;
```

```
        if fyinj=&i then do;
```

```
          %let c=%eval(&j+&i-81);
```

```

        tm&j=tm&c;
    end;
%end;
%end;
%do j=95 %to 107;
    drop tm&j;
%end;
mend create2m;
create2m;
roc report data=m2 split="*" headline headskip center nowindows;
    title1 "Table 2";
    title2 "Compensation Claim Cumulative Payment History";
    title3 "FY 1981 - 1994";
    title4 "=====";
    column fyinj tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88 tm89
           tm90 tm91 tm92 tm93 tm94;
efine fyinj/display format=comma7. width=7 "Injured*in*fiscal*year";
define tm81/display format=dollar15.2 width=15
    "Payment*in 12*months";
define tm82/display format=dollar15.2 width=15
    "Payment*in 24*months";
define tm83/display format=dollar15.2 width=15
    "Payment*in 36*months";
define tm84/display format=dollar15.2 width=15
    "Payment*in 48*months";
define tm85/display format=dollar15.2 width=15
    "Payment*in 60*months";
define tm86/display format=dollar15.2 width=15
    "Payment*in 72*months";
define tm87/display format=dollar15.2 width=15
    "Payment*in 84*months";
define tm88/display format=dollar15.2 width=15
    "Payment*in 96*months";
define tm89/display format=dollar15.2 width=15
    "Payment*in 108*months";
define tm90/display format=dollar15.2 width=15
    "Payment*in 120*months";
define tm91/display format=dollar15.2 width=15
    "Payment*in 132*months";
define tm92/display format=dollar15.2 width=15
    "Payment*in 144*months";
define tm93/display format=dollar15.2 width=15
    "Payment*in 156*months";
define tm94/display format=dollar15.2 width=15
    "Payment*in 168*months";
***** Table 3 *****;
macro create3M;
    data m30;
        set m2;
        %do j=81 %to 93;
            %let d=%eval(&j+1);
            if tm&j NE 0 then
                tm&j=tm&d/tm&j;
            else tm&j=0;
        %end;
        tm94=tm93;
    %mend create3m;
%create3m
proc sort data=m30;
    by fyinj;

```

```

** average for all **;
lata m3ms0;
  set m30;
  array del{14} tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88
                    tm89 tm90 tm91 tm92 tm93 tm94;
  do j=1 to 14;
    if del{j}=0 then del{j}=.;
  end;
run;

proc summary;
  var tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88 tm89 tm90 tm91 tm92
      tm93 tm94;
  output out=av      sum=tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88
                    tm89 tm90 tm91 tm92 tm93 tm94
      n=d81 d82 d83 d84 d85 d86 d87 d88 d89 d90 d91 d92 d93 d94;
lata avrall;
  set av;
  drop _type_ _freq_;
  fyinj=97;
  %macro avrg;
    %do j=81 %to 94;
      tm&j=tm&j/d&j;
    %end;
  %mend avrg;
  %avrg
  drop d81 d82 d83 d84 d85 d86 d87 d88 d89 d90 d91 d92 d93 d94;
** average for 91-93 **;
lata m3kp3yr;
  set m30;
  %macro kp3yr;
    %do j=81 %to 91;
      %let d=%eval(171-&j);
      if fyinj LE &d then tm&j=0;
    %end;
  %mend kp3yr;
  %kp3yr

proc summary;
  var tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88 tm89 tm90 tm91 tm92
      tm93 tm94;
  output out=av      sum=tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88
                    tm89 tm90 tm91 tm92 tm93 tm94;

lata avr3yr;
  set av;
  drop _type_ _freq_;
  fyinj=98;
  %macro avrg;
    %do j=81 %to 91;
      tm&j=tm&j/3;
    %end;
  %mend avrg;
  %avrg
  tm92=tm92/2;
** loss development factors (by 3 year average) **;
lata ldf;
  set avr3yr;
  array id{14} tm94 tm93 tm92 tm91 tm90 tm89 tm88 tm87
                    tm86 tm85 tm84 tm83 tm82 tm81;
  do j=2 to 14;
    id{j}=id{j}*id{j-1};
  end;

```

```

fyinj=99;
drop j;
roc format;
  value fyinjfm 81='81' 82='82' 83='83' 84='84' 85='85' 86='86'
                87='87' 88='88' 89='89' 90='90' 91='91' 92='92'
                93='93' 94='94'
                97='Av81-93'
                98='Av91-93'
                99="A-u ldf";
ata m3;
  set m30 avrall avr3yr ldf;
  format fyinj fyinjfm.;
roc report data=m3 split="*" headline headskip center nowindows;
  title1 "Table 3";
  title2 "Compensation Age to Age Development Factors";
  title3 "=====";
  column fyinj tm81 tm82 tm83 tm84 tm85 tm86 tm87 tm88 tm89
            tm90 tm91 tm92 tm93 tm94;
efine fyinj/display width=7 "Injured*in*fiscal*year"
      format=fyinjfm.;
define tm81/display format=10.5 width=15
  "12 to 24*months";
define tm82/display format=10.5 width=15
  "24 to 36*months";
define tm83/display format=10.5 width=15
  "36 to 48*months";
define tm84/display format=10.5 width=15
  "48 to 60*months";
define tm85/display format=10.5 width=15
  "60 to 72*months";
define tm86/display format=10.5 width=15
  "72 to 84*months";
define tm87/display format=10.5 width=15
  "84 to 96*months";
define tm88/display format=10.5 width=15
  "96 to 108*months";
define tm89/display format=10.5 width=15
  "108 to 120*months";
define tm90/display format=10.5 width=15
  "120 to 132*months";
define tm91/display format=10.5 width=15
  "132 to 144*months";
define tm92/display format=10.5 width=15
  "144 to 156*months";
define tm93/display format=10.5 width=15
  "156 to 168*months";
define tm94/display format=10.5 width=15
  "168 month*to ultimate";
rbreak after/;
compute after;
  line ' ';
  line @4
  'Av81-93: The average of all age-to-age factors.';
  line @4
  'Av91-93: The average of the 3 most recent age-to-age factors.';
  line @4
  'A-u ldf: The age-to-ultimate loss development factor.';
endcomp;
***** Table 4 *****;
lata m41(keep=fyinj p_to_day);

```

```

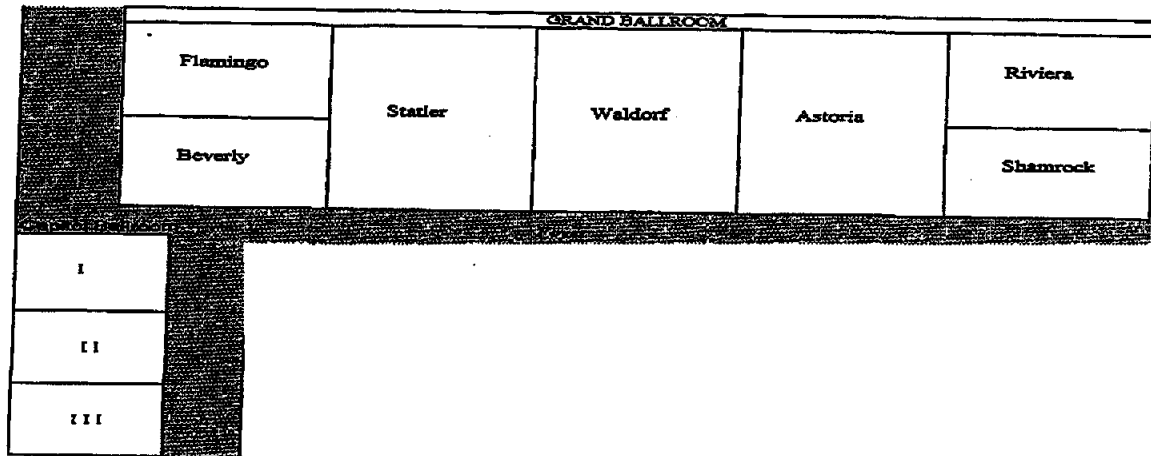
set m2;
%macro cc;
  %do j=81 %to 94;
    %let d=%eval(81+94-&j);
    if fyinj=&j then p_to_day=tm&d;
  %end;
%mend cc;
%cc;
proc sort;
  by fyinj;
data m421;
  set ldf;
  drop fyinj;
  %macro cc;
    %do j=81 %to 94;
      %let d=%eval(94+81-&j);
      mt&j=tm&d;
    %end;
    %do j=81 %to 94;
      tm&j=mt&j;
      drop mt&j;
    %end;
  %mend cc;
%cc;
proc transpose data=m421 out=m422;
data m42;
  set m422;
  ldf=coll;
  fyi=substr(_name_, 3);
  fyinj=input(fyi, 8.);
  drop coll _name_ fyi;
proc sort;
  by fyinj;
data m4;
  merge m41 m42;
  by fyinj;
  ucoc=p_to_day*ldf;
  ibnrl=ucoc-p_to_day;
proc report data=m4 split="*" headline headskip center nowindows;
  title1 "Table 4";
  title2 "Estimated Ultimate Incurred Compensation Losses";
  title3 "=====";
  column fyinj p_to_day ldf ucoc ibnrl;
define fyinj/display format=comma7. width=7 "Injured*in*fiscal*year";
define p_to_day/display format=dollar15.2 width=15
  "Total payment*as of 08/31/94";
define ldf/display format=10.5 width=15
  "Loss*development*factor";
define ucoc/display format=dollar15.2 width=15
  "Ultimate cost*of claims";
define ibnrl/display format=dollar15.2 width=15
  "Incurred but*not reported*losses";
endsas;

```

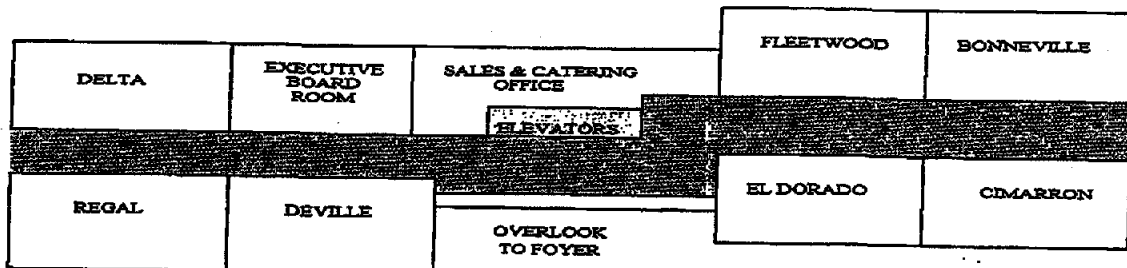
Diagram of Arlington Hilton Hotel

Diagram of Arlington Hilton Hotel

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SC-SUG '95 FACILITIES USAGE PLAN:

Tutorials & General Interest (Monday) - Shamrock/Riviera, Astoria/Waldorf, & Statler Ballrooms
 Statistical Computing (Tuesday) - Shamrock/Riviera Ballroom
 Application Development (Tuesday) - Astoria/Waldorf Ballroom
 Consultants Workshop (Tuesday) - Statler Ballroom
 Formal Demonstrations - Capitol Ballroom I
 SAS Institute Exhibit Area - Capitol Ballroom II and III
 Video Tutorial Theater - Flamingo Ballroom
 Vendor Exhibit Area & Poster Presentations - Beverly Ballroom
 Problem-Solving Sessions - Fleetwood Room & Bonneville Room (2nd Floor)
 Luncheon & Roundtable Discussions - Indoor Pool Atrium, September's Club, 2nd Floor Meeting Rooms
 Mixer (Monday) - Indoor Pool Atrium

ANNOUNCEMENT and CALL FOR PAPERS

Sixth Annual
South-Central Regional SAS Users' Group Conference
Austin Marriott at the Capitol Hotel, Austin, Texas
October 28-29, 1996

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This *regional conference for SAS users from Texas, Louisiana, Oklahoma, Arkansas, New Mexico, and adjoining states* will include presentations of technical papers, roundtable luncheon meetings, panel discussions, poster sessions, demonstrations, workshops, "birds-of-a-feather" sessions, and one-on-one technical exchanges. The conference will feature general sessions for all participants, as well as concurrent sessions covering various areas of specialization.

Please consider sharing your methods, experiences and results with other conference attendees. There will be a published conference proceedings, which will be available at check-in.

Proposed papers, or abstracts of papers, should be sent to Tom Winn, 10906 Rustic Manor Lane, Austin, TX 78750, by June 1, 1996. Volunteers also are needed to serve as section coordinators and as other facilitators at the conference. Please contact Conference Chairman Tom Winn at the above address, by telephone at (512) 463-4907, or by E-Mail at 0007095870@mcimail.com or at twin504@audit.cpa.state.tx.us

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