STP 429

MULTIPLE REGRESSION EXAMPLE
Automobile Insurance Rates

What affects automobile insurance rates? Responsible drivers carry automobile insurance to financially protect themselves if involved in an automobile accident or in case of theft. When we purchase automobile insurance we know that various factors affect the rate we pay. Such factors as our age, previous driving record, and type of car insured have an effect on our insurance premium.

However there are other factors that play a role in determining automobile insurance rates that are not specifically associated with an individual driver. For example, how often are people killed in automobile accidents in the area in which we live? What is the rate of automobile theft in our area? How expensive is it to be cared for in a hospital? How much time is spent driving to and from work? How densely populated is the area in which we live?

In order to investigate the effect of these factors on automobile insurance rates, information on each of the 50 states was obtained from the 117th edition (1997) of the *Statistical Abstract of the United States* on the following six variables:

1. Average Automobile Insurance Rate (1995)
2. Population Density (1996)
3. Automobile Theft Rate (1995)
4. Automobile Deaths per 100 Million Miles Driven (1995)
5. Average Drive Time to Work (1995)
6. Average Cost of a Day's Stay in a Hospital (1995)

The data for all the states can be found in the table below.

Find the multiple regression equation that can be used to predict the average automobile insurance rate based on the five predictor variables. Determine if there are useful associations between the average automobile insurance rate and the five predictor variables. Assess how well our equation fits the data.

Automobile insurance rates and other related data for the fifty states

STATE	AVE INS RATE	POP DEN	AUTO THEFT RATE	DEATHS/100M MILES	AVE DRIVE TIME	HOSPITAL COST/DAY
AK	730	1.1	522	2.0	16.7	1341
AL	549	84.2	347	2.2	21.2	819
AR	500	48.2	325	2.5	19.0	704
AZ	727	39.0	1158	2.6	21.6	1191
CA	831	204.4	888	1.5	24.6	1315
CO	722	36.9	388	1.9	20.7	1069
CT	881	675.8	540	1.1	21.1	1264
DE	784	370.8	414	1.7	20.0	1058
FL	739	266.7	786	2.3	21.8	1004
GA	596	127.0	608	1.8	22.7	836
HI	963	184.3	691	1.6	23.8	956
IA	429	51.0	223	2.0	16.2	702
ID	447	14.4	242	2.2	17.3	719
IL	612	213.1	523	1.7	25.1	1050
IN	542	162.8	466	1.5	20.4	963
KS	474	31.4	324	1.7	17.2	732
KY	555	97.7	259	2.1	20.7	795
LA	787	99.9	598	2.3	22.3	902
MA	898	777.3	605	0.9	22.7	1157
MD	732	518.8	718	1.5	27.0	1064
ME	472	40.3	135	1.5	19.0	916
MI	645	168.9	646	1.8	21.2	994
MN	630	58.5	342	1.4	19.1	736
MO	572	77.8	473	1.9	21.6	967
MS	579	57.9	361	3.0	20.6	584
MT	468	6.0	308	2.3	14.8	493
NC	501	150.3	311	2.0	19.8	832
ND	381	9.3	179	1.1	13.0	521
NE	452	21.5	351	1.6	15.8	661
NH	609	129.6	145	1.1	21.9	915
NJ	1013	1076.7	632	1.3	25.3	962
NM	639	14.1	513	2.3	19.1	1073
NV	759	14.6	745	2.4	19.8	1072
NY	906	385.1	566	1.4	28.6	909
OH	532	272.8	415	1.4	20.7	1061
OK	526	48.1	496	1.8	19.3	861
OR	565	33.4	702	1.9	19.6	1141
PA	667	269	413	1.6	21.6	963
RI	870	947.6	441	1.0	19.2	1092
SC	582	122.8	385	2.3	20.5	923
SD	429	9.7	121	2.0	13.8	476
TN	519	129.1	649	2.2	21.5	871
TX	711	73.0	560	1.7	22.2	1063
UT	547	24.3	389	1.7	18.9	1213
VA	553	168.6	293	1.3	24.0	901
VT	512	63.6	136	1.7	18.0	714
WA	650	83.1	554	1.4	22.0	1318
WI	506	95.0	364	1.4	18.3	794
WV	646	75.8	166	2.2	21.0	763
WY	433	5.0	168	2.5	15.4	545