

## Battisha PSet 3

```
library(tidyverse)
```

```
## -- Attaching packages ----- tidyverse 1.3.0 --
```

```
## v ggplot2 3.2.1    v purrr  0.3.3
## v tibble  2.1.3    v dplyr  0.8.3
## v tidyr   1.0.2    v stringr 1.4.0
## v readr   1.3.1    v forcats 0.4.0
```

```
## -- Conflicts ----- tidyverse_conflicts() --
```

```
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
```

```
library(dplyr)
```

```
library(caret)
```

```
## Loading required package: lattice
```

```
##
```

```
## Attaching package: 'caret'
```

```
## The following object is masked from 'package:purrr':
```

```
##
```

```
## lift
```

```
library(rsample)
```

```
library(ggplot2)
```

```
library(seriation)
```

```
## Registered S3 method overwritten by 'seriation':
```

```
## method from
```

```
## reorder.hclust gclus
```

```
##
```

```
## Attaching package: 'seriation'
```

```
## The following object is masked from 'package:lattice':
```

```
##
```

```
## panel.lines
```

```
library(skimr)
library(dendextend)
```

```
##
## -----
## Welcome to dendextend version 1.13.3
## Type citation('dendextend') for how to cite the package.
##
## Type browseVignettes(package = 'dendextend') for the package vignette.
## The github page is: https://github.com/talgalili/dendextend/
##
## Suggestions and bug-reports can be submitted at: https://github.com/talgalili/dendextend/issues
## Or contact: <tal.galili@gmail.com>
##
## To suppress this message use: suppressPackageStartupMessages(library(dendextend))
## -----

##
## Attaching package: 'dendextend'

## The following object is masked from 'package:stats':
##
##      cutree
```

```
library(mixtools)
```

```
## mixtools package, version 1.2.0, Released 2020-02-05
## This package is based upon work supported by the National Science Foundation under Grant No. SES-051
```

```
library(plotGMM)
library(factoextra)
```

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
```

```
library(clValid)
```

```
## Loading required package: cluster
```

```
library(raster)
```

```
## Loading required package: sp
```

```
##
## Attaching package: 'raster'
```

```
## The following object is masked from 'package:dendextend':
##
##      rotate
```

```
## The following object is masked from 'package:skimr':
##
##      bind

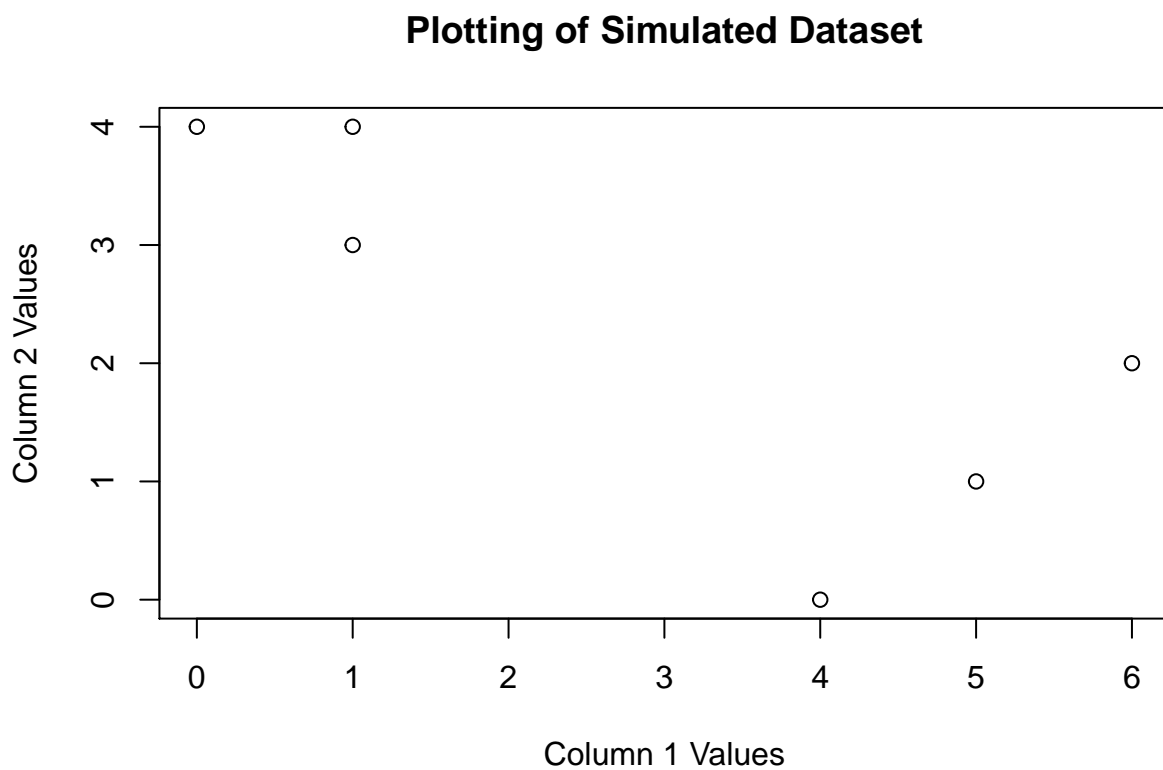
## The following object is masked from 'package:dplyr':
##
##      select

## The following object is masked from 'package:tidyr':
##
##      extract
```

## Performing k-Means By Hand

##Q1: Plot the Observations

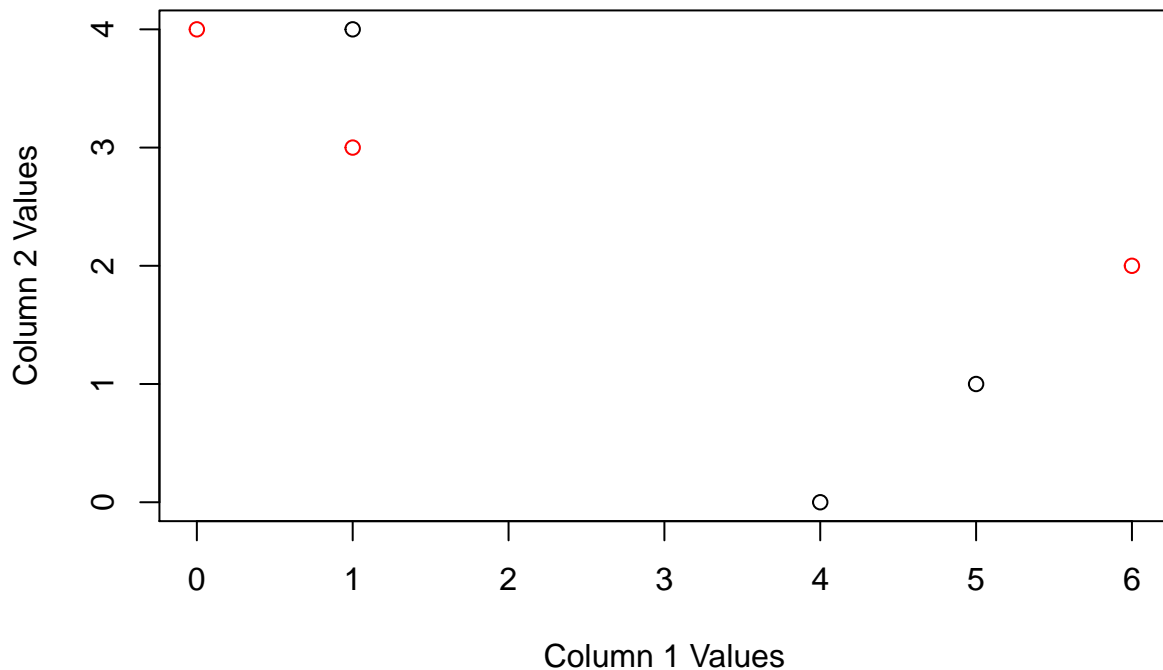
```
#Generate Dataset
sim_data <- cbind(c(1, 1, 0, 5, 6, 4), c(4, 3, 4, 1, 2, 0))
plot(sim_data, main="Plotting of Simulated Dataset", xlab="Column 1 Values", ylab="Column 2 Values")
```



##Q2: Set the Clusters

```
set.seed(27)
classified<-cbind(sim_data, sample(1:2, 6, replace=T))
plot(classified[,1], classified[,2], col=classified[,3], main="Plotting of Simulated Dataset (Clustered)")
```

## Plotting of Simulated Dataset (Clustered)



##Q3: Compute the Centroids

```
#Find Centroid 1
centroid.1 <- cbind(mean(classified[classified[,3]==1,][,1]), mean(classified[classified[,3]==1,][,2]))

#Find Centroid 2
centroid.2 <- cbind(mean(classified[classified[,3]==2,][,1]), mean(classified[classified[,3]==2,][,2]))

centroid.1
```

```
##           [,1]      [,2]
## [1,]  3.333333  1.666667
```

```
centroid.2
```

```
##           [,1] [,2]
## [1,]  2.333333    3
```

##Q4: Assign each observation to the centroid to which it is closest, in terms of Euclidean distance.

```
for (i in 1:6){
  if (pointDistance(classified[i,1:2], centroid.1, lonlat=FALSE) > pointDistance(classified[i,1:2], centroid.2, lonlat=FALSE)) {
    classified[i,3] <- 2
  }
  else {
```

```

        classified[i,3] <- 1
    }
}
classified

```

```

##      [,1] [,2] [,3]
## [1,]    1    4    2
## [2,]    1    3    2
## [3,]    0    4    2
## [4,]    5    1    1
## [5,]    6    2    1
## [6,]    4    0    1

```

##Q5: Keep running until results stabilize

```

#Find Centroid 1
centroid.1 <- cbind(mean(classified[classified[,3]==1,][,1]), mean(classified[classified[,3]==1,][,2]))

#Find Centroid 2
centroid.2 <- cbind(mean(classified[classified[,3]==2,][,1]), mean(classified[classified[,3]==2,][,2]))

for (i in 1:6){
  if (pointDistance(classified[i,1:2], centroid.1, lonlat=FALSE) > pointDistance(classified[i,1:2], centroid.2, lonlat=FALSE))
    classified[i,3] <- 2
  else {
    classified[i,3] <- 1
  }
}

(finalturn <- classified)

```

```

##      [,1] [,2] [,3]
## [1,]    1    4    2
## [2,]    1    3    2
## [3,]    0    4    2
## [4,]    5    1    1
## [5,]    6    2    1
## [6,]    4    0    1

```

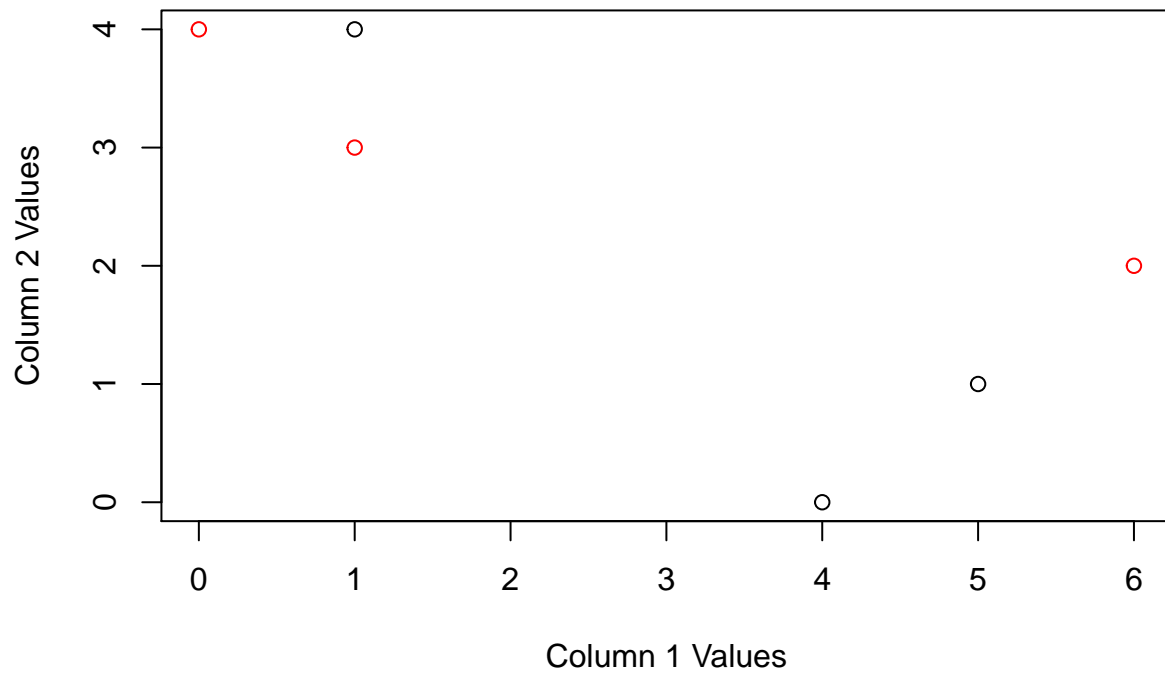
##Q6: Plot Results

```

#Original
set.seed(27)
classified<-cbind(sim_data, sample(1:2, 6, replace=T))
plot(classified[,1], classified[,2], col=classified[,3], main="Plotting of Simulated Dataset (Initial)",

```

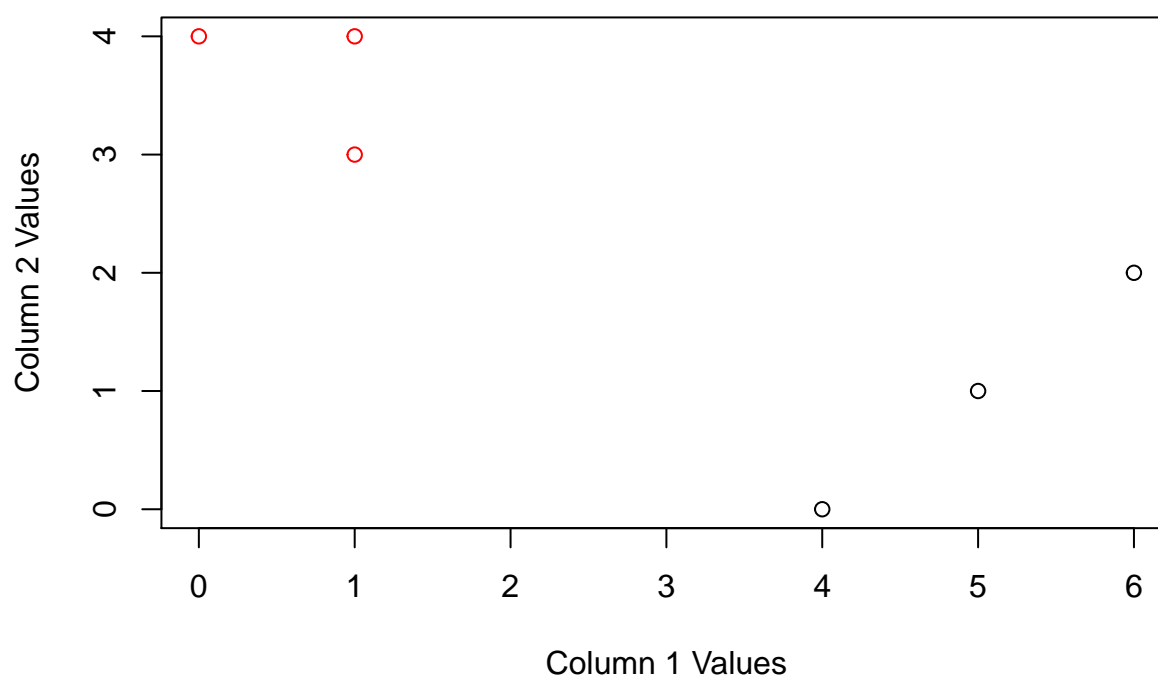
### Plotting of Simulated Dataset (Initial)



*#After Stabilizing (only took one turn)*

```
plot(finalturn[,1], finalturn[,2], col=finalturn[,3], main="Plotting of Simulated Dataset (Final--only o
```

## Plotting of Simulated Dataset (Final--only one turn required)



## Clustering State Legislative Professionalism

##Q1

```
#load data
leg <- get(load("Data and Codebook/legprof-components.v1.0.RData"))
leg
```

##	fips	stateabv	state	sessid	t_length	slength	salary_real
## 1	1	AL	Alabama	1973/4	46.00000	36.00	1.7680216
## 2	1	AL	Alabama	1975/6	110.00000	74.00	2.9330377
## 3	1	AL	Alabama	1977/8	83.00000	60.00	2.0828104
## 4	1	AL	Alabama	1979/80	65.00000	60.00	1.6949510
## 5	1	AL	Alabama	1981/2	218.68001	149.10	3.4729144
## 6	1	AL	Alabama	1983/4	188.86001	149.10	11.7059457
## 7	1	AL	Alabama	1985/6	206.40001	149.10	11.2106239
## 8	1	AL	Alabama	1987/7	121.55000	104.55	1.9839663
## 9	1	AL	Alabama	1989/90	109.55000	103.55	1.7537398
## 10	1	AL	Alabama	1991/2	126.55000	104.55	1.6598081
## 11	1	AL	Alabama	1993/4	NA	NA	NA
## 12	1	AL	Alabama	1995/6	NA	NA	NA
## 13	1	AL	Alabama	1997/8	71.00000	60.00	0.8089113
## 14	1	AL	Alabama	1999/00	78.00000	60.00	0.7725464
## 15	1	AL	Alabama	2001/2	86.00000	60.00	0.7330064
## 16	1	AL	Alabama	2003/4	85.00000	57.00	0.6662773

## 17	1	AL	Alabama	2005/6	65.00000	60.00	0.6594435
## 18	1	AL	Alabama	2007/8	70.00000	60.00	0.6193379
## 19	1	AL	Alabama	2009/10	116.55000	104.55	1.0504209
## 20	2	AK	Alaska	1973/4	154.07000	132.06	109.3077266
## 21	2	AK	Alaska	1975/6	281.00000	281.00	116.0723906
## 22	2	AK	Alaska	1977/8	214.42000	214.42	92.2636406
## 23	2	AK	Alaska	1979/80	186.72999	182.47	66.3855840
## 24	2	AK	Alaska	1981/2	311.13000	309.00	70.5956230
## 25	2	AK	Alaska	1983/4	222.93999	222.94	141.8271992
## 26	2	AK	Alaska	1985/6	185.31000	170.40	190.3855625
## 27	2	AK	Alaska	1987/7	173.95000	171.82	130.6423945
## 28	2	AK	Alaska	1989/90	182.47001	172.53	75.8712656
## 29	2	AK	Alaska	1991/2	220.62000	208.62	72.7658555
## 30	2	AK	Alaska	1993/4	214.01000	206.91	71.5653945
## 31	2	AK	Alaska	1995/6	193.83000	172.53	67.7280234
## 32	2	AK	Alaska	1997/8	177.50000	171.11	64.7452676
## 33	2	AK	Alaska	1999/00	178.21001	167.56	61.8346094
## 34	2	AK	Alaska	2001/2	180.63000	173.24	58.6698340
## 35	2	AK	Alaska	2003/4	178.21001	172.53	56.1744707
## 36	2	AK	Alaska	2005/6	230.04002	171.82	52.7818594
## 37	2	AK	Alaska	2007/8	214.42001	149.81	49.5718086
## 38	2	AK	Alaska	2009/10	128.51000	127.80	74.8058633
## 39	4	AZ	Arizona	1973/4	256.31000	169.69	56.0052813
## 40	4	AZ	Arizona	1975/6	260.56999	225.07	47.3121152
## 41	4	AZ	Arizona	1977/8	187.00000	185.00	41.6562070
## 42	4	AZ	Arizona	1979/80	254.88998	150.52	33.8990225
## 43	4	AZ	Arizona	1981/2	317.36998	146.26	48.2878496
## 44	4	AZ	Arizona	1983/4	248.50001	159.75	64.3204121
## 45	4	AZ	Arizona	1985/6	170.40000	170.40	60.2415742
## 46	4	AZ	Arizona	1987/7	220.10000	212.29	56.4412949
## 47	4	AZ	Arizona	1989/90	239.27000	234.30	51.4032969
## 48	4	AZ	Arizona	1991/2	415.35001	235.01	47.3281641
## 49	4	AZ	Arizona	1993/4	165.43001	138.45	44.7060156
## 50	4	AZ	Arizona	1995/6	NA	NA	42.3088594
## 51	4	AZ	Arizona	1997/8	NA	NA	40.4455684
## 52	4	AZ	Arizona	1999/00	NA	NA	61.8037070
## 53	4	AZ	Arizona	2001/2	238.56000	165.43	58.6405137
## 54	4	AZ	Arizona	2003/4	252.75999	208.74	56.1463984
## 55	4	AZ	Arizona	2005/6	233.59000	204.48	52.7554824
## 56	4	AZ	Arizona	2007/8	234.30000	234.30	49.5470332
## 57	4	AZ	Arizona	2009/10	286.12999	197.38	48.3936660
## 58	5	AR	Arkansas	1973/4	90.88000	76.68	28.3789961
## 59	5	AR	Arkansas	1975/6	68.16000	66.03	22.3084351
## 60	5	AR	Arkansas	1977/8	54.28000	50.28	37.8736543
## 61	5	AR	Arkansas	1979/80	78.10000	69.58	52.2711602
## 62	5	AR	Arkansas	1981/2	53.96000	46.86	40.3344746
## 63	5	AR	Arkansas	1983/4	74.55000	48.28	37.2338174
## 64	5	AR	Arkansas	1985/6	56.80000	53.25	35.3006299
## 65	5	AR	Arkansas	1987/7	72.42000	58.22	33.5848252
## 66	5	AR	Arkansas	1989/90	NA	NA	NA
## 67	5	AR	Arkansas	1991/2	58.22000	51.83	23.6640820
## 68	5	AR	Arkansas	1993/4	71.71000	62.48	29.7098242
## 69	5	AR	Arkansas	1995/6	66.03000	63.19	35.2573848
## 70	5	AR	Arkansas	1997/8	68.16000	68.16	33.7046406



## 71	5	AR	Arkansas	1999/00	152.19000	63.19	32.1894316
## 72	5	AR	Arkansas	2001/2	71.00000	68.87	31.2651670
## 73	5	AR	Arkansas	2003/4	118.57000	66.74	31.0377881
## 74	5	AR	Arkansas	2005/6	73.13000	68.87	30.9213066
## 75	5	AR	Arkansas	2007/8	64.61000	62.48	30.7805205
## 76	5	AR	Arkansas	2009/10	80.23000	80.23	30.6690254
## 77	6	CA	California	1973/4	244.00000	239.00	187.7091484
## 78	6	CA	California	1975/6	395.00000	256.00	166.5386406
## 79	6	CA	California	1977/8	318.00000	260.00	161.2928281
## 80	6	CA	California	1979/80	251.00000	251.00	144.3815781
## 81	6	CA	California	1981/2	286.00000	257.00	130.9505313
## 82	6	CA	California	1983/4	340.00000	266.00	120.5364570
## 83	6	CA	California	1985/6	321.00000	254.00	124.0780234
## 84	6	CA	California	1987/7	354.00000	350.00	133.1424531
## 85	6	CA	California	1989/90	313.00000	269.00	139.8717969
## 86	6	CA	California	1991/2	424.00000	288.00	146.9425078
## 87	6	CA	California	1993/4	NA	NA	156.4710625
## 88	6	CA	California	1995/6	NA	NA	203.0825312
## 89	6	CA	California	1997/8	384.00000	271.00	203.8456641
## 90	6	CA	California	1999/00	336.00000	310.00	254.9403047
## 91	6	CA	California	2001/2	507.14001	450.14	241.8921250
## 92	6	CA	California	2003/4	316.00000	206.00	231.6038906
## 93	6	CA	California	2005/6	366.00000	237.00	243.7303281
## 94	6	CA	California	2007/8	404.00000	289.00	236.6360391
## 95	6	CA	California	2009/10	390.00000	270.00	213.4051328
## 96	8	CO	Colorado	1973/4	203.00000	203.00	70.9400234
## 97	8	CO	Colorado	1975/6	228.78000	225.78	59.9286797
## 98	8	CO	Colorado	1977/8	194.00000	191.00	67.4799648
## 99	8	CO	Colorado	1979/80	196.00000	196.00	67.7980449
## 100	8	CO	Colorado	1981/2	331.57001	331.57	60.4213359
## 101	8	CO	Colorado	1983/4	305.30000	305.30	60.0323848
## 102	8	CO	Colorado	1985/6	248.49999	227.91	63.1889355
## 103	8	CO	Colorado	1987/7	257.02000	254.89	65.8481797
## 104	8	CO	Colorado	1989/90	177.49999	170.40	59.9705137
## 105	8	CO	Colorado	1991/2	205.39999	170.40	55.2161914
## 106	8	CO	Colorado	1993/4	173.95000	170.40	52.1570195
## 107	8	CO	Colorado	1995/6	170.39999	170.40	49.3603379
## 108	8	CO	Colorado	1997/8	173.52999	170.40	47.1864961
## 109	8	CO	Colorado	1999/00	170.39999	170.40	77.2546367
## 110	8	CO	Colorado	2001/2	196.67000	170.40	73.3006445
## 111	8	CO	Colorado	2003/4	170.39999	170.40	70.1829961
## 112	8	CO	Colorado	2005/6	173.95000	170.40	65.9443516
## 113	8	CO	Colorado	2007/8	169.68999	169.69	61.9337930
## 114	8	CO	Colorado	2009/10	205.20000	205.20	60.4920820
## 115	9	CT	Connecticut	1973/4	161.00000	158.00	56.2493457
## 116	9	CT	Connecticut	1975/6	157.00000	154.00	43.3694395
## 117	9	CT	Connecticut	1977/8	138.00000	138.00	38.1848574
## 118	9	CT	Connecticut	1979/80	143.94000	134.00	42.7309922
## 119	9	CT	Connecticut	1981/2	192.00000	158.00	37.3376328
## 120	9	CT	Connecticut	1983/4	182.00000	169.00	42.8349707
## 121	9	CT	Connecticut	1985/6	175.00000	168.00	47.1430059
## 122	9	CT	Connecticut	1987/7	179.00000	177.00	52.9709297
## 123	9	CT	Connecticut	1989/90	184.03000	182.32	54.6913320
## 124	9	CT	Connecticut	1991/2	300.33000	170.40	52.8813359

## 125	9	CT	Connecticut	1993/4	237.85001	170.40	49.9515234
## 126	9	CT	Connecticut	1995/6	NA	NA	47.2730996
## 127	9	CT	Connecticut	1997/8	NA	NA	45.1911816
## 128	9	CT	Connecticut	1999/00	171.35000	170.35	56.1074668
## 129	9	CT	Connecticut	2001/2	192.70000	174.66	68.4139336
## 130	9	CT	Connecticut	2003/4	177.32000	171.32	65.5041289
## 131	9	CT	Connecticut	2005/6	176.08000	170.40	61.5480625
## 132	9	CT	Connecticut	2007/8	197.00000	175.00	57.8048750
## 133	9	CT	Connecticut	2009/10	160.91000	144.26	56.4592773
## 134	10	DE	Delaware	1973/4	118.00000	110.00	69.2744082
## 135	10	DE	Delaware	1975/6	117.00000	111.00	70.9681719
## 136	10	DE	Delaware	1977/8	120.00000	109.00	62.4843105
## 137	10	DE	Delaware	1979/80	109.71000	109.00	52.5157070
## 138	10	DE	Delaware	1981/2	244.95000	240.69	48.8609668
## 139	10	DE	Delaware	1983/4	102.00000	102.00	50.6779102
## 140	10	DE	Delaware	1985/6	104.00000	103.00	64.6265234
## 141	10	DE	Delaware	1987/7	204.94000	92.05	77.0983047
## 142	10	DE	Delaware	1989/90	90.92000	89.21	75.7718398
## 143	10	DE	Delaware	1991/2	101.00000	97.00	74.9065937
## 144	10	DE	Delaware	1993/4	NA	NA	73.1752812
## 145	10	DE	Delaware	1995/6	99.71000	98.00	73.3353594
## 146	10	DE	Delaware	1997/8	105.00000	103.00	74.1502109
## 147	10	DE	Delaware	1999/00	108.00000	104.00	76.1576211
## 148	10	DE	Delaware	2001/2	93.00000	90.00	81.6080508
## 149	10	DE	Delaware	2003/4	89.00000	89.00	81.7155430
## 150	10	DE	Delaware	2005/6	85.71000	84.00	87.4532031
## 151	10	DE	Delaware	2007/8	91.00000	91.00	87.4668984
## 152	10	DE	Delaware	2009/10	93.71000	93.00	85.1312188
## 153	12	FL	Florida	1973/4	90.88000	88.75	112.0105625
## 154	12	FL	Florida	1975/6	84.49000	84.49	94.6242305
## 155	12	FL	Florida	1977/8	99.20000	85.20	83.3124141
## 156	12	FL	Florida	1979/80	94.43000	85.20	67.7980449
## 157	12	FL	Florida	1981/2	112.18000	90.17	55.9020410
## 158	12	FL	Florida	1983/4	108.30000	92.30	51.4563320
## 159	12	FL	Florida	1985/6	86.62000	85.91	60.1306309
## 160	12	FL	Florida	1987/7	107.92000	88.75	71.1358750
## 161	12	FL	Florida	1989/90	93.72000	86.62	71.0799688
## 162	12	FL	Florida	1991/2	134.19000	84.49	69.7790859
## 163	12	FL	Florida	1993/4	98.68999	86.62	67.2378477
## 164	12	FL	Florida	1995/6	NA	NA	65.5618086
## 165	12	FL	Florida	1997/8	NA	NA	67.1720000
## 166	12	FL	Florida	1999/00	95.14000	85.20	67.9531758
## 167	12	FL	Florida	2001/2	113.59999	85.20	68.1695977
## 168	12	FL	Florida	2003/4	123.54000	85.20	67.5973477
## 169	12	FL	Florida	2005/6	88.04000	85.20	65.7597090
## 170	12	FL	Florida	2007/8	109.34000	82.36	64.9379629
## 171	12	FL	Florida	2009/10	101.52999	90.17	60.5305938
## 172	13	GA	Georgia	1973/4	85.00000	85.00	67.2063359
## 173	13	GA	Georgia	1975/6	96.00000	85.00	56.7745391
## 174	13	GA	Georgia	1977/8	80.00000	80.00	49.9874492
## 175	13	GA	Georgia	1979/80	80.00000	80.00	40.6788262
## 176	13	GA	Georgia	1981/2	104.00000	80.00	33.5412246
## 177	13	GA	Georgia	1983/4	80.00000	80.00	30.8737988
## 178	13	GA	Georgia	1985/6	80.00000	80.00	28.9159551

##	179	13	GA	Georgia	1987/7	85.00000	80.00	37.8579355
##	180	13	GA	Georgia	1989/90	80.00000	80.00	35.1159883
##	181	13	GA	Georgia	1991/2	91.00000	80.00	32.9461113
##	182	13	GA	Georgia	1993/4	80.00000	80.00	31.5161611
##	183	13	GA	Georgia	1995/6	100.00000	80.00	30.6146914
##	184	13	GA	Georgia	1997/8	80.00000	80.00	30.5978818
##	185	13	GA	Georgia	1999/00	80.00000	80.00	29.2223389
##	186	13	GA	Georgia	2001/2	116.00000	80.00	39.5823477
##	187	13	GA	Georgia	2003/4	85.00000	80.00	37.8988184
##	188	13	GA	Georgia	2005/6	71.95000	68.40	36.3221504
##	189	13	GA	Georgia	2007/8	80.00000	80.00	35.8018613
##	190	13	GA	Georgia	2009/10	80.00000	80.00	34.9684570
##	191	15	HI	Hawaii	1973/4	123.00000	121.00	112.0105625
##	192	15	HI	Hawaii	1975/6	120.00000	120.00	94.6242305
##	193	15	HI	Hawaii	1977/8	128.00000	123.00	83.3124141
##	194	15	HI	Hawaii	1979/80	140.57999	140.58	67.7980449
##	195	15	HI	Hawaii	1981/2	147.68000	142.00	59.6304609
##	196	15	HI	Hawaii	1983/4	125.00000	120.00	58.5315762
##	197	15	HI	Hawaii	1985/6	136.26000	131.29	58.6994766
##	198	15	HI	Hawaii	1987/7	135.00000	133.00	58.6989473
##	199	15	HI	Hawaii	1989/90	125.00000	125.00	65.3048594
##	200	15	HI	Hawaii	1991/2	132.00000	127.00	78.3064023
##	201	15	HI	Hawaii	1993/4	131.00000	120.00	87.8276445
##	202	15	HI	Hawaii	1995/6	127.00000	120.00	90.2589023
##	203	15	HI	Hawaii	1997/8	126.00000	126.00	86.2838789
##	204	15	HI	Hawaii	1999/00	127.00000	120.00	82.4049453
##	205	15	HI	Hawaii	2001/2	133.00000	120.00	78.1873555
##	206	15	HI	Hawaii	2003/4	121.00000	120.00	74.8618594
##	207	15	HI	Hawaii	2005/6	121.00000	120.00	75.1765625
##	208	15	HI	Hawaii	2007/8	134.00000	120.00	74.9243359
##	209	15	HI	Hawaii	2009/10	127.00000	122.00	98.2149453
##	210	16	ID	Idaho	1973/4	100.11000	100.11	4.6531792
##	211	16	ID	Idaho	1975/6	102.24000	102.24	4.0262889
##	212	16	ID	Idaho	1977/8	140.00000	140.00	12.5880334
##	213	16	ID	Idaho	1979/80	117.86000	115.73	20.1250840
##	214	16	ID	Idaho	1981/2	115.02000	105.08	19.5657148
##	215	16	ID	Idaho	1983/4	128.50999	126.38	18.0097158
##	216	16	ID	Idaho	1985/6	105.08000	105.08	11.9864487
##	217	16	ID	Idaho	1987/7	137.80000	137.80	7.7499275
##	218	16	ID	Idaho	1989/90	138.22000	138.22	7.1344143
##	219	16	ID	Idaho	1991/2	122.83000	121.41	21.4468530
##	220	16	ID	Idaho	1993/4	112.18000	112.18	35.7648145
##	221	16	ID	Idaho	1995/6	96.56000	96.56	34.8625000
##	222	16	ID	Idaho	1997/8	102.24000	102.24	33.3271484
##	223	16	ID	Idaho	1999/00	136.28000	135.28	38.0092793
##	224	16	ID	Idaho	2001/2	150.00000	150.00	38.2287305
##	225	16	ID	Idaho	2003/4	166.99000	166.99	36.6027734
##	226	16	ID	Idaho	2005/6	128.51000	127.80	34.3921777
##	227	16	ID	Idaho	2007/8	120.70000	119.99	33.2708330
##	228	16	ID	Idaho	2009/10	145.55000	145.55	32.4963467
##	229	17	IL	Illinois	1973/4	171.00000	171.00	174.4063437
##	230	17	IL	Illinois	1975/6	251.00000	188.00	157.7070547
##	231	17	IL	Illinois	1977/8	195.00000	170.00	138.8540234
##	232	17	IL	Illinois	1979/80	173.00000	160.00	149.1848516

##	233	17	IL	Illinois	1981/2	147.00000	147.00	130.4380938
##	234	17	IL	Illinois	1983/4	152.00000	152.00	120.0647695
##	235	17	IL	Illinois	1985/6	151.00000	138.00	121.4039648
##	236	17	IL	Illinois	1987/7	126.00000	125.00	128.1159727
##	237	17	IL	Illinois	1989/90	146.00000	146.00	122.2061992
##	238	17	IL	Illinois	1991/2	257.00000	166.00	114.9565391
##	239	17	IL	Illinois	1993/4	178.00000	139.00	112.7112578
##	240	17	IL	Illinois	1995/6	131.00000	131.00	119.2122656
##	241	17	IL	Illinois	1997/8	114.00000	113.00	126.8346055
##	242	17	IL	Illinois	1999/00	114.00000	111.00	130.8255781
##	243	17	IL	Illinois	2001/2	155.00000	153.00	136.3098750
##	244	17	IL	Illinois	2003/4	175.00000	153.00	130.5123008
##	245	17	IL	Illinois	2005/6	118.00000	118.00	126.6549219
##	246	17	IL	Illinois	2007/8	165.00000	142.00	126.7850000
##	247	17	IL	Illinois	2009/10	169.00000	163.00	136.7846953
##	248	18	IN	Indiana	1973/4	90.00000	90.00	56.0052813
##	249	18	IN	Indiana	1975/6	91.00000	91.00	47.3121152
##	250	18	IN	Indiana	1977/8	93.00000	92.00	41.6562070
##	251	18	IN	Indiana	1979/80	89.00000	89.00	33.8990225
##	252	18	IN	Indiana	1981/2	94.00000	91.00	36.0857520
##	253	18	IN	Indiana	1983/4	91.00000	91.00	41.1650645
##	254	18	IN	Indiana	1985/6	91.00000	91.00	42.5337305
##	255	18	IN	Indiana	1987/7	92.00000	91.00	48.0717246
##	256	18	IN	Indiana	1989/90	100.00000	91.00	48.3334414
##	257	18	IN	Indiana	1991/2	102.00000	91.00	36.6004473
##	258	18	IN	Indiana	1993/4	108.00000	90.00	34.5726523
##	259	18	IN	Indiana	1995/6	NA	NA	32.7188525
##	260	18	IN	Indiana	1997/8	NA	NA	31.2779063
##	261	18	IN	Indiana	1999/00	112.00000	112.00	29.8717930
##	262	18	IN	Indiana	2001/2	93.00000	87.00	28.3429150
##	263	18	IN	Indiana	2003/4	83.00000	83.00	27.1374258
##	264	18	IN	Indiana	2005/6	115.36000	115.36	25.4984834
##	265	18	IN	Indiana	2007/8	171.00000	171.00	23.9477334
##	266	18	IN	Indiana	2009/10	142.71000	128.51	45.6038926
##	267	19	IA	Iowa	1973/4	188.00000	188.00	62.3957812
##	268	19	IA	Iowa	1975/6	199.00000	199.00	63.0828203
##	269	19	IA	Iowa	1977/8	182.00000	177.00	55.5416094
##	270	19	IA	Iowa	1979/80	147.68000	147.68	67.7980449
##	271	19	IA	Iowa	1981/2	171.11000	166.85	61.6625293
##	272	19	IA	Iowa	1983/4	161.88000	161.88	58.7459766
##	273	19	IA	Iowa	1985/6	156.91000	156.91	56.8112422
##	274	19	IA	Iowa	1987/7	156.91000	154.07	54.9361934
##	275	19	IA	Iowa	1989/90	149.10000	149.10	53.3692832
##	276	19	IA	Iowa	1991/2	168.72000	164.72	54.7078203
##	277	19	IA	Iowa	1993/4	151.23000	151.23	53.9452617
##	278	19	IA	Iowa	1995/6	164.01000	164.01	53.0271035
##	279	19	IA	Iowa	1997/8	147.68000	147.68	54.2509883
##	280	19	IA	Iowa	1999/00	154.07000	154.07	53.4550566
##	281	19	IA	Iowa	2001/2	178.33000	174.91	50.7191582
##	282	19	IA	Iowa	2003/4	154.07000	148.39	49.2805820
##	283	19	IA	Iowa	2005/6	170.40000	169.69	46.9975293
##	284	19	IA	Iowa	2007/8	150.52000	150.52	51.6114941
##	285	19	IA	Iowa	2009/10	129.93000	129.93	50.4100684
##	286	20	KS	Kansas	1973/4	118.00000	118.00	5.5511174

##	287	20	KS	Kansas	1975/6	140.00000	140.00	19.3191143
##	288	20	KS	Kansas	1977/8	137.00000	137.00	16.6406841
##	289	20	KS	Kansas	1979/80	137.00000	137.00	13.5642378
##	290	20	KS	Kansas	1981/2	137.00000	137.00	13.0743960
##	291	20	KS	Kansas	1983/4	139.00000	139.00	13.2427100
##	292	20	KS	Kansas	1985/6	139.00000	139.00	13.8140840
##	293	20	KS	Kansas	1987/7	146.00000	140.00	14.0850669
##	294	20	KS	Kansas	1989/90	147.42000	145.42	14.1890215
##	295	20	KS	Kansas	1991/2	145.55000	145.55	13.6611436
##	296	20	KS	Kansas	1993/4	130.64000	130.64	11.8730073
##	297	20	KS	Kansas	1995/6	132.19000	132.19	11.7373867
##	298	20	KS	Kansas	1997/8	136.00000	136.00	11.5512544
##	299	20	KS	Kansas	1999/00	134.00000	134.00	12.4359644
##	300	20	KS	Kansas	2001/2	148.97000	148.97	14.1221025
##	301	20	KS	Kansas	2003/4	151.06000	151.06	13.8798901
##	302	20	KS	Kansas	2005/6	135.61000	124.96	11.4081582
##	303	20	KS	Kansas	2007/8	153.90000	153.90	13.5832666
##	304	20	KS	Kansas	2009/10	151.48000	151.48	13.5210801
##	305	21	KY	Kentucky	1973/4	60.00000	60.00	6.6345640
##	306	21	KY	Kentucky	1975/6	74.00000	60.00	5.7484004
##	307	21	KY	Kentucky	1977/8	77.00000	49.00	8.1938223
##	308	21	KY	Kentucky	1979/80	60.00000	60.00	7.9389321
##	309	21	KY	Kentucky	1981/2	60.00000	60.00	6.7789429
##	310	21	KY	Kentucky	1983/4	70.00000	60.00	12.5922617
##	311	21	KY	Kentucky	1985/6	67.00000	57.00	11.3405039
##	312	21	KY	Kentucky	1987/7	79.07000	59.00	10.8751514
##	313	21	KY	Kentucky	1989/90	88.71000	60.00	10.0102217
##	314	21	KY	Kentucky	1991/2	63.00000	58.00	9.0144316
##	315	21	KY	Kentucky	1993/4	93.00000	60.00	8.8281787
##	316	21	KY	Kentucky	1995/6	79.00000	60.00	8.3386621
##	317	21	KY	Kentucky	1997/8	71.00000	60.00	8.2433193
##	318	21	KY	Kentucky	1999/00	60.00000	60.00	11.4726328
##	319	21	KY	Kentucky	2001/2	124.80000	116.80	22.9574209
##	320	21	KY	Kentucky	2003/4	101.00000	90.00	17.3358213
##	321	21	KY	Kentucky	2005/6	95.00000	90.00	16.7435640
##	322	21	KY	Kentucky	2007/8	143.55000	116.00	21.8725576
##	323	21	KY	Kentucky	2009/10	127.77000	116.80	21.9840352
##	324	22	LA	Louisiana	1973/4	127.45000	102.60	21.5803369
##	325	22	LA	Louisiana	1975/6	138.46000	120.00	22.2916523
##	326	22	LA	Louisiana	1977/8	118.00000	118.00	18.7093896
##	327	22	LA	Louisiana	1979/80	133.00000	114.00	14.3416060
##	328	22	LA	Louisiana	1981/2	125.00000	109.00	92.9567695
##	329	22	LA	Louisiana	1983/4	117.00000	111.00	86.4675000
##	330	22	LA	Louisiana	1985/6	118.54000	103.54	91.4356016
##	331	22	LA	Louisiana	1987/7	152.00000	110.00	75.3795781
##	332	22	LA	Louisiana	1989/90	137.03000	120.70	54.9253965
##	333	22	LA	Louisiana	1991/2	123.00000	108.00	51.4626074
##	334	22	LA	Louisiana	1993/4	NA	NA	48.7565684
##	335	22	LA	Louisiana	1995/6	110.00000	90.00	46.1728066
##	336	22	LA	Louisiana	1997/8	137.00000	119.00	44.4633242
##	337	22	LA	Louisiana	1999/00	98.00000	75.00	41.9589102
##	338	22	LA	Louisiana	2001/2	95.00000	81.00	40.2726680
##	339	22	LA	Louisiana	2003/4	127.81000	120.00	38.1505234
##	340	22	LA	Louisiana	2005/6	90.95000	79.95	35.8394395

##	341	22	LA	Louisiana	2007/8	124.35000	105.35	40.1887988
##	342	22	LA	Louisiana	2009/10	110.64000	93.60	44.9023340
##	343	23	ME	Maine	1973/4	168.00000	107.00	16.3348735
##	344	23	ME	Maine	1975/6	178.00000	109.00	15.1793042
##	345	23	ME	Maine	1977/8	160.00000	152.00	15.2877397
##	346	23	ME	Maine	1979/80	112.89000	109.34	20.1316445
##	347	23	ME	Maine	1981/2	156.00000	150.00	16.4439707
##	348	23	ME	Maine	1983/4	159.00000	151.00	17.1974136
##	349	23	ME	Maine	1985/6	158.00000	152.00	21.1307764
##	350	23	ME	Maine	1987/7	171.00000	164.00	25.4557783
##	351	23	ME	Maine	1989/90	144.00000	142.00	26.8378896
##	352	23	ME	Maine	1991/2	124.52000	110.00	27.8842471
##	353	23	ME	Maine	1993/4	114.00000	114.00	21.2353584
##	354	23	ME	Maine	1995/6	NA	NA	24.6956943
##	355	23	ME	Maine	1997/8	NA	NA	24.2985977
##	356	23	ME	Maine	1999/00	NA	NA	23.2402373
##	357	23	ME	Maine	2001/2	193.00000	192.00	22.6795059
##	358	23	ME	Maine	2003/4	123.00000	83.00	22.4000986
##	359	23	ME	Maine	2005/6	78.00000	78.00	22.0719238
##	360	23	ME	Maine	2007/8	96.08000	86.85	22.8050400
##	361	23	ME	Maine	2009/10	95.00000	95.00	23.4088633
##	362	24	MD	Maryland	1973/4	132.66000	127.80	102.6763516
##	363	24	MD	Maryland	1975/6	128.80000	127.80	98.5669102
##	364	24	MD	Maryland	1977/8	135.00000	135.00	86.7837656
##	365	24	MD	Maryland	1979/80	132.00000	132.00	92.3821211
##	366	24	MD	Maryland	1981/2	128.51000	127.80	84.0233437
##	367	24	MD	Maryland	1983/4	128.51000	127.80	90.0485781
##	368	24	MD	Maryland	1985/6	121.76000	110.76	84.3382031
##	369	24	MD	Maryland	1987/7	110.05000	110.05	82.7043047
##	370	24	MD	Maryland	1989/90	127.80000	127.80	83.9136445
##	371	24	MD	Maryland	1991/2	151.94000	130.64	81.9886992
##	372	24	MD	Maryland	1993/4	127.80000	127.80	81.9421914
##	373	24	MD	Maryland	1995/6	127.80000	127.80	81.3458359
##	374	24	MD	Maryland	1997/8	127.80000	127.80	77.7633438
##	375	24	MD	Maryland	1999/00	127.80000	127.80	78.7765508
##	376	24	MD	Maryland	2001/2	127.80000	127.80	76.9876641
##	377	24	MD	Maryland	2003/4	138.45000	127.80	73.7132031
##	378	24	MD	Maryland	2005/6	134.90000	127.80	89.0248750
##	379	24	MD	Maryland	2007/8	143.42001	127.80	89.8040000
##	380	24	MD	Maryland	2009/10	127.80000	127.80	87.7135195
##	381	25	MA	Massachusetts	1973/4	307.78000	295.00	118.4325039
##	382	25	MA	Massachusetts	1975/6	319.00000	319.00	100.0493555
##	383	25	MA	Massachusetts	1977/8	270.00000	269.00	95.6189492
##	384	25	MA	Massachusetts	1979/80	349.31999	349.32	107.3929883
##	385	25	MA	Massachusetts	1981/2	516.88000	516.88	93.7116758
##	386	25	MA	Massachusetts	1983/4	286.00000	286.00	104.8320039
##	387	25	MA	Massachusetts	1985/6	432.41000	432.41	120.4831484
##	388	25	MA	Massachusetts	1987/7	NA	NA	129.5455313
##	389	25	MA	Massachusetts	1989/90	516.88000	516.88	118.7035781
##	390	25	MA	Massachusetts	1991/2	402.44000	402.44	94.6563281
##	391	25	MA	Massachusetts	1993/4	NA	NA	89.4120312
##	392	25	MA	Massachusetts	1995/6	NA	NA	130.9036133
##	393	25	MA	Massachusetts	1997/8	NA	NA	125.1385898
##	394	25	MA	Massachusetts	1999/00	NA	NA	119.5129219

##	395	25	MA	Massachusetts	2001/2	515.45999	515.46	122.4682734
##	396	25	MA	Massachusetts	2003/4	391.92000	391.92	121.0190352
##	397	25	MA	Massachusetts	2005/6	512.62000	512.62	122.1495859
##	398	25	MA	Massachusetts	2007/8	347.90000	347.90	120.2282539
##	399	25	MA	Massachusetts	2009/10	385.01999	385.02	117.4295469
##	400	26	MI	Michigan	1973/4	246.00000	246.00	158.6816328
##	401	26	MI	Michigan	1975/6	270.00000	270.00	149.8216953
##	402	26	MI	Michigan	1977/8	261.00000	261.00	146.1250937
##	403	26	MI	Michigan	1979/80	270.00000	270.00	148.0403125
##	404	26	MI	Michigan	1981/2	498.42001	498.42	134.8181875
##	405	26	MI	Michigan	1983/4	500.55000	500.55	137.5460156
##	406	26	MI	Michigan	1985/6	505.52000	505.52	139.9400234
##	407	26	MI	Michigan	1987/7	499.13000	499.13	143.6108906
##	408	26	MI	Michigan	1989/90	499.84000	499.84	145.9588125
##	409	26	MI	Michigan	1991/2	344.75999	344.76	143.4043359
##	410	26	MI	Michigan	1993/4	366.92000	366.92	138.8036406
##	411	26	MI	Michigan	1995/6	NA	NA	138.6461328
##	412	26	MI	Michigan	1997/8	NA	NA	132.5401250
##	413	26	MI	Michigan	1999/00	167.00000	167.00	141.7725625
##	414	26	MI	Michigan	2001/2	168.00000	168.00	189.1156563
##	415	26	MI	Michigan	2003/4	216.00000	216.00	183.6694063
##	416	26	MI	Michigan	2005/6	210.00000	210.00	175.0822578
##	417	26	MI	Michigan	2007/8	389.60001	389.60	164.4342266
##	418	26	MI	Michigan	2009/10	213.00000	213.00	160.6064766
##	419	27	MN	Minnesota	1973/4	116.00000	116.00	78.4073945
##	420	27	MN	Minnesota	1975/6	NA	NA	66.2369609
##	421	27	MN	Minnesota	1977/8	94.00000	94.00	58.3186895
##	422	27	MN	Minnesota	1979/80	99.71000	99.00	54.4538584
##	423	27	MN	Minnesota	1981/2	117.00000	91.00	46.2413638
##	424	27	MN	Minnesota	1983/4	84.00000	84.00	79.3285117
##	425	27	MN	Minnesota	1985/6	94.13000	91.00	81.9577539
##	426	27	MN	Minnesota	1987/7	109.96000	108.96	87.4596133
##	427	27	MN	Minnesota	1989/90	139.69000	136.69	86.5470039
##	428	27	MN	Minnesota	1991/2	100.00000	100.00	85.7436641
##	429	27	MN	Minnesota	1993/4	NA	NA	83.3886406
##	430	27	MN	Minnesota	1995/6	NA	NA	83.7010312
##	431	27	MN	Minnesota	1997/8	118.00000	109.00	80.0148164
##	432	27	MN	Minnesota	1999/00	118.00000	118.00	80.1903086
##	433	27	MN	Minnesota	2001/2	125.00000	115.00	76.0860703
##	434	27	MN	Minnesota	2003/4	145.20000	137.20	72.8499531
##	435	27	MN	Minnesota	2005/6	135.00000	112.00	68.4522148
##	436	27	MN	Minnesota	2007/8	106.95000	106.24	64.2891348
##	437	27	MN	Minnesota	2009/10	109.00000	107.00	62.7925977
##	438	28	MS	Mississippi	1973/4	127.80000	127.80	54.9452051
##	439	28	MS	Mississippi	1975/6	154.78000	152.65	60.1874629
##	440	28	MS	Mississippi	1977/8	130.80000	127.80	51.4183437
##	441	28	MS	Mississippi	1979/80	154.23000	151.23	40.8658477
##	442	28	MS	Mississippi	1981/2	164.39001	144.84	36.0366172
##	443	28	MS	Mississippi	1983/4	145.55000	143.42	33.4145488
##	444	28	MS	Mississippi	1985/6	141.32000	134.19	39.0906914
##	445	28	MS	Mississippi	1987/7	165.43000	158.33	36.0176211
##	446	28	MS	Mississippi	1989/90	174.00000	158.00	32.6936885
##	447	28	MS	Mississippi	1991/2	154.07000	152.65	30.6325049
##	448	28	MS	Mississippi	1993/4	NA	NA	29.0217676

##	449	28	MS	Mississippi	1995/6	NA	NA	27.4838135
##	450	28	MS	Mississippi	1997/8	130.93000	129.93	26.4662637
##	451	28	MS	Mississippi	1999/00	137.03001	127.80	24.9755420
##	452	28	MS	Mississippi	2001/2	193.12000	127.80	23.9718252
##	453	28	MS	Mississippi	2003/4	NA	NA	22.7086445
##	454	28	MS	Mississippi	2005/6	132.05999	128.51	21.3330010
##	455	28	MS	Mississippi	2007/8	263.41000	178.21	20.2918936
##	456	28	MS	Mississippi	2009/10	154.35999	151.23	19.6940059
##	457	29	MO	Missouri	1973/4	293.93999	215.84	78.4073945
##	458	29	MO	Missouri	1975/6	164.00000	157.00	66.2369609
##	459	29	MO	Missouri	1977/8	181.00000	166.00	58.3186895
##	460	29	MO	Missouri	1979/80	189.81000	165.00	84.7475547
##	461	29	MO	Missouri	1981/2	198.00000	167.00	69.8775508
##	462	29	MO	Missouri	1983/4	162.00000	162.00	64.3204121
##	463	29	MO	Missouri	1985/6	181.88000	181.88	69.2423535
##	464	29	MO	Missouri	1987/7	192.25000	192.25	75.9118203
##	465	29	MO	Missouri	1989/90	190.08000	182.08	74.0637656
##	466	29	MO	Missouri	1991/2	191.70000	191.70	71.4302500
##	467	29	MO	Missouri	1993/4	198.56999	183.18	68.1510703
##	468	29	MO	Missouri	1995/6	NA	NA	68.5779258
##	469	29	MO	Missouri	1997/8	NA	NA	65.5577383
##	470	29	MO	Missouri	1999/00	NA	NA	69.0217617
##	471	29	MO	Missouri	2001/2	161.00000	153.00	77.1147187
##	472	29	MO	Missouri	2003/4	201.24000	178.24	73.5924414
##	473	29	MO	Missouri	2005/6	160.00000	152.00	68.9140469
##	474	29	MO	Missouri	2007/8	166.00000	160.00	64.7228789
##	475	29	MO	Missouri	2009/10	147.00000	147.00	72.4191055
##	476	30	MT	Montana	1973/4	132.00000	120.00	11.2010566
##	477	30	MT	Montana	1975/6	87.00000	86.00	6.9713071
##	478	30	MT	Montana	1977/8	90.00000	90.00	10.2335195
##	479	30	MT	Montana	1979/80	90.00000	90.00	9.4557012
##	480	30	MT	Montana	1981/2	104.00000	90.00	7.6643442
##	481	30	MT	Montana	1983/4	95.00000	90.00	8.6184668
##	482	30	MT	Montana	1985/6	111.00000	90.00	8.9753555
##	483	30	MT	Montana	1987/7	90.00000	90.00	9.0057520
##	484	30	MT	Montana	1989/90	111.00000	90.00	8.2504307
##	485	30	MT	Montana	1991/2	106.00000	90.00	7.5114053
##	486	30	MT	Montana	1993/4	120.00000	90.00	7.6653096
##	487	30	MT	Montana	1995/6	86.00000	86.00	7.0212319
##	488	30	MT	Montana	1997/8	87.00000	87.00	6.9134351
##	489	30	MT	Montana	1999/00	93.00000	87.00	6.7948970
##	490	30	MT	Montana	2001/2	95.68000	90.00	7.9589448
##	491	30	MT	Montana	2003/4	89.00000	89.00	7.5763179
##	492	30	MT	Montana	2005/6	110.00000	108.00	9.2608486
##	493	30	MT	Montana	2007/8	96.00000	90.00	7.8247632
##	494	30	MT	Montana	2009/10	90.00000	90.00	7.5595972
##	495	31	NE	Nebraska	1973/4	150.00000	150.00	44.8042266
##	496	31	NE	Nebraska	1975/6	159.00000	151.00	37.8496914
##	497	31	NE	Nebraska	1977/8	159.00000	150.00	33.3249668
##	498	31	NE	Nebraska	1979/80	105.79000	105.79	27.1192168
##	499	31	NE	Nebraska	1981/2	164.00000	150.00	22.3608164
##	500	31	NE	Nebraska	1983/4	156.00000	150.00	20.5825322
##	501	31	NE	Nebraska	1985/6	187.00000	150.00	25.8428584
##	502	31	NE	Nebraska	1987/7	157.00000	150.00	27.5627734



##	503	31	NE	Nebraska	1989/90	164.00000	150.00	28.4613203
##	504	31	NE	Nebraska	1991/2	184.00000	150.00	37.8625313
##	505	31	NE	Nebraska	1993/4	150.00000	150.00	35.7648145
##	506	31	NE	Nebraska	1995/6	150.00000	150.00	33.8470879
##	507	31	NE	Nebraska	1997/8	157.00000	150.00	32.3564541
##	508	31	NE	Nebraska	1999/00	149.00000	149.00	30.9018535
##	509	31	NE	Nebraska	2001/2	183.00000	150.00	29.3202568
##	510	31	NE	Nebraska	2003/4	149.00000	149.00	28.0731992
##	511	31	NE	Nebraska	2005/6	150.00000	150.00	26.3777412
##	512	31	NE	Nebraska	2007/8	157.00000	150.00	24.7735166
##	513	31	NE	Nebraska	2009/10	159.00000	147.00	24.1968330
##	514	32	NV	Nevada	1973/4	72.42000	72.42	21.3400195
##	515	32	NV	Nevada	1975/6	83.00000	83.00	20.1843652
##	516	32	NV	Nevada	1977/8	81.00000	81.00	17.4876602
##	517	32	NV	Nevada	1979/80	99.00000	98.00	23.5476465
##	518	32	NV	Nevada	1981/2	101.00000	101.00	19.3827559
##	519	32	NV	Nevada	1983/4	92.00000	90.00	20.4920098
##	520	32	NV	Nevada	1985/6	95.85000	95.85	20.2013887
##	521	32	NV	Nevada	1987/7	107.21000	107.21	26.7527461
##	522	32	NV	Nevada	1989/90	124.00000	123.00	28.1186738
##	523	32	NV	Nevada	1991/2	115.00000	115.00	23.9349277
##	524	32	NV	Nevada	1993/4	117.86000	117.86	23.1211797
##	525	32	NV	Nevada	1995/6	119.99000	119.99	22.3188340
##	526	32	NV	Nevada	1997/8	119.99000	119.99	21.1924609
##	527	32	NV	Nevada	1999/00	85.20000	85.20	14.4969277
##	528	32	NV	Nevada	2001/2	89.04000	85.20	13.6374258
##	529	32	NV	Nevada	2003/4	129.92999	85.20	13.1260225
##	530	32	NV	Nevada	2005/6	85.91000	85.20	12.3665547
##	531	32	NV	Nevada	2007/8	87.33000	85.20	12.3561904
##	532	32	NV	Nevada	2009/10	89.46000	85.20	12.7211738
##	533	33	NH	New Hampshire	1973/4	93.00000	78.00	0.9334214
##	534	33	NH	New Hampshire	1975/6	80.00000	70.00	0.7885353
##	535	33	NH	New Hampshire	1977/8	93.00000	62.00	0.6942701
##	536	33	NH	New Hampshire	1979/80	92.00000	92.00	0.5649837
##	537	33	NH	New Hampshire	1981/2	62.00000	49.00	0.4658504
##	538	33	NH	New Hampshire	1983/4	36.00000	36.00	0.4288028
##	539	33	NH	New Hampshire	1985/6	47.00000	47.00	0.4016105
##	540	33	NH	New Hampshire	1987/7	52.00000	52.00	0.5034593
##	541	33	NH	New Hampshire	1989/90	54.00000	53.00	0.5009551
##	542	33	NH	New Hampshire	1991/2	61.00000	60.00	0.3155211
##	543	33	NH	New Hampshire	1993/4	59.00000	59.00	0.2980401
##	544	33	NH	New Hampshire	1995/6	49.00000	49.00	0.2820591
##	545	33	NH	New Hampshire	1997/8	46.00000	46.00	0.2696371
##	546	33	NH	New Hampshire	1999/00	47.00000	47.00	0.2575155
##	547	33	NH	New Hampshire	2001/2	39.00000	39.00	0.2443355
##	548	33	NH	New Hampshire	2003/4	39.00000	39.00	0.2339433
##	549	33	NH	New Hampshire	2005/6	43.00000	42.00	0.2198145
##	550	33	NH	New Hampshire	2007/8	128.66000	128.66	0.2064460
##	551	33	NH	New Hampshire	2009/10	148.67000	147.67	0.2016403
##	552	34	NJ	New Jersey	1973/4	126.00000	126.00	84.7612812
##	553	34	NJ	New Jersey	1975/6	74.00000	74.00	74.3055117
##	554	34	NJ	New Jersey	1977/8	80.00000	80.00	63.4794336
##	555	34	NJ	New Jersey	1979/80	96.00000	96.00	90.8129961
##	556	34	NJ	New Jersey	1981/2	106.00000	105.00	80.0813672

##	557	34	NJ	New Jersey	1983/4	52.00000	52.00	103.1313281
##	558	34	NJ	New Jersey	1985/6	104.00000	104.00	97.7267266
##	559	34	NJ	New Jersey	1987/7	101.00000	101.00	90.0440508
##	560	34	NJ	New Jersey	1989/90	116.00000	116.00	114.4279102
##	561	34	NJ	New Jersey	1991/2	172.00000	172.00	107.2137656
##	562	34	NJ	New Jersey	1993/4	NA	NA	101.5761875
##	563	34	NJ	New Jersey	1995/6	NA	NA	96.1933477
##	564	34	NJ	New Jersey	1997/8	72.00000	72.00	92.6319219
##	565	34	NJ	New Jersey	1999/00	74.00000	74.00	87.4143945
##	566	34	NJ	New Jersey	2001/2	NA	NA	117.4619492
##	567	34	NJ	New Jersey	2003/4	NA	NA	111.2723555
##	568	34	NJ	New Jersey	2005/6	76.00000	72.00	104.5316992
##	569	34	NJ	New Jersey	2007/8	NA	NA	99.4302812
##	570	34	NJ	New Jersey	2009/10	126.00000	125.00	96.5006289
##	571	35	NM	New Mexico	1973/4	66.03000	63.90	10.9233606
##	572	35	NM	New Mexico	1975/6	68.87000	63.90	10.1715488
##	573	35	NM	New Mexico	1977/8	72.90000	63.90	8.9809189
##	574	35	NM	New Mexico	1979/80	63.90000	63.90	7.3726648
##	575	35	NM	New Mexico	1981/2	80.94000	63.90	6.9754797
##	576	35	NM	New Mexico	1983/4	73.84000	63.90	8.9485845
##	577	35	NM	New Mexico	1985/6	71.71000	63.90	9.6531289
##	578	35	NM	New Mexico	1987/7	66.02999	63.90	9.0774099
##	579	35	NM	New Mexico	1989/90	67.45000	63.90	8.2836804
##	580	35	NM	New Mexico	1991/2	73.84000	63.90	7.5980447
##	581	35	NM	New Mexico	1993/4	63.90000	63.90	4.8213765
##	582	35	NM	New Mexico	1995/6	66.74000	63.90	0.0000000
##	583	35	NM	New Mexico	1997/8	68.16000	63.90	0.0000000
##	584	35	NM	New Mexico	1999/00	76.68000	63.90	0.0000000
##	585	35	NM	New Mexico	2001/2	76.68000	63.90	0.0000000
##	586	35	NM	New Mexico	2003/4	71.00000	63.90	0.0000000
##	587	35	NM	New Mexico	2005/6	63.90000	63.90	0.0000000
##	588	35	NM	New Mexico	2007/8	74.55000	63.90	0.0000000
##	589	35	NM	New Mexico	2009/10	71.71000	63.90	0.0000000
##	590	36	NY	New York	1973/4	161.17000	154.78	140.0132031
##	591	36	NY	New York	1975/6	369.19998	278.32	185.3057812
##	592	36	NY	New York	1977/8	157.00000	150.00	163.1534766
##	593	36	NY	New York	1979/80	435.00000	428.00	132.7711680
##	594	36	NY	New York	1981/2	167.00000	157.00	125.9793008
##	595	36	NY	New York	1983/4	139.00000	139.00	136.6132187
##	596	36	NY	New York	1985/6	196.96000	178.21	152.3460234
##	597	36	NY	New York	1987/7	NA	NA	161.7983828
##	598	36	NY	New York	1989/90	309.56000	309.56	171.5474922
##	599	36	NY	New York	1991/2	325.66000	324.95	181.4246250
##	600	36	NY	New York	1993/4	NA	NA	171.3730625
##	601	36	NY	New York	1995/6	NA	NA	162.1839687
##	602	36	NY	New York	1997/8	NA	NA	155.0413438
##	603	36	NY	New York	1999/00	NA	NA	204.7247813
##	604	36	NY	New York	2001/2	512.19998	511.20	194.2467031
##	605	36	NY	New York	2003/4	323.14999	323.15	185.9849375
##	606	36	NY	New York	2005/6	519.29999	518.30	174.7525391
##	607	36	NY	New York	2007/8	518.29999	517.59	164.1245547
##	608	36	NY	New York	2009/10	458.14999	427.15	160.3040156
##	609	37	NC	North Carolina	1973/4	161.00000	161.00	22.4021133
##	610	37	NC	North Carolina	1975/6	127.00000	127.00	37.8496914

##	611	37	NC North Carolina	1977/8	149.00000	136.00	28.8100039
##	612	37	NC North Carolina	1979/80	123.00000	123.00	26.2400293
##	613	37	NC North Carolina	1981/2	155.06999	143.00	30.0660508
##	614	37	NC North Carolina	1983/4	164.00000	161.00	29.7417588
##	615	37	NC North Carolina	1985/6	149.00000	148.00	30.7684229
##	616	37	NC North Carolina	1987/7	163.00000	163.00	34.8143730
##	617	37	NC North Carolina	1989/90	181.00000	179.00	36.3903047
##	618	37	NC North Carolina	1991/2	155.31000	149.31	37.2433789
##	619	37	NC North Carolina	1993/4	195.09000	163.09	38.0349863
##	620	37	NC North Carolina	1995/6	156.00000	136.00	39.3500605
##	621	37	NC North Carolina	1997/8	247.00000	224.00	37.6170742
##	622	37	NC North Carolina	1999/00	152.57000	150.57	35.9259805
##	623	37	NC North Carolina	2001/2	368.07001	302.07	34.0872441
##	624	37	NC North Carolina	2003/4	151.00000	146.00	32.6374326
##	625	37	NC North Carolina	2005/6	214.42000	213.71	30.6663223
##	626	37	NC North Carolina	2007/8	186.02000	183.89	28.8012783
##	627	37	NC North Carolina	2009/10	181.76000	181.76	28.1308350
##	628	38	ND North Dakota	1973/4	54.00000	54.00	1.3260161
##	629	38	ND North Dakota	1975/6	57.00000	57.00	1.1551294
##	630	38	ND North Dakota	1977/8	67.00000	67.00	1.2054252
##	631	38	ND North Dakota	1979/80	61.00000	61.00	0.9160755
##	632	38	ND North Dakota	1981/2	62.84000	60.00	0.7196567
##	633	38	ND North Dakota	1983/4	75.00000	75.00	0.8209940
##	634	38	ND North Dakota	1985/6	66.00000	62.00	11.3081084
##	635	38	ND North Dakota	1987/7	73.00000	73.00	12.9429454
##	636	38	ND North Dakota	1989/90	75.00000	75.00	12.4868233
##	637	38	ND North Dakota	1991/2	72.00000	67.00	9.9422012
##	638	38	ND North Dakota	1993/4	79.13000	77.00	13.6357781
##	639	38	ND North Dakota	1995/6	67.00000	67.00	26.7992112
##	640	38	ND North Dakota	1997/8	66.00000	66.00	25.1924260
##	641	38	ND North Dakota	1999/00	71.00000	71.00	10.3151221
##	642	38	ND North Dakota	2001/2	58.22000	54.67	7.4717358
##	643	38	ND North Dakota	2003/4	56.09000	53.96	7.9934116
##	644	38	ND North Dakota	2005/6	53.96000	53.96	7.5309150
##	645	38	ND North Dakota	2007/8	51.83000	51.83	6.8135273
##	646	38	ND North Dakota	2009/10	79.00000	79.00	10.8399355
##	647	39	OH Ohio	1973/4	191.00000	174.00	130.6789883
##	648	39	OH Ohio	1975/6	189.33000	173.00	137.9936719
##	649	39	OH Ohio	1977/8	225.00000	219.00	121.4972734
##	650	39	OH Ohio	1979/80	231.00000	231.00	112.1036992
##	651	39	OH Ohio	1981/2	233.00000	233.00	104.8163320
##	652	39	OH Ohio	1983/4	205.00000	205.00	96.4806211
##	653	39	OH Ohio	1985/6	196.00000	196.00	108.5847578
##	654	39	OH Ohio	1987/7	NA	NA	128.1466563
##	655	39	OH Ohio	1989/90	238.00000	238.00	125.5839844
##	656	39	OH Ohio	1991/2	248.00000	248.00	127.5507617
##	657	39	OH Ohio	1993/4	307.00000	307.00	126.4491836
##	658	39	OH Ohio	1995/6	199.92000	199.92	119.6689180
##	659	39	OH Ohio	1997/8	322.00000	322.00	114.3986719
##	660	39	OH Ohio	1999/00	211.00000	211.00	109.2558242
##	661	39	OH Ohio	2001/2	259.00000	259.00	126.2579180
##	662	39	OH Ohio	2003/4	260.00000	252.00	124.6602734
##	663	39	OH Ohio	2005/6	252.00000	252.00	123.6698437
##	664	39	OH Ohio	2007/8	378.00000	378.00	123.3379727

##	665	39	OH	Ohio	2009/10	258.00000	258.00	122.1617461
##	666	40	OK	Oklahoma	1973/4	155.00000	155.00	88.4883477
##	667	40	OK	Oklahoma	1975/6	182.00000	177.00	78.5381094
##	668	40	OK	Oklahoma	1977/8	163.00000	158.00	79.1424219
##	669	40	OK	Oklahoma	1979/80	172.55000	169.00	73.1540859
##	670	40	OK	Oklahoma	1981/2	181.00000	176.00	71.7340410
##	671	40	OK	Oklahoma	1983/4	186.00000	178.00	81.3819180
##	672	40	OK	Oklahoma	1985/6	180.00000	180.00	80.3220977
##	673	40	OK	Oklahoma	1987/7	188.00000	180.00	75.2550586
##	674	40	OK	Oklahoma	1989/90	200.00000	150.00	88.5581758
##	675	40	OK	Oklahoma	1991/2	146.00000	141.00	100.9667500
##	676	40	OK	Oklahoma	1993/4	145.00000	137.00	95.3728359
##	677	40	OK	Oklahoma	1995/6	140.00000	134.00	90.2589023
##	678	40	OK	Oklahoma	1997/8	145.00000	140.00	86.2838789
##	679	40	OK	Oklahoma	1999/00	148.00000	134.00	98.8859336
##	680	40	OK	Oklahoma	2001/2	146.00000	130.00	93.8248242
##	681	40	OK	Oklahoma	2003/4	143.13000	141.00	89.8342344
##	682	40	OK	Oklahoma	2005/6	141.26000	132.00	84.4087734
##	683	40	OK	Oklahoma	2007/8	128.00000	128.00	79.2752539
##	684	40	OK	Oklahoma	2009/10	135.00000	135.00	77.4298672
##	685	41	OR	Oregon	1973/4	138.45000	127.80	44.8042266
##	686	41	OR	Oregon	1975/6	109.34000	108.63	41.6346602
##	687	41	OR	Oregon	1977/8	130.67000	125.67	47.1458184
##	688	41	OR	Oregon	1979/80	128.51000	124.96	44.3399199
##	689	41	OR	Oregon	1981/2	172.53001	144.13	37.8072617
##	690	41	OR	Oregon	1983/4	149.10000	133.48	36.0194316
##	691	41	OR	Oregon	1985/6	112.89000	112.89	35.5258867
##	692	41	OR	Oregon	1987/7	119.28000	119.28	17.8514160
##	693	41	OR	Oregon	1989/90	126.38000	125.67	62.3803945
##	694	41	OR	Oregon	1991/2	121.41000	119.28	38.2060703
##	695	41	OR	Oregon	1993/4	146.97000	146.97	37.1900059
##	696	41	OR	Oregon	1995/6	115.73000	108.63	36.9948672
##	697	41	OR	Oregon	1997/8	123.54000	123.54	35.3656055
##	698	41	OR	Oregon	1999/00	138.45000	138.45	37.3294395
##	699	41	OR	Oregon	2001/2	165.42999	128.51	37.6178887
##	700	41	OR	Oregon	2003/4	161.17000	161.17	36.0179141
##	701	41	OR	Oregon	2005/6	148.67999	147.68	35.7945937
##	702	41	OR	Oregon	2007/8	135.61000	122.12	39.4974492
##	703	41	OR	Oregon	2009/10	120.70000	120.70	43.5784961
##	704	42	PA	Pennsylvania	1973/4	176.00000	176.00	145.6137344
##	705	42	PA	Pennsylvania	1975/6	161.00000	161.00	123.0115000
##	706	42	PA	Pennsylvania	1977/8	170.00000	170.00	118.7407227
##	707	42	PA	Pennsylvania	1979/80	159.00000	159.00	122.3837773
##	708	42	PA	Pennsylvania	1981/2	145.00000	145.00	116.4625859
##	709	42	PA	Pennsylvania	1983/4	169.00000	169.00	128.1877930
##	710	42	PA	Pennsylvania	1985/6	152.00000	152.00	140.5636719
##	711	42	PA	Pennsylvania	1987/7	224.00000	154.00	131.6963594
##	712	42	PA	Pennsylvania	1989/90	138.00000	138.00	161.0636641
##	713	42	PA	Pennsylvania	1991/2	152.00000	149.00	148.2949141
##	714	42	PA	Pennsylvania	1993/4	112.86000	112.86	140.0788516
##	715	42	PA	Pennsylvania	1995/6	192.00000	152.00	132.5677617
##	716	42	PA	Pennsylvania	1997/8	NA	NA	126.7294492
##	717	42	PA	Pennsylvania	1999/00	NA	NA	152.5669375
##	718	42	PA	Pennsylvania	2001/2	122.00000	108.00	151.2167891

##	719	42	PA	Pennsylvania	2003/4	NA	NA	149.7656641
##	720	42	PA	Pennsylvania	2005/6	248.45000	147.00	153.0942109
##	721	42	PA	Pennsylvania	2007/8	NA	NA	154.5536797
##	722	42	PA	Pennsylvania	2009/10	242.00000	211.00	157.9138906
##	723	44	RI	Rhode Island	1973/4	135.00000	134.00	3.1220803
##	724	44	RI	Rhode Island	1975/6	151.00000	151.00	2.9717522
##	725	44	RI	Rhode Island	1977/8	125.00000	125.00	2.1702289
##	726	44	RI	Rhode Island	1979/80	94.43000	92.30	1.2998955
##	727	44	RI	Rhode Island	1981/2	135.00000	131.00	1.5253119
##	728	44	RI	Rhode Island	1983/4	130.00000	129.00	1.3835685
##	729	44	RI	Rhode Island	1985/6	166.00000	166.00	1.6668684
##	730	44	RI	Rhode Island	1987/7	145.00000	144.00	1.3557350
##	731	44	RI	Rhode Island	1989/90	171.00000	171.00	1.4652193
##	732	44	RI	Rhode Island	1991/2	174.00000	171.00	1.3461624
##	733	44	RI	Rhode Island	1993/4	183.00000	183.00	1.3647579
##	734	44	RI	Rhode Island	1995/6	NA	NA	NA
##	735	44	RI	Rhode Island	1997/8	NA	NA	NA
##	736	44	RI	Rhode Island	1999/00	NA	NA	27.7292637
##	737	44	RI	Rhode Island	2001/2	186.38000	185.38	27.4535342
##	738	44	RI	Rhode Island	2003/4	141.00000	141.00	27.4973809
##	739	44	RI	Rhode Island	2005/6	141.00000	141.00	27.7977432
##	740	44	RI	Rhode Island	2007/8	111.86000	111.86	27.0217139
##	741	44	RI	Rhode Island	2009/10	123.00000	123.00	26.3926953
##	742	45	SC	South Carolina	1973/4	257.00000	231.00	187.6854375
##	743	45	SC	South Carolina	1975/6	206.00000	206.00	141.9016172
##	744	45	SC	South Carolina	1977/8	207.00000	207.00	125.2387695
##	745	45	SC	South Carolina	1979/80	156.91000	156.91	91.7416523
##	746	45	SC	South Carolina	1981/2	220.00000	220.00	151.4013594
##	747	45	SC	South Carolina	1983/4	216.00000	212.00	102.5391738
##	748	45	SC	South Carolina	1985/6	206.73000	206.73	40.1610488
##	749	45	SC	South Carolina	1987/7	190.00000	190.00	37.6275293
##	750	45	SC	South Carolina	1989/90	194.00000	194.00	34.2688652
##	751	45	SC	South Carolina	1991/2	133.71000	133.00	32.1737939
##	752	45	SC	South Carolina	1993/4	NA	NA	30.9961719
##	753	45	SC	South Carolina	1995/6	NA	NA	29.3341436
##	754	45	SC	South Carolina	1997/8	NA	NA	28.0422607
##	755	45	SC	South Carolina	1999/00	NA	NA	26.7816074
##	756	45	SC	South Carolina	2001/2	148.00000	132.00	25.4108896
##	757	45	SC	South Carolina	2003/4	126.00000	126.00	24.3301055
##	758	45	SC	South Carolina	2005/6	129.00000	129.00	22.8607090
##	759	45	SC	South Carolina	2007/8	180.63000	180.63	21.4703818
##	760	45	SC	South Carolina	2009/10	169.53000	169.53	20.9705889
##	761	46	SD	South Dakota	1973/4	75.00000	75.00	23.3355342
##	762	46	SD	South Dakota	1975/6	75.00000	75.00	19.7133818
##	763	46	SD	South Dakota	1977/8	75.00000	75.00	17.3567529
##	764	46	SD	South Dakota	1979/80	75.00000	75.00	17.1638398
##	765	46	SD	South Dakota	1981/2	78.00000	75.00	14.9628945
##	766	46	SD	South Dakota	1983/4	77.00000	75.00	12.8822041
##	767	46	SD	South Dakota	1985/6	74.00000	74.00	12.0557109
##	768	46	SD	South Dakota	1987/7	76.00000	75.00	11.3035117
##	769	46	SD	South Dakota	1989/90	75.00000	75.00	11.8552778
##	770	46	SD	South Dakota	1991/2	77.00000	75.00	12.6333359
##	771	46	SD	South Dakota	1993/4	79.00000	75.00	11.9316636
##	772	46	SD	South Dakota	1995/6	75.00000	75.00	11.2933198

##	773	46	SD	South Dakota	1997/8	75.00000	74.00	10.7910488
##	774	46	SD	South Dakota	1999/00	76.00000	74.00	15.4509268
##	775	46	SD	South Dakota	2001/2	78.00000	75.00	14.6601284
##	776	46	SD	South Dakota	2003/4	77.00000	75.00	14.0365996
##	777	46	SD	South Dakota	2005/6	75.00000	75.00	13.1888706
##	778	46	SD	South Dakota	2007/8	74.00000	74.00	12.3867583
##	779	46	SD	South Dakota	2009/10	79.00000	79.00	12.0984165
##	780	47	TN	Tennessee	1973/4	93.70000	93.70	51.4781875
##	781	47	TN	Tennessee	1975/6	97.57000	97.57	49.2085430
##	782	47	TN	Tennessee	1977/8	84.00000	84.00	48.5448887
##	783	47	TN	Tennessee	1979/80	137.00000	137.00	45.4160566
##	784	47	TN	Tennessee	1981/2	92.00000	92.00	38.7028477
##	785	47	TN	Tennessee	1983/4	149.00000	122.00	35.6250996
##	786	47	TN	Tennessee	1985/6	108.00000	92.00	41.7062051
##	787	47	TN	Tennessee	1987/7	89.00000	89.00	47.0344121
##	788	47	TN	Tennessee	1989/90	92.00000	92.00	49.5095625
##	789	47	TN	Tennessee	1991/2	103.00000	95.00	52.0609805
##	790	47	TN	Tennessee	1993/4	91.00000	91.00	49.1766191
##	791	47	TN	Tennessee	1995/6	88.00000	88.00	46.5397461
##	792	47	TN	Tennessee	1997/8	89.00000	89.00	44.4901270
##	793	47	TN	Tennessee	1999/00	121.72000	99.00	42.4900488
##	794	47	TN	Tennessee	2001/2	101.00000	101.00	40.3153535
##	795	47	TN	Tennessee	2003/4	88.00000	88.00	38.6006484
##	796	47	TN	Tennessee	2005/6	103.00000	90.00	36.2693926
##	797	47	TN	Tennessee	2007/8	91.00000	91.00	37.4142051
##	798	47	TN	Tennessee	2009/10	101.00000	93.00	38.3298008
##	799	48	TX	Texas	1973/4	101.53000	99.40	44.8042266
##	800	48	TX	Texas	1975/6	99.40000	99.40	56.7745391
##	801	48	TX	Texas	1977/8	108.00000	81.00	25.9076445
##	802	48	TX	Texas	1979/80	99.40000	99.40	28.0099531
##	803	48	TX	Texas	1981/2	126.38000	99.40	33.5412246
##	804	48	TX	Texas	1983/4	82.36000	58.22	30.8737988
##	805	48	TX	Texas	1985/6	139.16000	99.40	43.4195166
##	806	48	TX	Texas	1987/7	122.12000	99.40	40.8293496
##	807	48	TX	Texas	1989/90	206.61001	99.40	37.2589307
##	808	48	TX	Texas	1991/2	146.97000	99.40	22.7175186
##	809	48	TX	Texas	1993/4	99.40000	99.40	21.4588887
##	810	48	TX	Texas	1995/6	99.40000	99.40	20.3082529
##	811	48	TX	Texas	1997/8	99.40000	99.40	19.4138730
##	812	48	TX	Texas	1999/00	99.40000	99.40	18.5411123
##	813	48	TX	Texas	2001/2	99.40000	99.40	17.5921543
##	814	48	TX	Texas	2003/4	168.46001	98.69	16.8439189
##	815	48	TX	Texas	2005/6	142.00000	99.40	15.8266445
##	816	48	TX	Texas	2007/8	99.40000	99.40	14.8641104
##	817	48	TX	Texas	2009/10	100.82000	99.40	14.5180996
##	818	49	UT	Utah	1973/4	61.77000	56.80	6.8005771
##	819	49	UT	Utah	1975/6	58.93000	56.80	5.6769910
##	820	49	UT	Utah	1977/8	70.00000	62.00	5.4757933
##	821	49	UT	Utah	1979/80	58.22000	56.80	4.1381956
##	822	49	UT	Utah	1981/2	63.90000	56.80	3.3569564
##	823	49	UT	Utah	1983/4	77.39000	56.80	3.0766649
##	824	49	UT	Utah	1985/6	73.03000	63.90	8.3404463
##	825	49	UT	Utah	1987/7	67.32000	63.90	7.8142976
##	826	49	UT	Utah	1989/90	64.61000	63.90	7.1167869

##	827	49	UT	Utah	1991/2	68.87000	63.90	6.5525845
##	828	49	UT	Utah	1993/4	66.03000	63.90	7.1297490
##	829	49	UT	Utah	1995/6	68.61000	63.90	7.6600193
##	830	49	UT	Utah	1997/8	63.90000	63.90	7.3226704
##	831	49	UT	Utah	1999/00	64.95000	64.95	8.3605796
##	832	49	UT	Utah	2001/2	74.63000	64.95	9.5229609
##	833	49	UT	Utah	2003/4	69.90000	63.90	8.9693872
##	834	49	UT	Utah	2005/6	67.45000	63.90	8.4276890
##	835	49	UT	Utah	2007/8	65.32000	63.90	8.5747339
##	836	49	UT	Utah	2009/10	64.61000	63.90	7.9597791
##	837	50	VT	Vermont	1973/4	117.00000	117.00	16.4181553
##	838	50	VT	Vermont	1975/6	115.00000	113.00	13.4087319
##	839	50	VT	Vermont	1977/8	122.00000	122.00	14.5902690
##	840	50	VT	Vermont	1979/80	133.00000	133.00	17.7884570
##	841	50	VT	Vermont	1981/2	140.00000	138.00	16.0927183
##	842	50	VT	Vermont	1983/4	136.00000	129.00	14.4967783
##	843	50	VT	Vermont	1985/6	145.00000	145.00	16.7156504
##	844	50	VT	Vermont	1987/7	168.00000	168.00	20.2131074
##	845	50	VT	Vermont	1989/90	157.00000	157.00	20.1103535
##	846	50	VT	Vermont	1991/2	153.52000	153.52	22.6714727
##	847	50	VT	Vermont	1993/4	187.43000	186.01	25.4804629
##	848	50	VT	Vermont	1995/6	149.62000	149.62	23.0160195
##	849	50	VT	Vermont	1997/8	194.47000	194.47	22.0023896
##	850	50	VT	Vermont	1999/00	167.30000	167.30	23.0526631
##	851	50	VT	Vermont	2001/2	188.21000	188.21	24.6756201
##	852	50	VT	Vermont	2003/4	138.67000	137.67	17.9785649
##	853	50	VT	Vermont	2005/6	166.00000	165.00	21.3770596
##	854	50	VT	Vermont	2007/8	134.19000	133.48	16.7065317
##	855	50	VT	Vermont	2009/10	97.42000	96.00	12.1505186
##	856	51	VA	Virginia	1973/4	83.00000	83.00	46.4068008
##	857	51	VA	Virginia	1975/6	79.52000	79.52	40.6822656
##	858	51	VA	Virginia	1977/8	83.00000	83.00	50.7835469
##	859	51	VA	Virginia	1979/80	88.75000	71.71	40.3613320
##	860	51	VA	Virginia	1981/2	89.02000	88.31	35.5917207
##	861	51	VA	Virginia	1983/4	127.00000	126.00	45.3777832
##	862	51	VA	Virginia	1985/6	81.23000	71.71	42.9997617
##	863	51	VA	Virginia	1987/7	78.10000	74.55	89.7033125
##	864	51	VA	Virginia	1989/90	87.26000	74.55	58.8486406
##	865	51	VA	Virginia	1991/2	107.00000	105.00	55.1385078
##	866	51	VA	Virginia	1993/4	192.41000	75.26	52.2391816
##	867	51	VA	Virginia	1995/6	75.26000	75.26	49.4708652
##	868	51	VA	Virginia	1997/8	111.00000	109.00	47.6392734
##	869	51	VA	Virginia	1999/00	74.55000	74.55	44.9559746
##	870	51	VA	Virginia	2001/2	87.60000	87.60	43.1492871
##	871	51	VA	Virginia	2003/4	78.37000	78.37	40.8755586
##	872	51	VA	Virginia	2005/6	93.66000	77.66	38.3994004
##	873	51	VA	Virginia	2007/8	85.20000	78.81	36.5254102
##	874	51	VA	Virginia	2009/10	90.68000	76.68	35.4492109
##	875	53	WA	Washington	1973/4	103.66000	42.60	33.6031680
##	876	53	WA	Washington	1975/6	163.29999	42.60	29.9643398
##	877	53	WA	Washington	1977/8	103.00000	103.00	37.7532832
##	878	53	WA	Washington	1979/80	137.03000	84.49	47.5592324
##	879	53	WA	Washington	1981/2	181.76000	127.80	48.8168418
##	880	53	WA	Washington	1983/4	139.16000	117.15	53.3776191

##	881	53	WA	Washington	1985/6	118.57000	117.15	55.1219629
##	882	53	WA	Washington	1987/7	137.74000	117.15	66.1334766
##	883	53	WA	Washington	1989/90	180.46001	134.55	74.6110332
##	884	53	WA	Washington	1991/2	168.60000	147.60	64.7156016
##	885	53	WA	Washington	1993/4	127.80000	117.15	73.1179883
##	886	53	WA	Washington	1995/6	195.24999	117.15	73.0532969
##	887	53	WA	Washington	1997/8	117.15000	117.15	69.8360117
##	888	53	WA	Washington	1999/00	145.55000	117.15	72.8768711
##	889	53	WA	Washington	2001/2	178.21000	117.15	67.2623965
##	890	53	WA	Washington	2003/4	139.87000	117.15	77.5084375
##	891	53	WA	Washington	2005/6	116.44000	116.44	75.2359102
##	892	53	WA	Washington	2007/8	117.86000	117.15	79.9951328
##	893	53	WA	Washington	2009/10	138.45000	117.15	84.9026563
##	894	54	WV	West Virginia	1973/4	144.13000	90.88	30.8029053
##	895	54	WV	West Virginia	1975/6	172.53000	155.49	37.8496914
##	896	54	WV	West Virginia	1977/8	107.00000	96.00	33.3249668
##	897	54	WV	West Virginia	1979/80	90.17000	88.75	28.0083770
##	898	54	WV	West Virginia	1981/2	97.98000	88.04	23.9260742
##	899	54	WV	West Virginia	1983/4	103.88000	90.88	22.0233096
##	900	54	WV	West Virginia	1985/6	104.91000	85.91	23.3404766
##	901	54	WV	West Virginia	1987/7	106.08000	86.62	24.4578945
##	902	54	WV	West Virginia	1989/90	110.05000	91.59	22.2747617
##	903	54	WV	West Virginia	1991/2	113.60000	95.85	20.5088711
##	904	54	WV	West Virginia	1993/4	105.79000	95.14	19.3726064
##	905	54	WV	West Virginia	1995/6	NA	NA	42.3088594
##	906	54	WV	West Virginia	1997/8	NA	NA	40.4455684
##	907	54	WV	West Virginia	1999/00	123.27000	97.27	38.6273184
##	908	54	WV	West Virginia	2001/2	121.83000	103.31	36.6503223
##	909	54	WV	West Virginia	2003/4	NA	NA	35.0914980
##	910	54	WV	West Virginia	2005/6	103.66000	84.49	32.9721758
##	911	54	WV	West Virginia	2007/8	88.04000	82.36	30.9668965
##	912	54	WV	West Virginia	2009/10	100.11000	90.17	40.3280547
##	913	55	WI	Wisconsin	1973/4	177.00000	150.00	92.4087148
##	914	55	WI	Wisconsin	1975/6	133.00000	125.00	123.6265586
##	915	55	WI	Wisconsin	1977/8	122.00000	112.00	123.8786172
##	916	55	WI	Wisconsin	1979/80	115.00000	98.00	111.6803242
##	917	55	WI	Wisconsin	1981/2	172.60001	130.00	98.5720859
##	918	55	WI	Wisconsin	1983/4	134.67000	80.00	97.0577617
##	919	55	WI	Wisconsin	1985/6	237.30000	172.00	99.9828359
##	920	55	WI	Wisconsin	1987/7	159.00000	133.00	107.5062773
##	921	55	WI	Wisconsin	1989/90	236.00000	185.00	106.5368008
##	922	55	WI	Wisconsin	1991/2	173.00000	99.00	103.8703203
##	923	55	WI	Wisconsin	1993/4	531.78998	518.30	102.3375820
##	924	55	WI	Wisconsin	1995/6	549.54001	521.85	107.3403984
##	925	55	WI	Wisconsin	1997/8	532.50000	516.17	102.6131016
##	926	55	WI	Wisconsin	1999/00	531.79001	515.46	107.6646328
##	927	55	WI	Wisconsin	2001/2	382.14999	321.15	108.3212461
##	928	55	WI	Wisconsin	2003/4	165.00000	162.00	105.1408672
##	929	55	WI	Wisconsin	2005/6	109.00000	101.00	100.1672773
##	930	55	WI	Wisconsin	2007/8	170.00000	93.00	97.8822305
##	931	55	WI	Wisconsin	2009/10	NA	NA	100.7052031
##	932	56	WY	Wyoming	1973/4	42.60000	42.60	3.0342670
##	933	56	WY	Wyoming	1975/6	60.00000	60.00	3.5815314
##	934	56	WY	Wyoming	1977/8	66.00000	60.00	4.1656208



##	935	56	WY	Wyoming	1979/80	60.00000	60.00	5.1920178
##	936	56	WY	Wyoming	1981/2	62.00000	60.00	4.2344155
##	937	56	WY	Wyoming	1983/4	62.00000	60.00	3.8864069
##	938	56	WY	Wyoming	1985/6	61.30000	58.46	5.1863999
##	939	56	WY	Wyoming	1987/7	63.84000	61.00	8.6616333
##	940	56	WY	Wyoming	1989/90	59.00000	59.00	7.6394543
##	941	56	WY	Wyoming	1991/2	70.00000	67.00	7.9432576
##	942	56	WY	Wyoming	1993/4	58.00000	58.00	6.5106289
##	943	56	WY	Wyoming	1995/6	57.00000	57.00	10.0919556
##	944	56	WY	Wyoming	1997/8	58.00000	58.00	9.7873689
##	945	56	WY	Wyoming	1999/00	58.00000	58.00	9.3721790
##	946	56	WY	Wyoming	2001/2	60.00000	37.00	5.6945737
##	947	56	WY	Wyoming	2003/4	64.00000	58.00	8.5150288
##	948	56	WY	Wyoming	2005/6	58.00000	58.00	8.0031672
##	949	56	WY	Wyoming	2007/8	67.00000	67.00	10.4526553
##	950	56	WY	Wyoming	2009/10	40.00000	40.00	6.0492083
##		expend	year		mds1		mds2	
##	1	125.09730	1974	-1.706181400	0.3848201600			
##	2	203.84659	1976	-1.212881700	-0.0815065500			
##	3	184.01152	1978	-1.414965700	0.1278997800			
##	4	175.98625	1980	-1.543153900	0.2726884200			
##	5	204.12364	1982	-0.501364230	-1.0038776000			
##	6	206.67449	1984	-0.584019400	-0.7413236000			
##	7	324.72450	1986	-0.382062170	-0.7763299300			
##	8	289.74605	1988	-1.081545000	-0.0971624300			
##	9	284.29596	1990	-1.166710400	-0.0007100352			
##	10	315.51341	1992	-1.032719900	-0.1149318600			
##	11	NA	1994	NA	NA			
##	12	NA	1996	NA	NA			
##	13	342.00020	1998	-1.382585900	0.3818486300			
##	14	350.19193	2000	-1.331128600	0.3303004200			
##	15	401.85136	2002	-1.238313300	0.3123727000			
##	16	443.52176	2004	-1.212195800	0.3611864000			
##	17	421.44211	2006	-1.359611400	0.5096595000			
##	18	538.35117	2008	-1.233822600	0.5804338000			
##	19	535.14232	2010	-0.929103500	0.1823032800			
##	20	419.61064	1974	0.648013200	-0.1588637000			
##	21	587.94368	1976	1.694831700	-1.0682669000			
##	22	834.68915	1978	1.147863000	-0.2833593800			
##	23	1061.75333	1980	0.809792940	0.1504522100			
##	24	1590.51056	1982	2.096100800	-0.3903514400			
##	25	1763.21082	1984	2.602252700	0.5848920000			
##	26	1716.72058	1986	2.961081000	0.8995855500			
##	27	1594.09979	1988	2.001555000	0.8278969500			
##	28	1297.19482	1990	1.096356700	0.4225966300			
##	29	1222.04358	1992	1.242242300	0.0231839200			
##	30	1091.30157	1994	1.078558200	-0.0483436100			
##	31	1265.48907	1996	1.037163900	0.2886601000			
##	32	1197.84906	1998	0.837703470	0.3593584300			
##	33	1053.11102	2000	0.687664300	0.2106834200			
##	34	1027.74960	2002	0.641258400	0.1629406500			
##	35	978.94672	2004	0.553483070	0.1341471700			
##	36	1201.17957	2006	1.023129000	-0.0935544700			
##	37	1297.44678	2008	0.956950300	0.1297383800			

## 38	1493.83508	2010	0.890661000	1.0705600000
## 39	354.11060	1974	0.555322100	-1.1347590000
## 40	462.03410	1976	0.555050730	-1.0735557000
## 41	371.39592	1978	-0.068997360	-0.5411755400
## 42	341.28499	1980	0.244458590	-1.1533914000
## 43	345.85054	1982	0.842602000	-1.6677588000
## 44	386.17940	1984	0.640073960	-1.0304810000
## 45	401.68509	1986	0.092732050	-0.3554766000
## 46	462.75287	1988	0.413729580	-0.7215795000
## 47	473.75504	1990	0.480377670	-0.8779048300
## 48	571.35272	1992	1.645963900	-2.2822628000
## 49	504.25497	1994	-0.061827138	-0.2267187100
## 50	576.98755	1996	NA	NA
## 51	583.98209	1998	NA	NA
## 52	655.07831	2000	NA	NA
## 53	633.04745	2002	0.699133100	-0.7115527000
## 54	517.37657	2004	0.665342150	-0.9462985000
## 55	555.79596	2006	0.527305200	-0.7490527600
## 56	883.32224	2008	0.752741200	-0.4403880500
## 57	631.13293	2010	0.870766460	-1.1259158000
## 58	111.04453	1974	-1.075945300	0.0119998340
## 59	128.32732	1976	-1.289282100	0.2167041300
## 60	139.54607	1978	-1.165054700	0.3583271800
## 61	168.27704	1980	-0.797876100	0.1957441300
## 62	130.86364	1982	-1.141669800	0.3546659600
## 63	128.38416	1984	-1.051117700	0.1748180000
## 64	142.30924	1986	-1.180419100	0.3374744000
## 65	228.85215	1988	-1.032299900	0.2872395000
## 66	NA	1990	NA	NA
## 67	306.21706	1992	-1.192909600	0.4746114300
## 68	358.43076	1994	-0.983873700	0.4156192000
## 69	396.72771	1996	-0.916793700	0.5055535400
## 70	433.00186	1998	-0.894316300	0.5213257700
## 71	460.96872	2000	-0.347356560	-0.1665467000
## 72	528.05627	2002	-0.831703660	0.5872881400
## 73	541.93073	2004	-0.515330100	0.1965024800
## 74	586.49889	2006	-0.775483970	0.6255387700
## 75	549.50586	2008	-0.862262700	0.6619447500
## 76	516.63762	2010	-0.788929460	0.4973358000
## 77	2879.00513	1974	4.239818600	1.5250432000
## 78	3294.50549	1976	5.272977400	0.6276007000
## 79	3713.40491	1978	5.041454300	1.6831536000
## 80	3309.31323	1980	4.059813500	1.8467195000
## 81	3481.90710	1982	4.248227000	1.7055743000
## 82	3869.76160	1984	4.772445700	1.6141138000
## 83	4397.12341	1986	5.119678500	2.2893896000
## 84	5119.14844	1988	6.033015700	2.7161741000
## 85	5305.38403	1990	6.005667700	3.2504196000
## 86	4934.00464	1992	6.519718000	1.9536351000
## 87	3909.58667	1994	NA	NA
## 88	4112.28674	1996	NA	NA
## 89	4302.92896	1998	6.503539000	1.7289380000
## 90	4667.87280	2000	7.159136000	2.5324523000
## 91	5251.16284	2002	8.564637000	1.6332345000

## 92	5361.33936	2004	7.279082000	3.3549542000
## 93	5343.96924	2006	7.748922000	2.9234638000
## 94	5428.26465	2008	7.969356000	2.6765196000
## 95	5523.10083	2010	7.648650600	2.8681228000
## 96	247.18037	1974	0.320841280	-0.7732305500
## 97	284.74094	1976	0.372925760	-0.9649014500
## 98	325.06538	1978	0.279493500	-0.6241829400
## 99	312.83752	1980	0.286821100	-0.6527551000
## 100	299.68066	1982	1.057436700	-1.8230772000
## 101	333.83913	1984	0.909538700	-1.5671747000
## 102	316.04085	1986	0.568814340	-1.0993744000
## 103	337.31885	1988	0.676161400	-1.1489260000
## 104	353.28030	1990	0.096276380	-0.4629054400
## 105	374.00780	1992	0.231041270	-0.6837224400
## 106	360.74347	1994	-0.023711098	-0.4319783200
## 107	369.90933	1996	-0.076209490	-0.3952559500
## 108	395.10434	1998	-0.064339360	-0.3992252600
## 109	412.71111	2000	0.325820950	-0.3307351500
## 110	487.51628	2002	0.504016760	-0.4846494000
## 111	458.35199	2004	0.269283400	-0.2923562200
## 112	407.19412	2006	0.195321810	-0.3755788000
## 113	416.93015	2008	0.122682310	-0.3332765700
## 114	440.44977	2010	0.352658360	-0.6132874000
## 115	188.64652	1974	-0.191938970	-0.4853525200
## 116	190.45293	1976	-0.386161630	-0.4602706000
## 117	191.46601	1978	-0.576788400	-0.3021945000
## 118	193.77852	1980	-0.476525370	-0.3466494000
## 119	223.17130	1982	-0.212597270	-0.7308296600
## 120	265.28171	1984	-0.171106580	-0.6005495000
## 121	313.82922	1986	-0.120681316	-0.4904958600
## 122	630.57082	1988	0.236506660	-0.2127577700
## 123	488.51938	1990	0.177653730	-0.3916953200
## 124	452.45755	1992	0.878379600	-1.4159389000
## 125	431.63593	1994	0.418205680	-0.9078535000
## 126	438.58713	1996	NA	NA
## 127	447.91832	1998	NA	NA
## 128	555.21457	2000	0.167740230	-0.2182039600
## 129	553.28888	2002	0.466726480	-0.3912394600
## 130	550.30719	2004	0.326327120	-0.2659011200
## 131	578.79749	2006	0.289040100	-0.2310332200
## 132	602.63928	2008	0.394407450	-0.3887118000
## 133	577.08728	2010	0.122304090	-0.1080471350
## 134	182.86495	1974	-0.303527680	-0.1149664450
## 135	194.97816	1976	-0.277952050	-0.0933365600
## 136	193.24038	1978	-0.371726720	-0.1275114600
## 137	178.71698	1980	-0.581452670	-0.0624213440
## 138	175.48476	1982	0.244053170	-1.2172488000
## 139	182.65710	1984	-0.652465340	0.0053634555
## 140	230.51559	1986	-0.417217050	0.0462731300
## 141	270.39326	1988	0.433225400	-0.7621281000
## 142	291.87224	1990	-0.305781130	0.2260286400
## 143	275.24968	1992	-0.265226780	0.1235921500
## 144	262.64507	1994	NA	NA
## 145	320.16605	1996	-0.258209760	0.1767709000

## 146	310.17781	1998	-0.221218320	0.1228352200
## 147	329.94987	2000	-0.159438480	0.1181706400
## 148	334.88884	2002	-0.180825100	0.2548639800
## 149	320.77303	2004	-0.216666070	0.2752501700
## 150	315.89691	2006	-0.166278510	0.3032107000
## 151	317.28287	2008	-0.130708680	0.2596336600
## 152	277.07889	2010	-0.176232100	0.1957316500
## 153	902.94431	1974	0.662497000	0.8483919500
## 154	760.75000	1976	0.277709200	0.7505249400
## 155	786.33780	1978	0.244488240	0.6410293600
## 156	724.78067	1980	-0.040349584	0.6090804000
## 157	785.82523	1982	-0.033088070	0.5076362000
## 158	882.88788	1984	-0.038845590	0.6309637000
## 159	944.86316	1986	-0.015203218	0.8823218000
## 160	1140.58856	1988	0.425094780	0.9001437000
## 161	1452.20502	1990	0.582692150	1.3226378000
## 162	1851.59784	1992	1.148625000	1.3648056000
## 163	2035.54675	1994	1.032891400	1.8424604000
## 164	2130.01013	1996	NA	NA
## 165	2059.81580	1998	NA	NA
## 166	2133.47021	2000	1.097985900	1.9680839000
## 167	2111.03210	2002	1.202421500	1.7897298000
## 168	2165.87537	2004	1.303343700	1.7579691000
## 169	2127.21912	2006	1.018050600	2.0205193000
## 170	2123.55847	2008	1.142290000	1.8353792000
## 171	2087.29309	2010	1.004462800	1.8629344000
## 172	217.79944	1974	-0.516539300	0.1974625000
## 173	218.05513	1976	-0.582551060	0.0956606200
## 174	230.43480	1978	-0.765729200	0.2379450400
## 175	223.39107	1980	-0.894074860	0.2234284300
## 176	231.47385	1982	-0.826149400	0.0215155170
## 177	262.80921	1984	-0.991637400	0.2535194200
## 178	236.62743	1986	-1.038475200	0.2265336200
## 179	223.85767	1988	-0.898482260	0.1790815600
## 180	240.83240	1990	-0.953381000	0.2357310500
## 181	227.20648	1992	-0.921653200	0.1273059200
## 182	213.66196	1994	-1.022654200	0.2064305100
## 183	236.02992	1996	-0.886978270	0.0574861600
## 184	235.41085	1998	-1.017284900	0.2267446400
## 185	256.41441	2000	-1.018540900	0.2459587600
## 186	273.44064	2002	-0.635060600	-0.0347535800
## 187	269.05753	2004	-0.861631500	0.2229103300
## 188	269.64965	2006	-0.966492100	0.3330228300
## 189	286.38104	2008	-0.907749100	0.2804307000
## 190	241.59739	2010	-0.954710900	0.2363503400
## 191	520.22232	1974	0.563149750	0.2047506900
## 192	622.02597	1976	0.396346200	0.3145044700
## 193	637.96036	1978	0.311893400	0.2526476700
## 194	578.92036	1980	0.141495020	0.0757734800
## 195	571.60999	1982	0.073977570	0.0016366764
## 196	554.63107	1984	-0.101098310	0.1769125300
## 197	599.74454	1986	0.010315003	0.1251245000
## 198	693.86090	1988	0.077753670	0.2270171300
## 199	786.56866	1990	0.174503420	0.4072380400

##	200	820.99414	1992	0.418874740	0.3918816000
##	201	829.09180	1994	0.544390100	0.4160886400
##	202	825.49097	1996	0.547623600	0.4485831600
##	203	782.94287	1998	0.454572050	0.4125665000
##	204	752.20090	2000	0.385230360	0.3710812300
##	205	756.55374	2002	0.372016040	0.3208521000
##	206	698.98044	2004	0.204181280	0.3642436600
##	207	599.71170	2006	0.128580140	0.2683203500
##	208	700.50644	2008	0.290462640	0.2553569400
##	209	717.46100	2010	0.565696300	0.3504850300
##	210	141.52561	1974	-1.304357900	-0.0564673900
##	211	121.44910	1976	-1.314948000	-0.0945292700
##	212	125.95415	1978	-0.953824040	-0.4038083000
##	213	109.82956	1980	-1.010893600	-0.2251552600
##	214	93.83638	1982	-1.049515800	-0.2169917200
##	215	82.89197	1984	-0.991409360	-0.3434604400
##	216	86.10296	1986	-1.220027900	-0.1463211500
##	217	92.49389	1988	-1.058725400	-0.4215404000
##	218	106.51772	1990	-1.052850200	-0.4120284000
##	219	132.63049	1992	-0.942952800	-0.2441840900
##	220	101.07973	1994	-0.848595200	-0.1724661700
##	221	158.71529	1996	-0.915393300	0.0153026340
##	222	176.84934	1998	-0.884258000	-0.0166393780
##	223	191.44285	2000	-0.590265750	-0.2877530200
##	224	208.41293	2002	-0.484843080	-0.3876613700
##	225	194.77649	2004	-0.407143380	-0.5465240000
##	226	197.50549	2006	-0.683413200	-0.2188723100
##	227	224.54358	2008	-0.727075000	-0.1272660800
##	228	217.29649	2010	-0.582092050	-0.3459941000
##	229	569.01160	1974	1.735727900	-0.1041115150
##	230	678.91513	1976	2.122275600	-0.6909115000
##	231	606.55157	1978	1.452814100	-0.3009621800
##	232	631.09476	1980	1.466144400	-0.0817859500
##	233	805.65915	1982	1.190838200	0.2926960000
##	234	793.40543	1984	1.076671100	0.2297834900
##	235	815.70868	1986	1.105760000	0.2609937500
##	236	853.80011	1988	1.062840500	0.5157876600
##	237	826.71924	1990	1.092781900	0.3147930200
##	238	860.91403	1992	1.743914100	-0.6008561000
##	239	851.91492	1994	1.195220700	0.0595643100
##	240	913.42444	1996	1.025787100	0.5237335600
##	241	897.03427	1998	1.002932300	0.6585426000
##	242	934.61127	2000	1.085721100	0.6982494000
##	243	1036.72165	2002	1.505690200	0.4534798000
##	244	882.64319	2004	1.435085200	0.1295275100
##	245	746.12854	2006	0.905249360	0.4782042800
##	246	696.48276	2008	1.171611200	0.0310093670
##	247	724.91156	2010	1.352162700	0.0328429750
##	248	255.15316	1974	-0.601762900	0.1819316400
##	249	297.33942	1976	-0.675967930	0.2071298000
##	250	309.46097	1978	-0.727815600	0.1972138400
##	251	297.99966	1980	-0.865179960	0.2136734000
##	252	265.02192	1982	-0.830455240	0.1410595200
##	253	262.36359	1984	-0.785083950	0.1681617000

##	254	295.70691	1986	-0.740258200	0.2015996100
##	255	332.37280	1988	-0.631332400	0.2332083900
##	256	372.93904	1990	-0.543458460	0.2047811400
##	257	387.41661	1992	-0.673509000	0.1921264200
##	258	372.55731	1994	-0.673296330	0.1250917300
##	259	369.63881	1996	NA	NA
##	260	383.14290	1998	NA	NA
##	261	406.71275	2000	-0.681896570	0.1203267900
##	262	433.87985	2002	-0.803330300	0.3067647500
##	263	443.85414	2004	-0.875999450	0.4003690200
##	264	452.54512	2006	-0.680945750	0.1325823800
##	265	468.95503	2008	-0.327688540	-0.3253836000
##	266	502.81100	2010	-0.198364840	-0.0344009800
##	267	207.96128	1974	0.079530746	-0.6908867400
##	268	256.81239	1976	0.199104340	-0.7364160000
##	269	247.04678	1978	-0.018283207	-0.6077180500
##	270	230.76550	1980	-0.092196370	-0.3218649600
##	271	215.82120	1982	-0.033255864	-0.5404199400
##	272	210.49301	1984	-0.135781000	-0.4695964200
##	273	241.40833	1986	-0.168646960	-0.3990274000
##	274	252.53731	1988	-0.184419380	-0.3897937200
##	275	300.52809	1990	-0.217121050	-0.2782542400
##	276	307.53069	1992	-0.066728085	-0.4370079000
##	277	298.07893	1994	-0.197696180	-0.2982427000
##	278	324.13252	1996	-0.106060386	-0.3823059500
##	279	333.14351	1998	-0.188498900	-0.2338630900
##	280	345.29965	2000	-0.147820170	-0.2770166000
##	281	356.82321	2002	-0.017431676	-0.4741669000
##	282	358.93378	2004	-0.191886300	-0.2672556600
##	283	336.92325	2006	-0.133850920	-0.4291692400
##	284	369.10724	2008	-0.175993870	-0.2253200100
##	285	371.13493	2010	-0.323610100	-0.0494646500
##	286	165.65522	1974	-1.157222200	-0.1842964300
##	287	232.11292	1976	-0.779824700	-0.2953871200
##	288	216.51391	1978	-0.847096100	-0.2872336800
##	289	187.03404	1980	-0.911326470	-0.3183393800
##	290	191.84782	1982	-0.913915400	-0.3140799700
##	291	202.67506	1984	-0.890040000	-0.3204374000
##	292	219.92516	1986	-0.868651200	-0.3032513300
##	293	221.32022	1988	-0.818603300	-0.3611309800
##	294	231.74986	1990	-0.799653650	-0.3630005000
##	295	229.65906	1992	-0.820407200	-0.3495794500
##	296	229.90264	1994	-0.940386600	-0.2241813000
##	297	212.15113	1996	-0.946391940	-0.2546582200
##	298	218.99962	1998	-0.918656900	-0.2805370700
##	299	243.28824	2000	-0.900442600	-0.2392851000
##	300	248.77746	2002	-0.776813200	-0.3597225500
##	301	216.64368	2004	-0.792278770	-0.4088094000
##	302	215.71929	2006	-0.925705130	-0.2805211800
##	303	234.80639	2008	-0.763195600	-0.4155781600
##	304	243.73860	2010	-0.772519400	-0.3864204000
##	305	199.79443	1975	-1.491320400	0.3423063500
##	306	223.46354	1977	-1.393273700	0.2455969800
##	307	293.18208	1979	-1.285595700	0.2896884400

##	308	297.57333	1981	-1.395576800	0.4381239700
##	309	339.62619	1983	-1.377081600	0.4779112600
##	310	367.09004	1985	-1.213605300	0.4243890000
##	311	396.91621	1986	-1.225580200	0.4777346000
##	312	420.53041	1988	-1.134536600	0.3977124700
##	313	442.70413	1990	-1.065661400	0.3366038800
##	314	482.36578	1992	-1.213508100	0.5925807000
##	315	473.55542	1994	-1.028659300	0.3290819200
##	316	528.97919	1996	-1.081297000	0.5012891000
##	317	547.27545	1998	-1.119690200	0.5868868000
##	318	663.23886	2000	-1.055240400	0.7953441000
##	319	602.25150	2002	-0.533002700	0.1953563200
##	320	602.36755	2004	-0.761211100	0.3929715200
##	321	650.28601	2006	-0.769397300	0.4898729000
##	322	621.53955	2008	-0.410317400	0.0538932680
##	323	633.01416	2010	-0.501874450	0.1991325000
##	324	455.41591	1975	-0.651944640	0.0294386220
##	325	379.64731	1977	-0.632101300	-0.1369018900
##	326	395.95529	1979	-0.798782200	0.0497184200
##	327	525.00667	1981	-0.655483300	0.0437454250
##	328	680.39404	1983	0.453656900	0.3272125000
##	329	553.37262	1985	0.214249300	0.2667258000
##	330	482.98047	1987	0.233156260	0.1895465700
##	331	457.38573	1989	0.217777180	-0.1327161000
##	332	426.44754	1991	-0.173658580	-0.0524448230
##	333	539.56917	1993	-0.219325810	0.1734648500
##	334	576.12576	1995	NA	NA
##	335	536.72754	1997	-0.375559900	0.2767574500
##	336	604.72791	1999	-0.168518360	0.1119042560
##	337	603.73511	2001	-0.455019860	0.4401236800
##	338	603.67963	2003	-0.496727170	0.4641574000
##	339	601.41864	2005	-0.313924760	0.1815378000
##	340	680.82077	2007	-0.519425900	0.5696368000
##	341	788.18933	2009	-0.159434240	0.3935755500
##	342	736.85712	2011	-0.227380950	0.4641810700
##	343	94.52202	1974	-0.748269700	-0.6689885000
##	344	113.72502	1976	-0.683279100	-0.7362733000
##	345	107.45407	1978	-0.803516700	-0.5893748000
##	346	104.06668	1980	-1.047639400	-0.1885203100
##	347	103.74538	1982	-0.817174700	-0.5580383500
##	348	129.90844	1984	-0.766787700	-0.5575467300
##	349	159.36663	1986	-0.697759900	-0.5172604000
##	350	202.66566	1988	-0.521739840	-0.5821503000
##	351	226.43271	1990	-0.659373460	-0.3286523800
##	352	205.21558	1992	-0.788846000	-0.1828899700
##	353	182.44435	1994	-0.962934600	-0.1210946700
##	354	186.57438	1996	NA	NA
##	355	207.83791	1998	NA	NA
##	356	234.61893	2000	NA	NA
##	357	318.22374	2002	-0.322949350	-0.6593373400
##	358	237.85641	2004	-0.844752900	-0.1428849400
##	359	260.07161	2006	-1.122803600	0.2605810500
##	360	245.96560	2008	-1.007326100	0.0939548000
##	361	217.15435	2010	-1.029511500	0.0757111100

##	362	430.29005	1974	0.430467930	0.0278523730
##	363	442.15060	1976	0.360823700	0.0687339500
##	364	332.07478	1978	0.157263800	-0.1003174600
##	365	283.14859	1980	0.172306100	-0.1176161700
##	366	262.36462	1982	0.022827828	-0.1150184000
##	367	255.96419	1984	0.097098140	-0.1162411800
##	368	305.08771	1986	0.017564012	-0.0160311520
##	369	326.50220	1988	-0.062640615	0.1028278100
##	370	363.67542	1990	0.098171080	-0.0109166550
##	371	351.91806	1992	0.219767300	-0.2289349000
##	372	303.69099	1994	0.023998134	-0.0706657200
##	373	321.03438	1996	0.030071272	-0.0543541500
##	374	411.85889	1998	0.055819380	0.0306871600
##	375	540.10748	2000	0.172203690	0.1557868600
##	376	624.42004	2002	0.216359960	0.2360007000
##	377	547.06853	2004	0.180066800	0.0678906900
##	378	746.23584	2006	0.518875660	0.3036721300
##	379	653.46945	2008	0.509823600	0.1420672700
##	380	694.24014	2010	0.413816960	0.3125136000
##	381	459.09471	1974	1.795943100	-1.4186198000
##	382	452.72472	1976	1.621235700	-1.5352802000
##	383	551.93405	1978	1.325054600	-1.0266284000
##	384	631.67297	1980	2.058239700	-1.6133520000
##	385	613.72534	1982	2.949187800	-3.0652360000
##	386	668.22821	1984	1.643578800	-1.0422338000
##	387	759.27347	1986	2.871648800	-2.1846352000
##	388	812.91614	1988	NA	NA
##	389	749.93631	1990	3.388006400	-2.9126077000
##	390	587.60519	1992	2.199153700	-2.1177552000
##	391	553.48022	1994	NA	NA
##	392	588.86768	1996	NA	NA
##	393	593.81104	1998	NA	NA
##	394	553.05341	2000	NA	NA
##	395	613.40652	2002	3.318740800	-3.0297220000
##	396	517.09525	2004	2.421804200	-2.0749369000
##	397	477.44283	2006	3.186910900	-3.1376014000
##	398	476.23135	2008	2.093330900	-1.7412955000
##	399	478.17543	2010	2.298520300	-2.0570070000
##	400	926.14426	1974	2.301338400	-0.4080932000
##	401	1023.12891	1976	2.417984200	-0.5252906000
##	402	1099.66479	1978	2.372435000	-0.3777456000
##	403	1169.29761	1980	2.511932400	-0.3851370000
##	404	1080.92667	1982	3.746692200	-2.4217973000
##	405	1324.23560	1984	3.991911400	-2.2018878000
##	406	1531.41541	1986	4.222108000	-2.0413828000
##	407	1575.13989	1988	4.264213000	-1.9417100000
##	408	1770.82684	1990	4.456967000	-1.7561953000
##	409	1630.05103	1992	3.305381800	-0.5775173300
##	410	1506.08337	1994	3.288737000	-0.8896521000
##	411	1356.02020	1996	NA	NA
##	412	1385.26965	1998	NA	NA
##	413	1602.93903	2000	2.110319400	0.9046889500
##	414	1587.22919	2002	2.728156800	0.9200938300
##	415	1388.94983	2004	2.808095500	0.3157837700



##	416	1306.69281	2006	2.589959000	0.2799493700
##	417	1260.25372	2008	3.576008000	-1.2992972000
##	418	1143.00085	2010	2.287103000	0.0839028700
##	419	356.34393	1974	-0.056747500	0.0776544800
##	420	349.95573	1976	NA	NA
##	421	447.73611	1978	-0.390640560	0.3364660000
##	422	466.20903	1980	-0.389741030	0.3026727000
##	423	465.85997	1982	-0.386233060	0.1486939000
##	424	461.36133	1984	-0.167580290	0.4519644400
##	425	519.72472	1986	-0.020403896	0.4246461700
##	426	557.48477	1988	0.185013960	0.3313249600
##	427	610.24799	1990	0.408005950	0.1291790800
##	428	619.26410	1992	0.147494500	0.4743625500
##	429	551.89609	1994	NA	NA
##	430	557.70389	1996	NA	NA
##	431	584.60034	1998	0.160769940	0.2831574000
##	432	575.52054	2000	0.155788530	0.2745048400
##	433	565.08313	2002	0.138665570	0.2015451800
##	434	524.72250	2004	0.194473000	-0.0118059080
##	435	487.14600	2006	0.040233802	0.0347864140
##	436	493.11554	2008	-0.191586300	0.2753762000
##	437	493.34140	2010	-0.197846370	0.2569465300
##	438	140.28771	1975	-0.463092650	-0.2512980700
##	439	158.65909	1977	-0.204427440	-0.4583235700
##	440	177.03957	1979	-0.460613220	-0.2440836600
##	441	129.43852	1981	-0.486123500	-0.4979300500
##	442	140.46235	1983	-0.475085680	-0.5775344400
##	443	149.33207	1985	-0.624590400	-0.4110873300
##	444	186.09255	1987	-0.547654900	-0.3348512400
##	445	197.40538	1989	-0.422851560	-0.5312103000
##	446	187.23924	1991	-0.419299570	-0.6165972400
##	447	194.18449	1993	-0.570020400	-0.4422934000
##	448	206.35175	1995	NA	NA
##	449	209.77106	1997	NA	NA
##	450	232.44482	1999	-0.744127100	-0.2121227400
##	451	246.63995	2001	-0.712846600	-0.2514116800
##	452	244.56573	2003	-0.364313300	-0.7306573400
##	453	235.40160	2005	NA	NA
##	454	235.29710	2007	-0.802170100	-0.2231985000
##	455	242.22187	2009	0.040738210	-1.3329849000
##	456	225.58509	2011	-0.687083960	-0.4233704500
##	457	213.56902	1974	0.981493600	-1.5720357000
##	458	261.05878	1976	0.017308688	-0.4324189000
##	459	283.96649	1978	0.041499130	-0.5611575000
##	460	289.21521	1980	0.451129820	-0.6090622000
##	461	260.80571	1982	0.285387130	-0.7184385700
##	462	271.44724	1984	-0.012564350	-0.4069498000
##	463	304.25104	1986	0.207470030	-0.5399514400
##	464	323.39462	1988	0.377943660	-0.6039706000
##	465	311.26567	1990	0.329782200	-0.5988185000
##	466	293.33546	1992	0.291164730	-0.6321271700
##	467	279.02785	1994	0.280964430	-0.7070507000
##	468	317.33801	1996	NA	NA
##	469	337.49951	1998	NA	NA

## 470	333.44923	2000	NA	NA
## 471	364.90387	2002	0.224664060	-0.2973322300
## 472	301.08980	2004	0.387705120	-0.7038561700
## 473	271.00444	2006	0.034664962	-0.3865958500
## 474	287.76048	2008	0.031763130	-0.4247854400
## 475	295.90446	2010	0.016633207	-0.2491565300
## 476	120.57745	1974	-1.028258800	-0.3422150600
## 477	115.53437	1976	-1.379630200	0.0316159300
## 478	167.99737	1978	-1.275049400	0.0596631280
## 479	176.93584	1980	-1.278120300	0.0676810500
## 480	172.03979	1982	-1.214952100	-0.0574535580
## 481	177.63380	1984	-1.256197300	0.0251974350
## 482	189.23891	1986	-1.138500300	-0.0991610000
## 483	169.43347	1988	-1.290077700	0.0600400530
## 484	167.74016	1990	-1.165326100	-0.1205905600
## 485	167.77612	1992	-1.207434400	-0.0786983500
## 486	170.38708	1994	-1.112597100	-0.1949519000
## 487	152.71841	1996	-1.355579300	0.0761791540
## 488	165.64087	1998	-1.340139300	0.0801172300
## 489	179.71684	2000	-1.291517100	0.0426960920
## 490	184.98779	2002	-1.254575800	0.0260022190
## 491	183.98057	2004	-1.303710300	0.0814474450
## 492	180.94729	2006	-1.147878000	-0.0984653800
## 493	186.91731	2008	-1.252720800	0.0250429620
## 494	223.22615	2010	-1.265922800	0.1109658260
## 495	332.62021	1974	-0.298394830	-0.2618812300
## 496	420.02750	1976	-0.261520830	-0.2593797400
## 497	429.37331	1978	-0.313648340	-0.2540632500
## 498	418.66983	1980	-0.748806500	0.1823830900
## 499	394.31512	1982	-0.453922660	-0.3395596000
## 500	460.25661	1984	-0.476220400	-0.2091882100
## 501	561.22098	1986	-0.124917656	-0.3703172000
## 502	551.38794	1988	-0.304530260	-0.1236151300
## 503	625.70547	1990	-0.187627790	-0.1103202600
## 504	640.61060	1992	0.077841450	-0.2579822800
## 505	645.46048	1994	-0.166209100	0.0337662180
## 506	644.27896	1996	-0.192433790	0.0310367890
## 507	641.61588	1998	-0.168864010	-0.0322305260
## 508	627.93756	2000	-0.250859300	0.0212632320
## 509	649.46838	2002	-0.034108500	-0.2479647700
## 510	636.18091	2004	-0.281518300	0.0269130200
## 511	618.32977	2006	-0.311725940	-0.0002778616
## 512	645.43341	2008	-0.265739740	-0.0347974970
## 513	696.94482	2010	-0.218999240	-0.0023508617
## 514	291.00645	1974	-1.143753000	0.3373440000
## 515	309.72285	1976	-1.075396500	0.2646613400
## 516	372.09776	1978	-1.073787900	0.3398564500
## 517	362.23708	1980	-0.885210600	0.1824247100
## 518	394.05167	1982	-0.901586100	0.1928217400
## 519	380.94951	1984	-0.955806430	0.2574859000
## 520	229.49447	1986	-1.056364800	0.0777977400
## 521	297.58067	1988	-0.841714440	0.0526937730
## 522	680.34961	1990	-0.407420000	0.2820867300
## 523	532.09210	1992	-0.639980700	0.2114226700

##	524	521.44150	1994	-0.640731100	0.1761389500
##	525	583.92604	1996	-0.587307100	0.2179270400
##	526	752.27100	1998	-0.466910330	0.3801089000
##	527	996.78720	2000	-0.584139300	0.9069853400
##	528	1001.17996	2002	-0.567057600	0.8779159000
##	529	1050.91852	2004	-0.268897800	0.5783822500
##	530	1127.91980	2006	-0.502269860	1.0262513000
##	531	1471.57208	2008	-0.217127890	1.3471531000
##	532	1281.94156	2010	-0.350858700	1.1456267000
##	533	40.13522	1974	-1.480905900	-0.0973905300
##	534	70.04475	1976	-1.543019200	0.0418865940
##	535	41.89706	1978	-1.482642400	-0.0958810500
##	536	44.91636	1980	-1.488400200	-0.0845688300
##	537	48.79629	1982	-1.680971300	0.1739168800
##	538	48.10140	1984	-1.850481900	0.3940468700
##	539	51.46173	1986	-1.776867400	0.3038505300
##	540	69.65202	1988	-1.728514700	0.2790915700
##	541	57.75617	1990	-1.725145700	0.2505761700
##	542	57.31397	1992	-1.682589200	0.1905392100
##	543	59.89494	1994	-1.693705000	0.2100127600
##	544	62.18419	1996	-1.756870300	0.2971537400
##	545	59.45810	1998	-1.778662200	0.3199829800
##	546	58.63363	2000	-1.773004900	0.3106804200
##	547	58.73178	2002	-1.824934800	0.3787135500
##	548	62.93379	2004	-1.821696000	0.3827763800
##	549	60.75837	2006	-1.797712400	0.3466824300
##	550	66.71929	2008	-1.238075900	-0.3751155700
##	551	70.42939	2010	-1.105506200	-0.5414818500
##	552	454.78905	1975	0.170877380	0.0933539800
##	553	464.73367	1977	-0.295867740	0.5360175400
##	554	472.44864	1979	-0.393480500	0.4835853300
##	555	591.60315	1981	0.166168600	0.4857246300
##	556	713.13879	1983	0.187157630	0.5096790000
##	557	873.72797	1985	0.270079500	1.1429782000
##	558	1366.56891	1987	0.931705700	1.1743675000
##	559	1336.85254	1989	0.787137300	1.1647073000
##	560	1244.20624	1991	1.131277100	0.9676850000
##	561	1191.75415	1993	1.356902500	0.4352599400
##	562	1095.38098	1995	NA	NA
##	563	1123.07892	1997	NA	NA
##	564	1199.54694	1999	0.523036840	1.2801224000
##	565	1321.69440	2001	0.565357800	1.3771749000
##	566	1396.77509	2003	NA	NA
##	567	1260.19135	2005	NA	NA
##	568	1255.68610	2007	0.750892900	1.3103751000
##	569	1217.29865	2009	NA	NA
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##	571	98.94474	1974	-1.476742600	0.1969185900
##	572	148.49178	1976	-1.428445700	0.2201825400
##	573	163.30999	1978	-1.406121900	0.1993271600
##	574	150.08905	1980	-1.496254200	0.2616306800
##	575	158.64573	1982	-1.384206200	0.1248620900
##	576	190.76740	1984	-1.378399100	0.2179204200
##	577	223.04808	1986	-1.356981200	0.2678713200

##	578	217.69648	1988	-1.405671400	0.3104541000
##	579	245.69710	1990	-1.384437200	0.3248675800
##	580	292.78024	1992	-1.314245700	0.3156466200
##	581	300.57138	1994	-1.408988000	0.4053276800
##	582	272.10595	1996	-1.477000000	0.3496411700
##	583	373.54300	1998	-1.386308400	0.4358645400
##	584	373.94228	2000	-1.330783400	0.3638858500
##	585	377.21240	2002	-1.328156200	0.3670543400
##	586	378.95187	2004	-1.363561700	0.4169834300
##	587	400.43219	2006	-1.392308800	0.4981007600
##	588	427.24893	2008	-1.301759700	0.4336270400
##	589	417.47267	2010	-1.328015100	0.4482765000
##	590	1242.45557	1974	1.759756800	0.6034738000
##	591	1467.31891	1976	3.885263200	-0.9081517000
##	592	1649.32745	1978	2.364591400	1.0522390000
##	593	1808.59949	1980	3.893376400	-1.1797682000
##	594	1756.63037	1982	2.025635200	1.0405533000
##	595	1910.65662	1984	2.108106100	1.4364003000
##	596	2158.56812	1986	2.890171500	1.1973169000
##	597	2477.27295	1988	NA	NA
##	598	2630.52002	1990	4.251973000	0.7140859000
##	599	2621.93372	1992	4.479573200	0.5771807400
##	600	2318.45068	1994	NA	NA
##	601	2203.05261	1996	NA	NA
##	602	2112.04187	1998	NA	NA
##	603	2130.41724	2000	NA	NA
##	604	2173.57202	2002	5.497033600	-1.4310482000
##	605	2166.93042	2004	4.157881300	0.1614066500
##	606	2000.16840	2006	5.146799600	-1.6754751000
##	607	1933.15826	2008	4.946410700	-1.7406910000
##	608	2027.91785	2010	4.582447500	-1.1411428000
##	609	163.71699	1974	-0.658070800	-0.5374755000
##	610	168.94460	1976	-0.670572040	-0.2308631500
##	611	175.64705	1978	-0.641783600	-0.4186980400
##	612	181.05813	1980	-0.839772600	-0.1947448800
##	613	195.36135	1982	-0.570061450	-0.4501147600
##	614	191.94374	1984	-0.519220230	-0.5295421000
##	615	234.56792	1986	-0.568636900	-0.3599902700
##	616	301.43605	1988	-0.370880700	-0.4107678000
##	617	303.69562	1990	-0.231665860	-0.5601612300
##	618	380.67424	1992	-0.325035900	-0.2666694500
##	619	501.96329	1994	0.040586486	-0.4863718700
##	620	510.11404	1996	-0.188811930	-0.1453726100
##	621	451.26280	1998	0.330692260	-0.9767452000
##	622	462.02910	2000	-0.294795070	-0.1656592800
##	623	504.72577	2002	1.111578500	-1.9561820000
##	624	479.30574	2004	-0.334431140	-0.1383020100
##	625	544.48965	2006	0.102878650	-0.6154376000
##	626	530.83133	2008	-0.116689620	-0.3889939500
##	627	552.03857	2010	-0.136091020	-0.3328171000
##	628	66.71990	1974	-1.707070200	0.2599430700
##	629	79.39788	1976	-1.679699300	0.2466049300
##	630	91.46163	1978	-1.604551100	0.1733992200
##	631	102.07082	1980	-1.638717900	0.2344012000

##	632	112.48364	1982	-1.621019400	0.2286998300
##	633	121.12038	1984	-1.533955900	0.1338695600
##	634	96.29236	1986	-1.473996900	0.1949213400
##	635	90.17780	1988	-1.412006400	0.1308924300
##	636	90.02756	1990	-1.405180000	0.1133827300
##	637	62.73289	1992	-1.480083700	0.1103146450
##	638	92.21290	1994	-1.361521400	0.0813709700
##	639	73.89520	1996	-1.281338900	0.1775271600
##	640	91.90043	1998	-1.294530700	0.2021386500
##	641	98.95063	2000	-1.452552000	0.1542084200
##	642	130.71462	2002	-1.547316100	0.2911840400
##	643	111.54616	2004	-1.569640600	0.2911337000
##	644	113.67812	2006	-1.587824700	0.3109086800
##	645	131.76861	2008	-1.596547700	0.3459355000
##	646	155.51266	2010	-1.348360000	0.1414972200
##	647	402.13802	1974	1.154931700	-0.4718029800
##	648	478.93127	1976	1.302211200	-0.3771680600
##	649	522.88008	1978	1.351216200	-0.6511833700
##	650	479.35454	1980	1.231318800	-0.7520798000
##	651	426.66939	1982	1.105905300	-0.8261362300
##	652	470.77591	1984	0.850052000	-0.5524674000
##	653	550.89871	1986	1.015637000	-0.3883906600
##	654	584.10034	1988	NA	NA
##	655	602.75922	1990	1.553482800	-0.6808271000
##	656	655.33115	1992	1.686432800	-0.7132000300
##	657	655.73285	1994	2.054520600	-1.2148440000
##	658	657.42941	1996	1.272707700	-0.3093071000
##	659	666.84610	1998	2.001814100	-1.3414378000
##	660	656.95023	2000	1.206870400	-0.4124850300
##	661	731.05472	2002	1.801500100	-0.7343281000
##	662	635.59167	2004	1.710231100	-0.8366378000
##	663	599.96674	2006	1.616722500	-0.8040249300
##	664	499.48909	2008	2.348030600	-1.9718487000
##	665	541.21951	2010	1.588526700	-0.9131541000
##	666	200.59770	1974	0.203693800	-0.3961717800
##	667	224.05929	1976	0.266341840	-0.6109888000
##	668	252.55666	1978	0.174092130	-0.4214992500
##	669	247.62020	1980	0.153078620	-0.5123445000
##	670	280.03252	1982	0.215152170	-0.5538839700
##	671	285.33995	1984	0.378971280	-0.5832374000
##	672	289.45709	1986	0.329434160	-0.5291623500
##	673	302.47284	1988	0.324942380	-0.5886869400
##	674	378.95346	1990	0.639470930	-0.6055142000
##	675	373.36601	1992	0.448639750	-0.1420197800
##	676	367.54004	1994	0.363752540	-0.1437933900
##	677	363.81706	1996	0.260963380	-0.1091582850
##	678	395.72855	1998	0.266606300	-0.1239912960
##	679	484.81158	2000	0.523704800	-0.0527446940
##	680	450.60020	2002	0.416556780	-0.0730875700
##	681	434.39128	2004	0.332343550	-0.0677134800
##	682	425.26950	2006	0.241391800	-0.0651518400
##	683	421.87434	2008	0.085088186	0.0399419300
##	684	404.73044	2010	0.092348980	-0.0376492500
##	685	400.05000	1974	-0.319061000	-0.0984460700

##	686	450.97144	1976	-0.508542100	0.1955226700
##	687	524.99791	1978	-0.238229990	0.0906335040
##	688	524.06497	1980	-0.289956480	0.1057572140
##	689	537.40092	1982	-0.080120355	-0.2606081400
##	690	482.49091	1984	-0.299608600	-0.1162834100
##	691	522.88736	1986	-0.508278900	0.2300032700
##	692	571.50020	1988	-0.660770200	0.2082264100
##	693	654.97369	1990	0.039182037	0.2655955600
##	694	597.67120	1992	-0.357671230	0.2323118400
##	695	563.41252	1994	-0.232972060	-0.0188183100
##	696	603.66055	1996	-0.405626120	0.2853579200
##	697	572.24916	1998	-0.401730450	0.1872414400
##	698	659.42624	2000	-0.209204750	0.1466920000
##	699	709.97549	2002	0.010020155	-0.0332491030
##	700	659.82181	2004	-0.078961200	-0.0469832870
##	701	664.50256	2006	-0.159071710	0.0634526900
##	702	779.56534	2008	-0.102516520	0.2890102600
##	703	774.12198	2010	-0.149709210	0.4137481000
##	704	714.16098	1974	1.505248000	-0.0297332130
##	705	758.50034	1976	1.145781900	0.1219557300
##	706	890.04355	1978	1.253484800	0.1694389300
##	707	766.57108	1980	1.131033400	0.1462441400
##	708	787.59863	1982	0.979174000	0.2806359500
##	709	924.49106	1984	1.399191000	0.2191155900
##	710	1138.65723	1986	1.624208200	0.5812428600
##	711	1323.62671	1988	2.122451000	0.1415962400
##	712	1477.52344	1990	2.075918400	1.0454266000
##	713	1552.81189	1992	2.058822400	0.9889135400
##	714	1525.11890	1994	1.674684600	1.2877321000
##	715	1637.61041	1996	2.178839000	0.7183364600
##	716	1706.64868	1998	NA	NA
##	717	1903.93011	2000	NA	NA
##	718	1938.00739	2002	2.212403300	1.6193594000
##	719	2289.33557	2004	NA	NA
##	720	2460.36646	2006	3.476109700	1.0530171000
##	721	2426.87244	2008	NA	NA
##	722	2434.62341	2010	3.477160000	1.0868406000
##	723	75.86564	1974	-1.151220900	-0.4176937600
##	724	103.48575	1976	-1.027343200	-0.5269541000
##	725	120.05747	1978	-1.193057900	-0.2907259000
##	726	136.43349	1980	-1.389447700	-0.0159283730
##	727	165.55322	1982	-1.100214400	-0.3321132400
##	728	190.49798	1984	-1.114439800	-0.2655928400
##	729	202.97709	1986	-0.867422900	-0.5590374500
##	730	229.78341	1988	-0.986055400	-0.3549556000
##	731	260.01595	1990	-0.791860760	-0.5464061500
##	732	250.93707	1992	-0.781285350	-0.5807820000
##	733	277.27965	1994	-0.701563200	-0.6316853000
##	734	NA	1996	NA	NA
##	735	NA	1998	NA	NA
##	736	356.64177	2000	NA	NA
##	737	457.44095	2002	-0.191079420	-0.4642746200
##	738	501.76625	2004	-0.448926540	-0.0358507860
##	739	490.96982	2006	-0.453641240	-0.0460634600

## 740	482.64450	2008	-0.659366700	0.1927325300
## 741	457.06351	2010	-0.616027650	0.0728080500
## 742	118.34424	1974	2.105922500	-1.2602494000
## 743	183.84361	1976	1.224666100	-0.8014433400
## 744	220.97394	1978	1.041359400	-0.7877293000
## 745	288.28227	1980	0.329390440	-0.3247471200
## 746	252.39054	1982	1.495651600	-0.8460877000
## 747	283.05190	1984	0.850365900	-0.8227802000
## 748	429.76976	1986	0.086030245	-0.6534304000
## 749	428.71204	1988	-0.056611200	-0.5144506000
## 750	434.37761	1990	-0.070409120	-0.5457109000
## 751	400.72453	1992	-0.515699700	-0.0679694100
## 752	382.85771	1994	NA	NA
## 753	392.65408	1996	NA	NA
## 754	375.77028	1998	NA	NA
## 755	384.25673	2000	NA	NA
## 756	377.22162	2002	-0.531125370	-0.2177037700
## 757	342.37860	2004	-0.715908050	-0.0654974900
## 758	617.80139	2006	-0.494571720	0.1746698300
## 759	620.88864	2008	-0.175885420	-0.2620127800
## 760	651.37802	2010	-0.229899730	-0.1386049700
## 761	79.02894	1974	-1.271030500	0.1116903700
## 762	98.45725	1976	-1.303162300	0.1275218100
## 763	108.14020	1978	-1.326443600	0.1349565000
## 764	112.13408	1980	-1.325777600	0.1386668400
## 765	95.44955	1982	-1.348751500	0.0952014000
## 766	91.32191	1984	-1.385970400	0.0979763940
## 767	95.55398	1986	-1.412901600	0.1268747900
## 768	92.71658	1988	-1.412136300	0.1065168200
## 769	92.19331	1990	-1.411763800	0.1149593200
## 770	134.24912	1992	-1.354764200	0.1393637200
## 771	140.76698	1994	-1.345817200	0.1281119700
## 772	143.10881	1996	-1.378266700	0.1638279600
## 773	129.67567	1998	-1.395678300	0.1503973000
## 774	134.94895	2000	-1.323545700	0.1508636200
## 775	132.96644	2002	-1.322602300	0.1313020300
## 776	120.33885	2004	-1.347444300	0.1270453300
## 777	83.99230	2006	-1.400775600	0.1081151500
## 778	78.26692	2008	-1.422426300	0.1103985760
## 779	94.79214	2010	-1.380554000	0.0837038900
## 780	209.88599	1974	-0.673822000	0.1029042450
## 781	236.84414	1976	-0.657003300	0.0942788300
## 782	236.67348	1978	-0.753812550	0.2088233700
## 783	229.05692	1980	-0.457761940	-0.2513031700
## 784	209.60773	1982	-0.853438600	0.1065174100
## 785	219.57300	1984	-0.516672550	-0.3705060000
## 786	259.55841	1986	-0.670055870	0.0214995050
## 787	298.43156	1988	-0.691709400	0.2249457700
## 788	318.46648	1990	-0.623553630	0.2209224000
## 789	337.07845	1992	-0.503700700	0.1476344300
## 790	327.24341	1994	-0.627370060	0.2376450000
## 791	337.06595	1996	-0.673671000	0.2704642000
## 792	385.83197	1998	-0.655028600	0.3075273000
## 793	416.40050	2000	-0.444826420	0.0575821100

##	794	421.74229	2002	-0.603450200	0.2369485200
##	795	431.81746	2004	-0.702187840	0.3557106000
##	796	477.08226	2006	-0.599358800	0.2702380000
##	797	477.50937	2008	-0.661679700	0.3735211200
##	798	546.27417	2010	-0.529575200	0.3559691000
##	799	707.02063	1974	-0.311670720	0.5125676400
##	800	715.67188	1976	-0.160753760	0.5489325500
##	801	668.39267	1978	-0.549837100	0.4045722000
##	802	663.06998	1980	-0.582127600	0.4741971200
##	803	695.18460	1982	-0.308612350	0.2807265800
##	804	878.07687	1984	-0.482062200	0.8296189000
##	805	855.80698	1986	0.033427645	0.3359707600
##	806	850.00012	1988	-0.115784270	0.4729352000
##	807	949.33551	1990	0.464403400	-0.1513922800
##	808	1164.03839	1992	0.058802657	0.5511806600
##	809	1174.97101	1994	-0.257227400	0.9647744000
##	810	1215.83435	1996	-0.239564550	1.0034169000
##	811	1287.70679	1998	-0.193612680	1.0723164000
##	812	1481.88635	2000	-0.049118750	1.2597394000
##	813	1549.01794	2002	-0.007694837	1.3240004000
##	814	1497.09833	2004	0.388199360	0.6865075000
##	815	1432.82477	2006	0.151712090	0.8481320000
##	816	1453.07422	2008	-0.120728030	1.2287844000
##	817	1551.93170	2010	-0.036669190	1.3122225000
##	818	95.10513	1974	-1.561767500	0.2259744000
##	819	123.10108	1976	-1.572486800	0.2762936400
##	820	152.19917	1978	-1.480035400	0.2102967800
##	821	146.74431	1980	-1.578374100	0.3039608600
##	822	142.21152	1982	-1.555509400	0.2506798000
##	823	195.25957	1984	-1.429179900	0.1872685800
##	824	206.88381	1986	-1.378715200	0.2399131700
##	825	223.25856	1988	-1.409492300	0.3038427500
##	826	239.68507	1990	-1.423048000	0.3422000000
##	827	286.02209	1992	-1.365656500	0.3504478600
##	828	299.08014	1994	-1.365960600	0.3876987700
##	829	252.53252	1996	-1.379649500	0.3211225600
##	830	194.20300	1998	-1.461473600	0.3043322000
##	831	202.74991	2000	-1.434124400	0.3045528000
##	832	215.44888	2002	-1.345881900	0.2355994100
##	833	213.06944	2004	-1.385737000	0.2730112400
##	834	215.54538	2006	-1.406761900	0.2957720000
##	835	222.83794	2008	-1.412766500	0.3210508000
##	836	228.77421	2010	-1.420702800	0.3323248300
##	837	58.38946	1974	-1.106648100	-0.2707551000
##	838	61.89748	1976	-1.156452700	-0.2528556000
##	839	58.31153	1978	-1.098405200	-0.3148090500
##	840	65.98521	1980	-0.978815400	-0.3981609000
##	841	57.54098	1982	-0.962593200	-0.4671991500
##	842	59.00657	1984	-1.008367700	-0.4331234000
##	843	68.28654	1986	-0.913353500	-0.4987409000
##	844	84.24727	1988	-0.705409170	-0.6757393000
##	845	83.16205	1990	-0.778908500	-0.5834459700
##	846	67.00805	1992	-0.780678900	-0.5674238000
##	847	70.08998	1994	-0.521464770	-0.8501349000



## 848	73.39223	1996	-0.796278540	-0.5278283400
## 849	71.46851	1998	-0.520583300	-0.9114682000
## 850	86.20076	2000	-0.670950200	-0.6655546400
## 851	83.35620	2002	-0.516361060	-0.8445711000
## 852	80.58273	2004	-0.927844500	-0.4320187600
## 853	84.99544	2006	-0.702426000	-0.6570653300
## 854	97.38440	2008	-0.960139630	-0.3787390300
## 855	99.88067	2010	-1.256429100	-0.0677749700
## 856	295.49245	1975	-0.741218750	0.2725410800
## 857	332.20093	1977	-0.809725760	0.3329361400
## 858	346.93582	1979	-0.642205800	0.3260020600
## 859	352.87816	1981	-0.737539600	0.2743094600
## 860	334.55484	1983	-0.813373600	0.2503212000
## 861	377.63255	1985	-0.403699900	-0.0224409550
## 862	425.90767	1987	-0.692820970	0.4111212800
## 863	448.98984	1989	-0.079008296	0.4986626200
## 864	487.69618	1991	-0.395224400	0.4328689000
## 865	489.34464	1993	-0.314896370	0.2637365500
## 866	541.93512	1995	0.242544070	-0.4131425000
## 867	481.63634	1997	-0.601443770	0.5211718000
## 868	538.96796	1999	-0.347952700	0.2716463800
## 869	601.68329	2001	-0.569108660	0.6397872600
## 870	549.69861	2003	-0.550127400	0.4770838600
## 871	509.52753	2005	-0.672171650	0.5146786000
## 872	549.28348	2007	-0.573799000	0.4212854800
## 873	584.79034	2009	-0.624788700	0.5259962000
## 874	563.08176	2011	-0.620905800	0.4575281000
## 875	479.38734	1974	-0.628371240	0.2646625000
## 876	573.21411	1976	-0.214523390	-0.1539925500
## 877	598.12680	1978	-0.482558370	0.3887465000
## 878	640.80704	1980	-0.098535450	0.1491653800
## 879	633.16946	1982	0.201726820	-0.2371148300
## 880	678.58813	1984	0.022303583	0.1724885600
## 881	763.49982	1986	-0.019901618	0.4310859000
## 882	823.06567	1988	0.297292230	0.3350768000
## 883	1010.40112	1990	0.836323740	0.1607476500
## 884	1075.03577	1992	0.680982200	0.3159309300
## 885	900.54492	1994	0.387186620	0.5003457700
## 886	876.18784	1996	0.803800700	-0.0962016900
## 887	934.17532	1998	0.301942440	0.6206758600
## 888	1002.77567	2000	0.581146240	0.4484383000
## 889	1038.21338	2002	0.747233870	0.2007338700
## 890	957.05945	2004	0.568660400	0.4562137000
## 891	971.05170	2006	0.398137480	0.6668985500
## 892	1028.03821	2008	0.515845400	0.7139855000
## 893	991.26297	2010	0.684392800	0.5075250000
## 894	207.28751	1974	-0.621653100	-0.3450303400
## 895	218.52206	1976	-0.335737020	-0.5695407000
## 896	234.14733	1978	-0.807413760	-0.0015536472
## 897	329.24603	1980	-0.910135200	0.2291435900
## 898	230.50831	1982	-0.992658100	0.0637664500
## 899	242.60423	1984	-0.969790600	0.0238018300
## 900	260.07975	1986	-0.931717400	0.0330741260
## 901	270.58066	1988	-0.900972960	0.0342344870

## 902	234.06757	1990	-0.933356640	-0.0366673130
## 903	249.50759	1992	-0.921225250	-0.0533186700
## 904	245.75948	1994	-0.989816250	0.0084459130
## 905	344.32071	1996	NA	NA
## 906	320.90025	1998	NA	NA
## 907	348.55470	2000	-0.540198740	-0.0245118770
## 908	330.31482	2002	-0.590239000	-0.0315876500
## 909	455.35307	2004	NA	NA
## 910	382.53601	2006	-0.714494500	0.1703000800
## 911	361.24440	2008	-0.859236840	0.2806834300
## 912	370.52855	2010	-0.650192740	0.1948963700
## 913	464.14462	1974	0.609634500	-0.3244362000
## 914	522.92955	1976	0.783216500	0.1320360700
## 915	586.26974	1978	0.766150650	0.2870455700
## 916	565.17154	1980	0.543072700	0.3159788300
## 917	539.83777	1982	0.723167240	-0.2086310100
## 918	554.34067	1984	0.469096600	0.1263325400
## 919	592.73505	1986	1.203472600	-0.7057486000
## 920	655.65353	1988	0.845841800	0.0264806320
## 921	732.01898	1990	1.393325900	-0.5543365500
## 922	839.26096	1992	1.036135100	0.0824663400
## 923	878.23486	1994	3.371981600	-2.9284596000
## 924	910.19330	1996	3.578602000	-3.0441227000
## 925	933.24713	1998	3.424408200	-2.8809605000
## 926	973.91299	2000	3.519056300	-2.8313540000
## 927	970.73004	2002	2.555578500	-1.5629114000
## 928	892.37848	2004	1.043718500	0.2029316400
## 929	811.65149	2006	0.550468300	0.5962462000
## 930	821.82349	2008	0.923765700	0.0861036550
## 931	831.99249	2010	NA	NA
## 932	41.10656	1974	-1.778997400	0.3333645200
## 933	81.43018	1976	-1.626648800	0.2250982700
## 934	217.16512	1978	-1.471029600	0.3061353000
## 935	179.95812	1980	-1.526268800	0.3218946000
## 936	93.01046	1982	-1.595781800	0.2198708500
## 937	70.33638	1984	-1.618584000	0.1976139200
## 938	87.34511	1986	-1.592321600	0.2211137300
## 939	95.87333	1988	-1.523209300	0.2106747200
## 940	123.41672	1990	-1.545914400	0.2776265000
## 941	182.12593	1992	-1.423472300	0.2413323000
## 942	78.40699	1994	-1.603430900	0.2415765500
## 943	87.53827	1996	-1.555372800	0.2618769000
## 944	98.54786	1998	-1.544063200	0.2637990400
## 945	98.84684	2000	-1.549295200	0.2637456400
## 946	138.57949	2002	-1.552887300	0.2822173500
## 947	127.29152	2004	-1.498864700	0.2396362700
## 948	141.31708	2006	-1.533219700	0.3037646000
## 949	133.17257	2008	-1.449164200	0.2214548100
## 950	147.18433	2010	-1.670888100	0.4607199000

##Q2: Data Munging

```

selected <- leg %>%
  #Select 2009/10 session
  filter(sessid == "2009/10") %>%
  #Select only continous features
  dplyr::select(state, t_slength, slength, salary_real, expend) %>%
  #drop nans
  drop_na()

#save state variable separately
states <- selected$state

changed<-selected %>%
  #remove state variable
  dplyr::select(-state)%>%
  #standardize values
  scale()

munged<- changed%>%
  #Matrix
  dist()

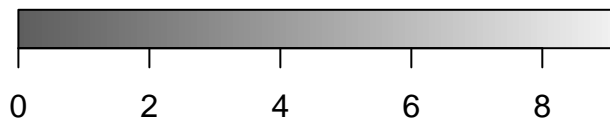
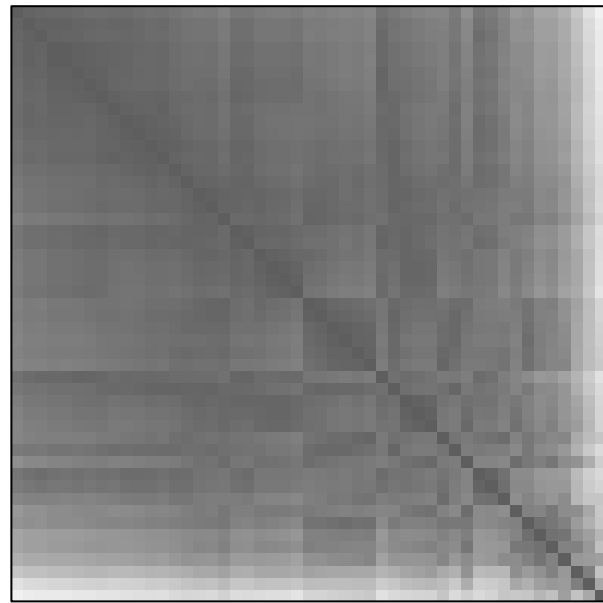
```

##Q3: Diagnose Clusterability

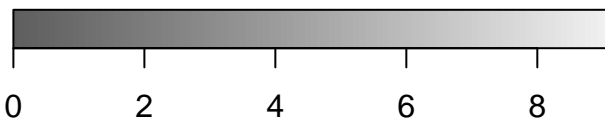
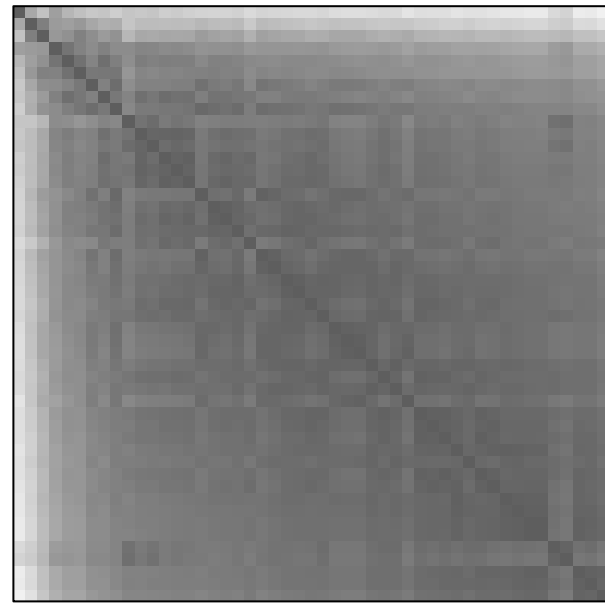
```

dissplot(munged, method="VAT")

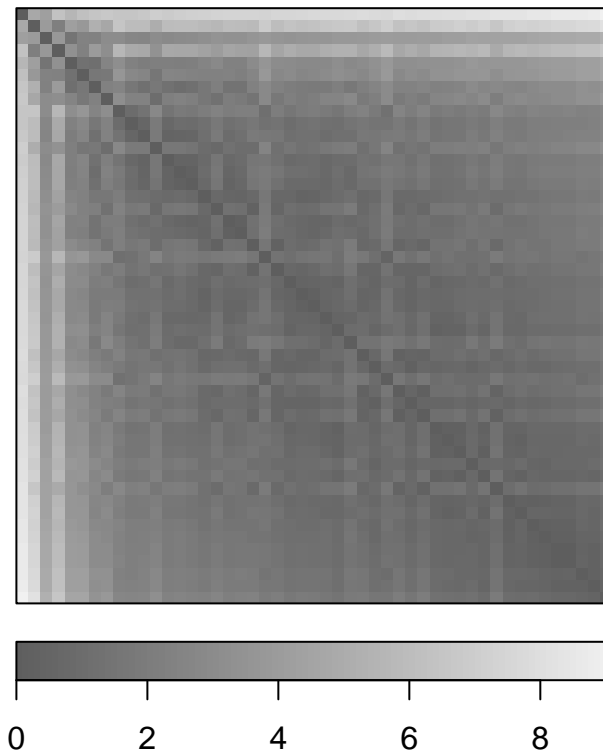
```



```
disssplot(munged, method="ARSA")
```



```
disssplot(munged, method="Spectral")
```

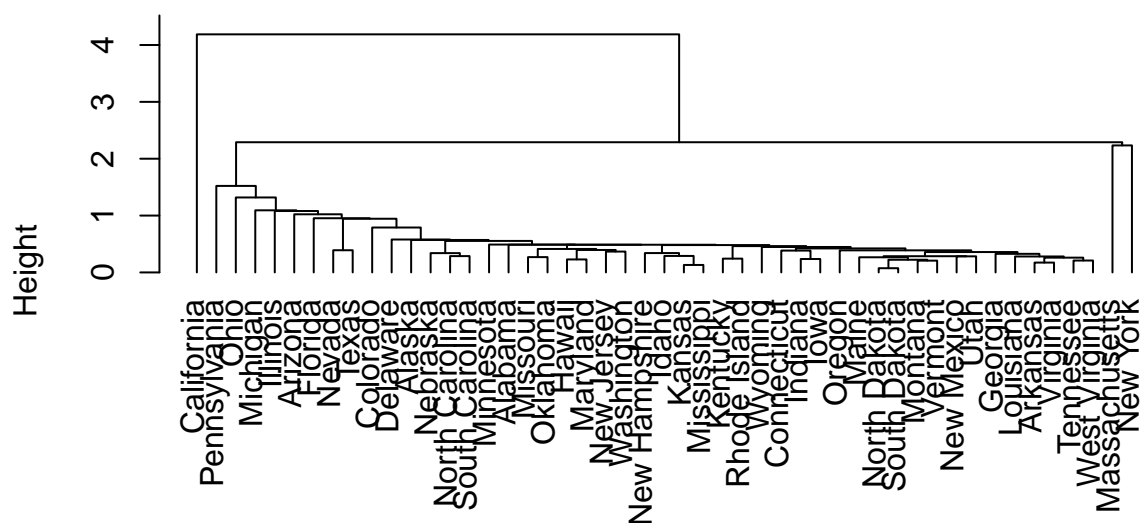


I opted for an ODI using the `dissplot` function, but utilized multiple methods to see different categorizations presented themselves. The clearest of the ODIs in my opinion was generated by the VAT method, which presented 6 rough categories. Importantly, however, in all three ODIs, we can see that there is one distinct square towards the top corner or the bottom corner of the chart—if we use only this square as the distinct category from the rest, we get 2 categories.

##Q4: Agglomerative Hierarchical

```
hc_single <- hclust(munged,
  method = "single"); plot(hc_single, labels=states, hang = -1)
```

## Cluster Dendrogram



munged  
hclust (\*, "single")

```
hc_complete <- hclust(munged,  
                      method = "complete"); plot(hc_complete, labels=states, hang = -1)
```

## Cluster Dendrogram

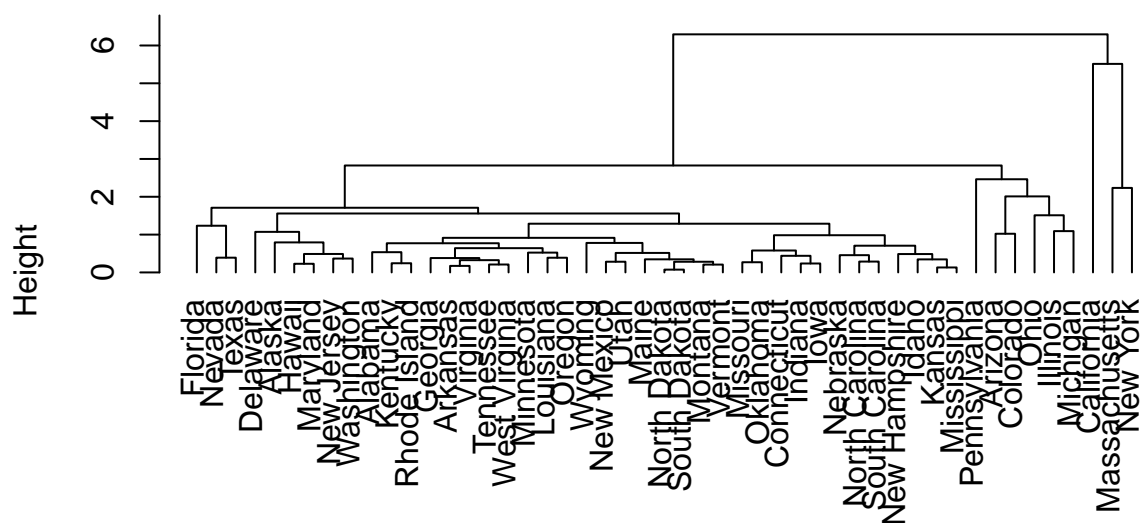


munged  
hclust (\*, "complete")

```
hc_average <- hclust(munged,
                     method = "average"); plot(hc_average, labels=states, hang = -1)
```



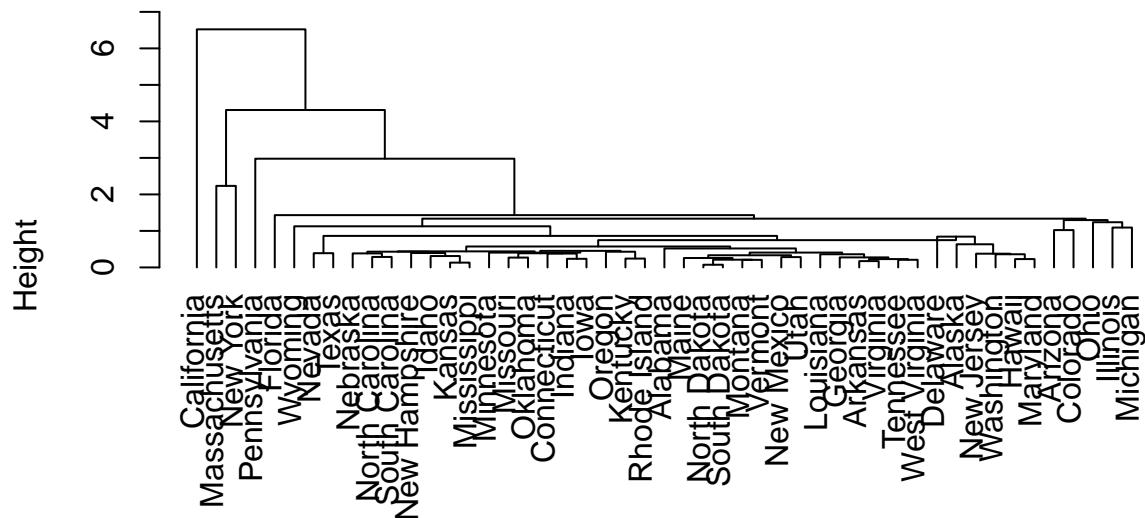
## Cluster Dendrogram



munged  
hclust (\*, "average")

```
hc_centroid <- hclust(munged,
                      method = "centroid"); plot(hc_centroid, labels=states, hang = -1)
```

## Cluster Dendrogram



munged  
hclust (\*, "centroid")

I used HAC with four different methods—the one that I found most insightful was the complete method. Here we can see two main categories—one with CA, MA, NY, PA, OH, IL and MI and the other with the rest. These states tend to be blue, and generally have higher industrialization and education than the rest of the nation.

##Q5: K-Means

```
set.seed(777)
```

```
kmeans <- kmeans(munged,
                  centers = 2,
                  nstart = 2)
```

```
# Inspect the kmeans object
str(kmeans)
```

```
## List of 9
## $ cluster      : Named int [1:49] 2 2 2 2 1 2 2 2 2 2 ...
##   ..- attr(*, "names")= chr [1:49] "1" "2" "3" "4" ...
## $ centers      : num [1:2, 1:49] 5.41 1.21 4.18 1.57 3.64 ...
##   ..- attr(*, "dimnames")=List of 2
##     .. ..$ : chr [1:2] "1" "2"
##     .. ..$ : chr [1:49] "1" "2" "3" "4" ...
## $ totss       : num 4855
## $ withinss    : num [1:2] 922 774
## $ tot.withinss: num 1695
## $ betweenss   : num 3160
```

```
## $ size      : int [1:2] 6 43
## $ iter      : int 1
## $ ifault    : int 0
## - attr(*, "class")= chr "kmeans"

# Assess a little more descriptively
t <- as.table(kmeans$cluster)
t <- data.frame(t)
t$state <- states
colnames(t)[colnames(t)=="Freq"] <- "Assignment"
t$Var1 <- NULL

t
```

```
##      Assignment      state
## 1           2      Alabama
## 2           2      Alaska
## 3           2      Arizona
## 4           2      Arkansas
## 5           1    California
## 6           2      Colorado
## 7           2    Connecticut
## 8           2      Delaware
## 9           2      Florida
## 10          2      Georgia
## 11          2      Hawaii
## 12          2      Idaho
## 13          2      Illinois
## 14          2      Indiana
## 15          2      Iowa
## 16          2      Kansas
## 17          2      Kentucky
## 18          2      Louisiana
## 19          2      Maine
## 20          2      Maryland
## 21          1    Massachusetts
## 22          1      Michigan
## 23          2      Minnesota
## 24          2      Mississippi
## 25          2      Missouri
## 26          2      Montana
## 27          2      Nebraska
## 28          2      Nevada
## 29          2    New Hampshire
## 30          2      New Jersey
## 31          2      New Mexico
## 32          1      New York
## 33          2    North Carolina
## 34          2    North Dakota
## 35          1          Ohio
## 36          2      Oklahoma
## 37          2      Oregon
## 38          1    Pennsylvania
## 39          2    Rhode Island
```

```
## 40      2 South Carolina
## 41      2   South Dakota
## 42      2      Tennessee
## 43      2        Texas
## 44      2         Utah
## 45      2      Vermont
## 46      2      Virginia
## 47      2   Washington
## 48      2 West Virginia
## 49      2      Wyoming
```

```
sum(t$Assignment==1)
```

```
## [1] 6
```

K-Means came out with exactly the same clustering as HAC-complete from the last section. Once again, those 6 states have been separated from the rest of the country.

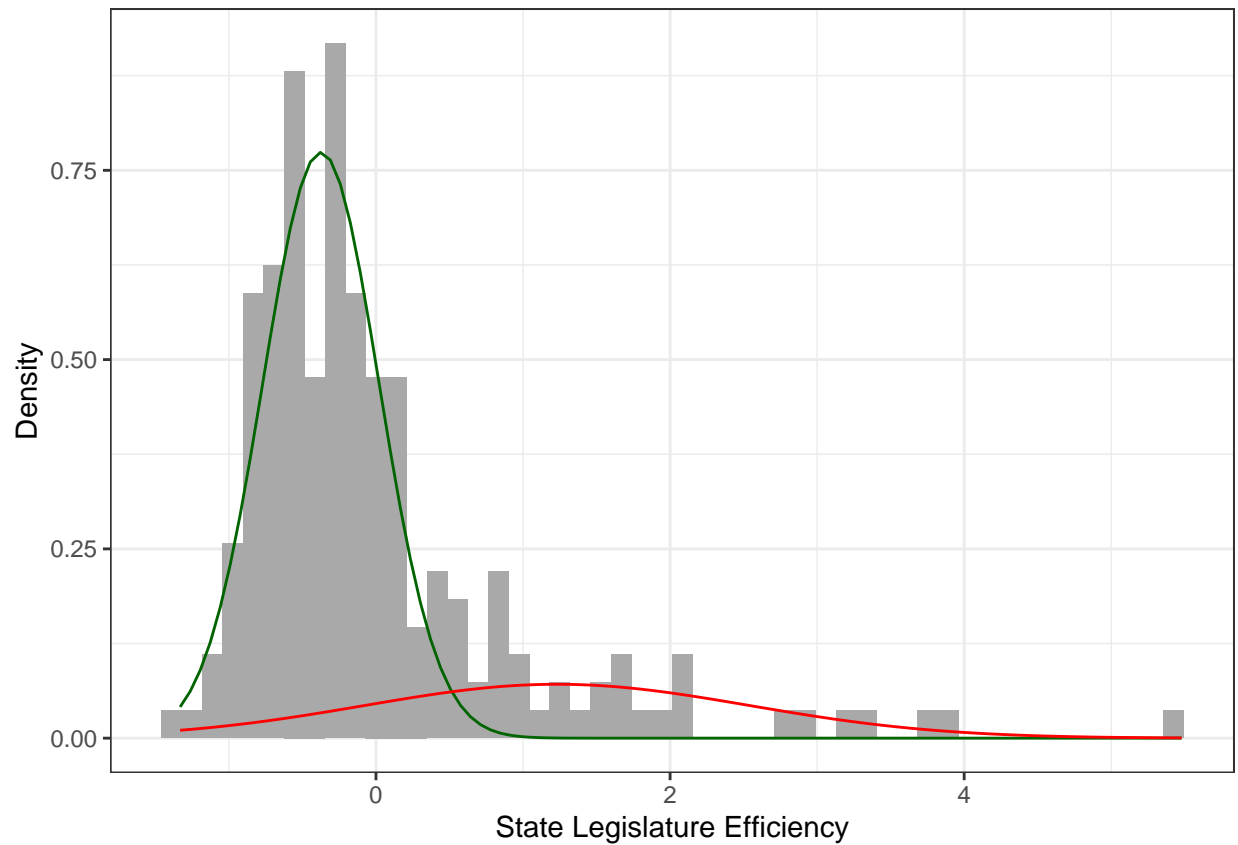
##Q6: GMM

```
set.seed(380)
```

```
gmm <- normalmixEM(changed, k = 2)
```

```
## number of iterations= 32
```

```
ggplot(data.frame(x = gmm$x)) +
  geom_histogram(aes(x, ..density..), fill = "darkgray", bins=50) +
  stat_function(geom = "line", fun = plot_mix_comps,
    args = list(gmm$mu[1], gmm$sigma[1], lam = gmm$lambda[1]),
    colour = "darkgreen") +
  stat_function(geom = "line", fun = plot_mix_comps,
    args = list(gmm$mu[2], gmm$sigma[2], lam = gmm$lambda[2]),
    colour = "red")+
  xlab("State Legislature Efficiency") +
  ylab("Density") +
  theme_bw()
```

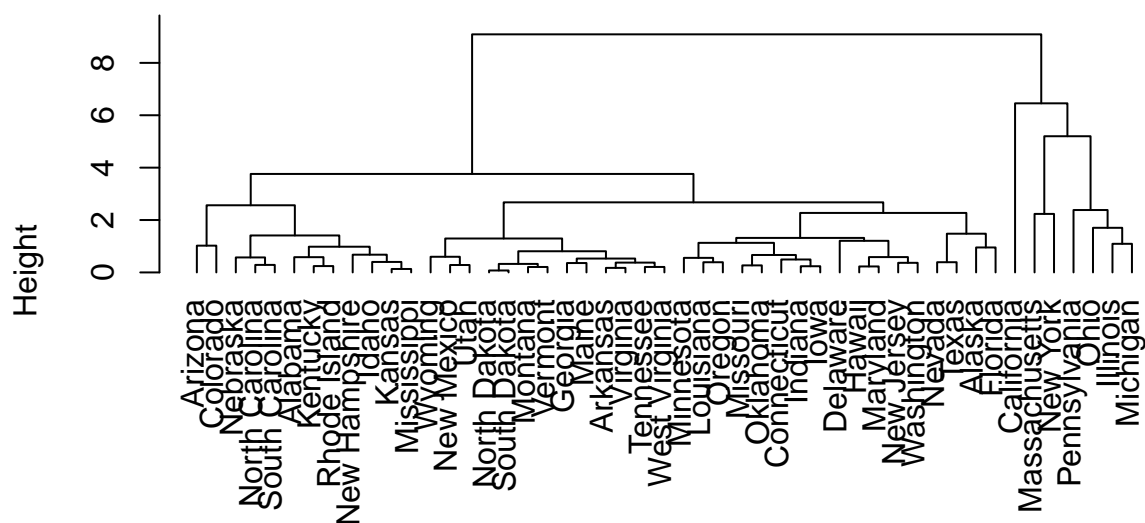


Like the other two methods, the GMM also selected the same range of 6 states. However here, it is interesting to see how far away some of these states are from the rest; the GMM shows how disparate some of the features are in these states from the country as a whole.

#Q7: Compare Outputs

```
#HAC
plot(hc_complete, labels=states, hang = -1)
```

## Cluster Dendrogram



munged  
hclust (\*, "complete")

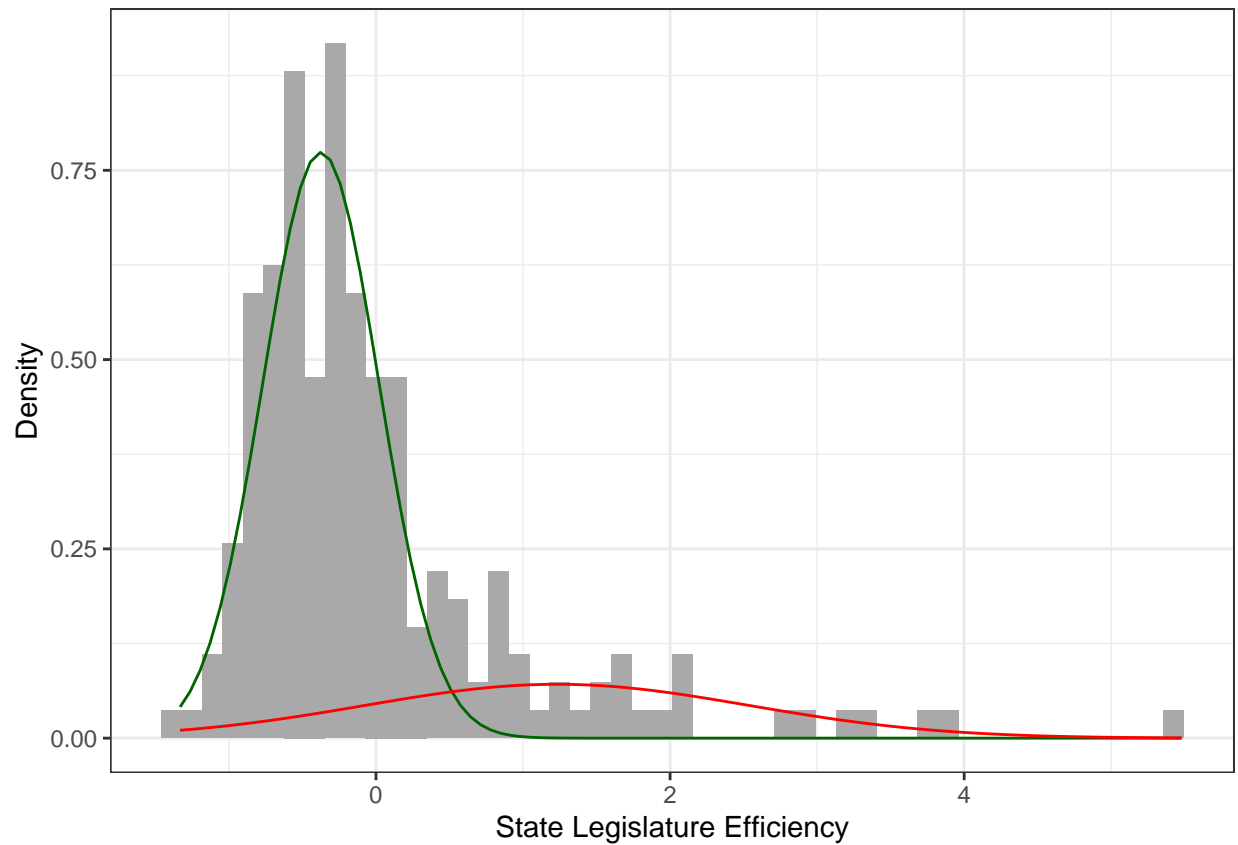
### #K-Means

t

##	Assignment	state
## 1	2	Alabama
## 2	2	Alaska
## 3	2	Arizona
## 4	2	Arkansas
## 5	1	California
## 6	2	Colorado
## 7	2	Connecticut
## 8	2	Delaware
## 9	2	Florida
## 10	2	Georgia
## 11	2	Hawaii
## 12	2	Idaho
## 13	2	Illinois
## 14	2	Indiana
## 15	2	Iowa
## 16	2	Kansas
## 17	2	Kentucky
## 18	2	Louisiana
## 19	2	Maine
## 20	2	Maryland
## 21	1	Massachusetts
## 22	1	Michigan

```
## 23      2      Minnesota
## 24      2      Mississippi
## 25      2      Missouri
## 26      2      Montana
## 27      2      Nebraska
## 28      2      Nevada
## 29      2      New Hampshire
## 30      2      New Jersey
## 31      2      New Mexico
## 32      1      New York
## 33      2      North Carolina
## 34      2      North Dakota
## 35      1      Ohio
## 36      2      Oklahoma
## 37      2      Oregon
## 38      1      Pennsylvania
## 39      2      Rhode Island
## 40      2      South Carolina
## 41      2      South Dakota
## 42      2      Tennessee
## 43      2      Texas
## 44      2      Utah
## 45      2      Vermont
## 46      2      Virginia
## 47      2      Washington
## 48      2      West Virginia
## 49      2      Wyoming
```

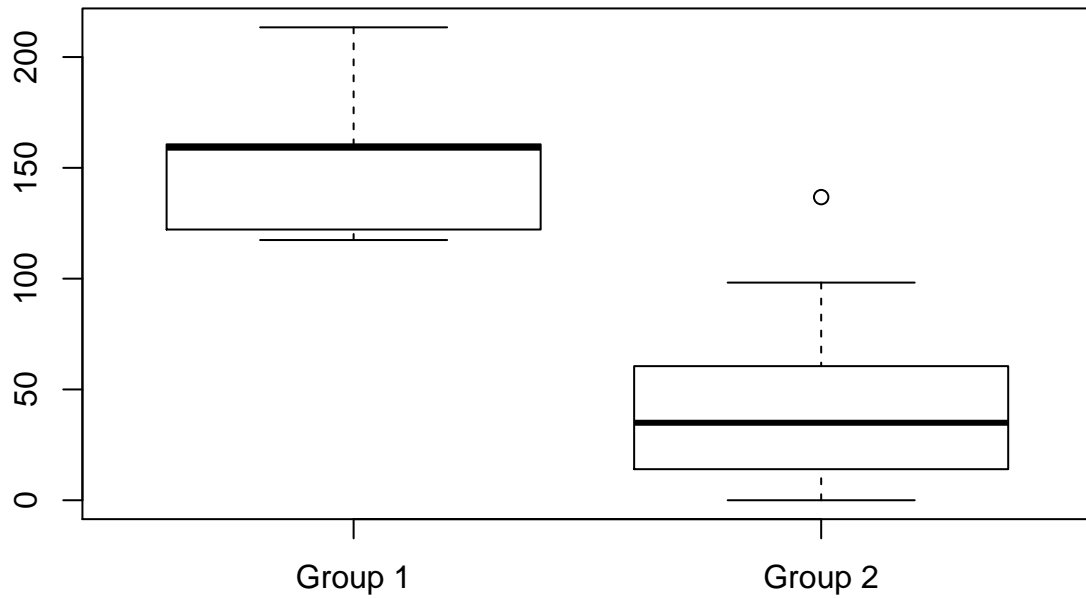
```
#GMM
ggplot(data.frame(x = gmm$x)) +
  geom_histogram(aes(x, ..density..), fill = "darkgray", bins=50) +
  stat_function(geom = "line", fun = plot_mix_comps,
    args = list(gmm$mu[1], gmm$sigma[1], lam = gmm$lambda[1]),
    colour = "darkgreen") +
  stat_function(geom = "line", fun = plot_mix_comps,
    args = list(gmm$mu[2], gmm$sigma[2], lam = gmm$lambda[2]),
    colour = "red")+
  xlab("State Legislature Efficiency") +
  ylab("Density") +
  theme_bw()
```



```
#Compare Salary and Expenditures based on K-Means Grouping
comparision_table <-merge(x=t,y=selected,by="state")
comp_1 <- comparision_table %>%
  filter(Assignment==1)
comp_2 <- comparision_table %>%
  filter(Assignment==2)
boxplot(comp_1$salary_real, comp_2$salary_real,
  main = "Salary Comparision",
  names = c("Group 1", "Group 2"))
```

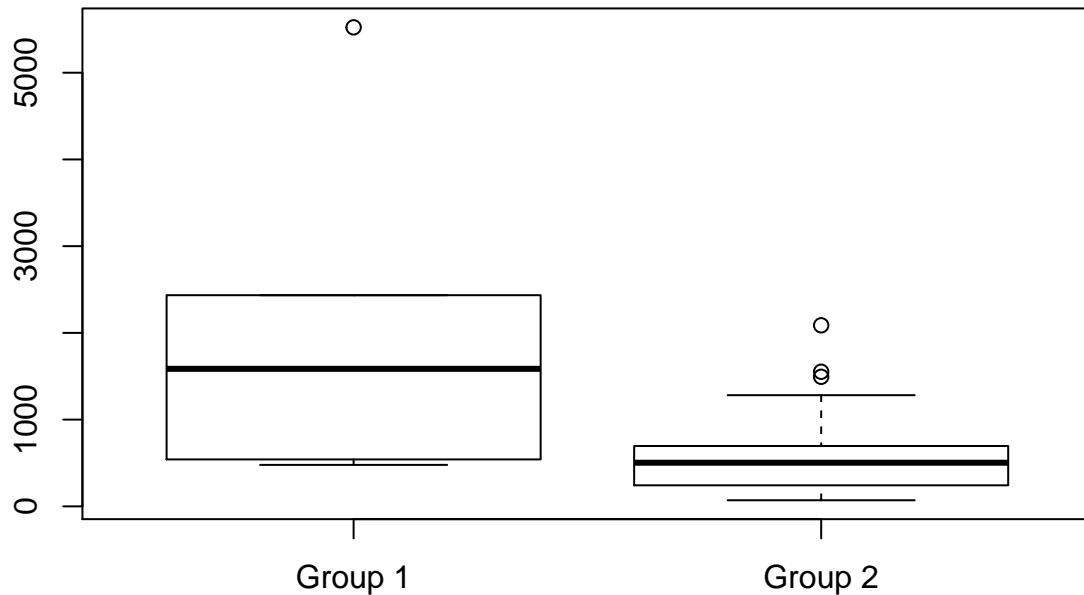


## Salary Comparision



```
boxplot(comp_1$expend, comp_2$expend,  
        main = "Expenditures Comparision",  
        names = c("Group 1", "Group 2"))
```

## Expenditures Comparision



As we can see, the HAC, K-Means and GMM all came out with relatively similar results—all three of them selecting the same 6 states (CA, MA, NY, PA, OH, IL and MI) to separate from the rest. The box plots allow us to see a bit about why these states were so distinct from the rest. We can see that in terms of salary, these states pay much more, with the ranges almost not overlapping at all. We can also see that on average, these states expend quite a bit more and in a greater range than the other states.

#Q8: validation:

```
validation <- clValid(changed, c(2:5),
                      clMethods = c("hierarchical", "kmeans", "pam" ),
                      validation = c("internal", "stability"))
summary(validation)
```

```
##
## Clustering Methods:
## hierarchical kmeans pam
##
## Cluster sizes:
## 2 3 4 5
##
## Validation Measures:
##           2           3           4           5
##
## hierarchical APN      0.0136  0.0905  0.0357  0.0551
##                AD      1.8189  1.6022  1.2859  1.2629
##                ADM     0.2568  0.3168  0.1439  0.2135
##                FOM     0.8886  0.7261  0.5698  0.5645
```

```

##          Connectivity  6.0869  6.9536 16.1885 18.6774
##          Dunn         0.3637  0.4371  0.2562  0.2836
##          Silhouette   0.6994  0.6711  0.4932  0.4440
## kmeans  APN          0.0136  0.0801  0.1817  0.2291
##          AD           1.5945  1.4966  1.3454  1.2040
##          ADM          0.0920  0.2803  0.3623  0.5120
##          FOM          0.7094  0.7009  0.6181  0.5932
##          Connectivity  8.4460 10.8960 16.1885 28.7437
##          Dunn         0.1735  0.2581  0.2562  0.1090
##          Silhouette   0.6458  0.6131  0.4932  0.3042
## pam     APN          0.1297  0.1603  0.2474  0.3750
##          AD           1.6924  1.4379  1.3923  1.2448
##          ADM          0.4170  0.3508  0.5902  0.6168
##          FOM          0.7979  0.7147  0.6891  0.7013
##          Connectivity  7.9071 21.2952 25.4798 26.3464
##          Dunn         0.1673  0.0324  0.0332  0.0670
##          Silhouette   0.6204  0.2530  0.2673  0.2841
##
## Optimal Scores:
##
##          Score Method      Clusters
## APN         0.0136 kmeans      2
## AD          1.2040 kmeans      5
## ADM         0.0920 kmeans      2
## FOM         0.5645 hierarchical 5
## Connectivity 6.0869 hierarchical 2
## Dunn        0.4371 hierarchical 3
## Silhouette  0.6994 hierarchical 2

```

#Question 9: I decided to focus on the Silhouette validation metric. According to my ClValid “Optimal Scores” section, my most optimal score for Silhouette was the 2 clustered Hierarchical, with a score of 0.6994. Thus, under this metric we can see that the optimal approach is hierarchical at k=2. However, it is important to note the other metrics that are presented by my validation algorithm. The optimal methods and clusters for those metrics vary, and we can see that in general using 2 or 5 clusters is best, and hierarchical or kmeans is best as a method. One important reason that I could use the sub-optimal GMM for clustering even when it doesn’t have great validation statistics is because of its nature as a probabilistic clusterer. Unlike K-Means and HAC, which don’t allow me to see as clearly which entries were most staunchly in a cluster and which were further away, the probabilities in GMM allow me to do so, which can be very useful in some scenarios.