

APPENDIX B : Typical SAS Code Files, Log Files, and Output of the Selected Models for the Prediction of Decrease in PSE Values

Statistical Analysis System (SAS) Codes

```
Title1 ' FDBIT PAVEMENTS' ;
Title2 ' Prediction of del(PSE)' ;
options ls= 80 ps= 60;
data;
input age th cumESAL pse dpse DL1 DL2 DL3;
age1 = age**1.5;
dsn = age*0.021872+ th*0.001025;
expdsn = exp(dsn);
cards;
3 13.8 129687 8 1 0 1 0
5 9.8 301154 7 1 0 0 1
1 11.8 53125 6 0 1 0 0
6 10.3 925514 8 2 0 0 1
6 12.4 810048 7 1 0 1 0

5 19 298817 6 1 1 0 0
6 14.4 385079 6 1 0 0 1
5 14.7 461194 8 2 0 1 0

6 11.4 238113 6 1 0 1 0
6 17.5 394265 9 4 0 0 1

6 15.6 1326061 9 2 0 0 1
6 18.8 1722453 7 2 1 0 0
6 17 1636727 7 2 0 0 1
5 14.1 531323 8 1 0 1 0
5 12.2 675370 8 1 1 0 0
5 12.2 675370 8 1 1 0 0
6 15.6 2135526 9 2 0 0 1
6 18 1722453 9 2 1 0 0

2 14.6 995321 7 1 1 0 0
7 14.9 2087479 8 1 1 0 0
5 17.4 2388042 8 2 0 1 0
2 17.6 1119591 7 1 0 1 0
7 10.5 176723 8 2 0 1 0

3 10 227849 6 0 1 0 0
3 12.3 267089 7 0 1 0 0
```

3 12.3 267089 7 0 1 0 0
3 12.3 365729 7 0 1 0 0

```
proc reg;  
model dpse = age1 expdsn th pse DL1 DL2 DL3;  
model dpse = age1 expdsn th pse DL1 DL2 DL3/noint;  
model dpse = age1 dsn pse DL1 DL2 DL3;  
model dpse = age1 dsn pse DL1 DL2 DL3/noint;  
model dpse = age1 dsn th pse DL1 DL2 DL3;  
model dpse = age1 dsn th pse DL1 DL2 DL3/noint;  
model dpse = age1 expdsn pse DL1 DL2 DL3;  
model dpse = age1 expdsn pse DL1 DL2 DL3/noint;  
proc stepwise;  
model dpse = age1 expdsn th pse DL1 DL2 DL3/F B stepwise;  
proc rsquare;  
model dpse = age1 expdsn th pse DL1 DL2 DL3/adjrsq cp rmse;  
proc corr;  
run;
```

The SAS System : Log File

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This message is contained in the SAS news file, and is presented upon initialization. Edit the files "news" in the "misc/base" directory to display site-specific news and information in the program log. The command line option "-nonews" will prevent this display.

NOTE: AUTOEXEC processing beginning; file is /usr/local/lic/sas612/autoexec.sas.

NOTE: SAS initialization used:
real time 1.290 seconds
cpu time 0.639 seconds

NOTE: AUTOEXEC processing completed.

```
1  
2 Title1 'FDBIT PAVEMENTS';  
3 Title3 'Prediction of del(PSE)';
```

```

4      options ls= 80 ps= 60;
5      data;
6      input age th cumESAL pse dpse DL1 DL2 DL3;
7      age1 = age**1.5;
8      dsn = age*0.021872+ th*0.001025;
9      expdsn = exp(dsn);
10     cards;

```

NOTE: SAS went to a new line when INPUT statement reached past the end of a line.

NOTE: The data set WORK.DATA1 has 27 observations and 11 variables.

NOTE: DATA statement used:

```

      real time      0.450 seconds
      cpu time       0.188 seconds

```

```

44     proc reg;
45     model dpse = age1 expdsn th pse DL1 DL2 DL3;
46     model dpse = age1 expdsn th pse DL1 DL2 DL3/noint;
47     model dpse = age1 dsn pse DL1 DL2 DL3;
48     model dpse = age1 dsn pse DL1 DL2 DL3/noint;
49     model dpse = age1 dsn th pse DL1 DL2 DL3;
50     model dpse = age1 dsn th pse DL1 DL2 DL3/noint;
51     model dpse = age1 expdsn pse DL1 DL2 DL3;
52     model dpse = age1 expdsn pse DL1 DL2 DL3/noint;

```

NOTE: The PROCEDURE REG printed pages 1-8.

NOTE: PROCEDURE REG used:

```

      real time      0.930 seconds
      cpu time       0.258 seconds

```

```

53     proc stepwise;
54     model dpse = age1 expdsn th pse DL1 DL2 DL3/F B stepwise;

```

NOTE: 27 observations read.

NOTE: 27 observations used in computations.

NOTE: The PROCEDURE STEPWISE printed pages 9-16.

NOTE: PROCEDURE STEPWISE used:

```

      real time      0.340 seconds
      cpu time       0.114 seconds

```

```

55     proc rsquare;
56     model dpse = age1 expdsn th pse DL1 DL2 DL3/adjrsq cp rmse;

```

NOTE: The PROCEDURE RSQUARE printed pages 17-19.

NOTE: PROCEDURE RSQUARE used:

```

      real time      0.370 seconds
      cpu time       0.103 seconds

```

```

57     proc corr;

```

58 run;

NOTE: PROCEDURE CORR used:

 real time 0.060 seconds

 cpu time 0.041 seconds

59

NOTE: The SAS System used:

 real time 3.710 seconds

 cpu time 1.436 seconds

NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414

Output: FDBIT PAVEMENTS

Model: MODEL2 Selected Model

NOTE: No intercept in model.

Dependent Variable: DPSE

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob> F
Model	7	59.41349	8.48764	37.011	0.0001
Error	20	4.58651	0.22933		
U Total	27	64.00000			
Root MSE	0.47888	R-square	0.7835		
Dep Mean	1.25926	Adj R-sq	0.7717		
C.V.	38.02865				

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter= 0	Prob > T
AGE1	1	0.216685	0.23914791	0.906	0.0105
EXPDSN	1	-20.820483	29.99936689	-0.694	0.0512
TH	1	0.138074	0.04958408	2.785	0.0114
PSE	1	0.328737	0.10999755	2.989	0.0073
DL1	1	17.655164	30.62681612	0.576	0.0875
DL2	1	18.064029	30.63639956	0.590	0.0975
DL3	1	18.381956	30.63624915	0.600	0.0885

In	R-square	Adjusted R-square	C(p)	Root MSE	Variables in Model
1	0.4412660	0.4189166	28.6161	0.6880954	EXPDSN
1	0.4242109	0.4011794	30.1917	0.6985184	PSE
1	0.4063750	0.3826300	31.8394	0.7092547	AGE1
1	0.2644231	0.2350000	44.9529	0.7895146	DL1
1	0.2509777	0.2210168	46.1950	0.7966976	TH
1	0.2447552	0.2145455	46.7699	0.8000000	DL3
1	0.0071885	-.0325239	68.7164	0.9172327	DL2

2	0.6033276	0.5702715	15.6448	0.5917340	EXPDSN PSE
2	0.5872546	0.5528591	17.1296	0.6036034	AGE1 PSE
2	0.5638447	0.5274984	19.2922	0.6204847	AGE1 TH
2	0.5600446	0.5233817	19.6433	0.6231819	EXPDSN TH
2	0.5518015	0.5144516	20.4048	0.6289929	PSE DL1
2	0.5462266	0.5084121	20.9198	0.6328926	TH PSE
2	0.5395534	0.5011828	21.5363	0.6375293	PSE DL3
2	0.5223561	0.4825525	23.1250	0.6493257	EXPDSN DL1
2	0.5062316	0.4650842	24.6146	0.6601949	EXPDSN DL3
2	0.5056879	0.4644952	24.6648	0.6605583	TH DL1
2	0.4930660	0.4508215	25.8308	0.6689386	AGE1 DL1
2	0.4815786	0.4383768	26.8920	0.6764754	AGE1 EXPDSN
2	0.4766080	0.4329920	27.3512	0.6797106	AGE1 DL3
2	0.4732349	0.4293378	27.6628	0.6818974	TH DL3
2	0.4451075	0.3988665	30.2612	0.6998661	EXPDSN DL2
2	0.4278426	0.3801628	31.8562	0.7106705	PSE DL2
2	0.4103105	0.3611697	33.4758	0.7214765	AGE1 DL2
2	0.3332605	0.2776989	40.5937	0.7671647	DL1 DL3
2	0.3332605	0.2776989	40.5937	0.7671647	DL2 DL3
2	0.3332605	0.2776989	40.5937	0.7671647	DL1 DL2
2	0.2604255	0.1987942	47.3223	0.8079816	TH DL2

3	0.6887634	0.6481673	9.7522	0.5354236	AGE1 TH PSE
3	0.6866526	0.6457812	9.9472	0.5372362	TH PSE DL1
3	0.6837208	0.6424670	10.2180	0.5397437	EXPDSN TH PSE
3	0.6657695	0.6221742	11.8764	0.5548496	TH PSE DL3
3	0.6630709	0.6191236	12.1257	0.5570850	AGE1 TH DL1
3	0.6609352	0.6167093	12.3230	0.5588478	EXPDSN PSE DL1
3	0.6593062	0.6148678	12.4735	0.5601887	EXPDSN TH DL1
3	0.6494018	0.6036716	13.3884	0.5682731	EXPDSN PSE DL3

Appendix B : FDBIT Pavements

3	0.6469807	0.6009347	13.6121	0.5702318	AGE1 PSE DL1
3	0.6389619	0.5918700	14.3529	0.5766718	AGE1 TH DL3
3	0.6357582	0.5882484	14.6488	0.5792248	EXPDSN TH DL3
3	0.6354413	0.5878901	14.6781	0.5794767	AGE1 PSE DL3
3	0.6212076	0.5717998	15.9930	0.5906808	AGE1 EXPDSN PSE
3	0.6060122	0.5546225	17.3968	0.6024120	EXPDSN PSE DL2
3	0.5899411	0.5364551	18.8814	0.6145757	AGE1 PSE DL2
3	0.5868383	0.5329477	19.1681	0.6168964	PSE DL1 DL2
3	0.5868383	0.5329477	19.1681	0.6168964	PSE DL2 DL3
3	0.5868383	0.5329477	19.1681	0.6168964	PSE DL1 DL3
3	0.5694920	0.5133388	20.7705	0.6297132	AGE1 TH DL2
3	0.5679853	0.5116355	20.9097	0.6308142	AGE1 EXPDSN DL
3	0.5655092	0.5088365	21.1385	0.6326194	EXPDSN TH DL2
3	0.5642544	0.5074180	21.2544	0.6335323	AGE1 EXPDSN TH
3	0.5637505	0.5068484	21.3009	0.6338984	TH DL2 DL3
3	0.5637505	0.5068484	21.3009	0.6338984	TH DL1 DL3
3	0.5637505	0.5068484	21.3009	0.6338984	TH DL1 DL2
3	0.5515024	0.4930028	22.4324	0.6427355	TH PSE DL2
3	0.5514541	0.4929481	22.4369	0.6427701	AGE1 EXPDSN DL3
3	0.5426597	0.4830066	23.2493	0.6490407	EXPDSN DL1 DL2
3	0.5426597	0.4830066	23.2493	0.6490407	EXPDSN DL1 DL3
3	0.5426597	0.4830066	23.2493	0.6490407	EXPDSN DL2 DL3
3	0.5153431	0.4521270	25.7728	0.6681430	AGE1 DL2 DL3
3	0.5153431	0.4521270	25.7728	0.6681430	AGE1 DL1 DL3
3	0.5153431	0.4521270	25.7728	0.6681430	AGE1 DL1 DL2
3	0.4855279	0.4184228	28.5272	0.6883878	AGE1 EXPDSN DL2

4	0.7615447	0.7181892	5.0286	0.4791906	AGE1 TH PSE DL1
4	0.7573542	0.7132368	5.4157	0.4833828	EXPDSN TH PSE DL1
4	0.7436757	0.6970713	6.6794	0.4968207	AGE1 TH PSE DL3
4	0.7397534	0.6924359	7.0417	0.5006074	EXPDSN TH PSE DL3
4	0.7206141	0.6698167	8.8098	0.5186890	TH PSE DL1 DL2
4	0.7206141	0.6698167	8.8098	0.5186890	TH PSE DL1 DL3
4	0.7206141	0.6698167	8.8098	0.5186890	TH PSE DL2 DL3
4	0.6928186	0.6369674	11.3776	0.5438790	AGE1 TH PSE DL2
4	0.6925526	0.6366530	11.4021	0.5441144	AGE1 EXPDSN TH PSE
4	0.6876838	0.6308991	11.8519	0.5484058	EXPDSN TH PSE DL2
4	0.6853437	0.6281335	12.0681	0.5504565	AGE1 TH DL1 DL3
4	0.6853437	0.6281335	12.0681	0.5504565	AGE1 TH DL2 DL3
4	0.6853437	0.6281335	12.0681	0.5504565	AGE1 TH DL1 DL2
4	0.6833599	0.6257889	12.2514	0.5521890	AGE1 EXPDSN PSE DL1
4	0.6820114	0.6241953	12.3759	0.5533636	EXPDSN TH DL1 DL2

Appendix B : FDBIT Pavements

4	0.6820114	0.6241953	12.3759	0.5533636	EXPDSN TH DL1 DL3
4	0.6820114	0.6241953	12.3759	0.5533636	EXPDSN TH DL2 DL3
4	0.6756293	0.6166528	12.9655	0.5588890	EXPDSN PSE DL1 DL2
4	0.6756293	0.6166528	12.9655	0.5588890	EXPDSN PSE DL1 DL3
4	0.6756293	0.6166528	12.9655	0.5588890	EXPDSN PSE DL2 DL3
4	0.6712764	0.6115085	13.3676	0.5626266	AGE1 EXPDSN PSE DL3
4	0.6645175	0.6035207	13.9920	0.5683812	AGE1 EXPDSN TH DL1
4	0.6625829	0.6012343	14.1708	0.5700177	AGE1 PSE DL2 DL3
4	0.6625829	0.6012343	14.1708	0.5700177	AGE1 PSE DL1 DL2
4	0.6625829	0.6012343	14.1708	0.5700177	AGE1 PSE DL1 DL3
4	0.6397344	0.5742316	16.2815	0.5890012	AGE1 EXPDSN TH DL3
4	0.6240152	0.5556544	17.7337	0.6017137	AGE1 EXPDSN PSE DL2
4	0.5901095	0.5155840	20.8659	0.6282590	AGE1 EXPDSN DL1 DL2
4	0.5901095	0.5155840	20.8659	0.6282590	AGE1 EXPDSN DL1 DL3
4	0.5901095	0.5155840	20.8659	0.6282590	AGE1 EXPDSN DL2 DL3
4	0.5700067	0.4918261	22.7230	0.6434809	AGE1 EXPDSN TH DL2

5	0.7782900	0.7255019	5.4817	0.4729325	AGE1 TH PSE DL1 DL2
5	0.7782900	0.7255019	5.4817	0.4729325	AGE1 TH PSE DL1 DL3
5	0.7782900	0.7255019	5.4817	0.4729325	AGE1 TH PSE DL2 DL3
5	0.7746173	0.7209548	5.8210	0.4768335	EXPDSN TH PSE DL1 DL2
5	0.7746173	0.7209548	5.8210	0.4768335	EXPDSN TH PSE DL1 DL3
5	0.7746173	0.7209548	5.8210	0.4768335	EXPDSN TH PSE DL2 DL3
5	0.7668402	0.7113259	6.5394	0.4849906	AGE1 EXPDSN TH PSE DL1
5	0.7478856	0.6878583	8.2905	0.5043190	AGE1 EXPDSN TH PSE DL3
5	0.6995658	0.6280338	12.7543	0.5505303	AGE1 EXPDSN PSE DL1 DL2
5	0.6995658	0.6280338	12.7543	0.5505303	AGE1 EXPDSN PSE DL1 DL3
5	0.6995658	0.6280338	12.7543	0.5505303	AGE1 EXPDSN PSE DL2 DL3
5	0.6968404	0.6246595	13.0060	0.5530217	AGE1 EXPDSN TH PSE DL2
5	0.6868211	0.6122547	13.9316	0.5620859	AGE1 EXPDSN TH DL2 DL3
5	0.6868211	0.6122547	13.9316	0.5620859	AGE1 EXPDSN TH DL1 DL3
5	0.6868211	0.6122547	13.9316	0.5620859	AGE1 EXPDSN TH DL1 DL2

6	0.7835040	0.7185553	7.0000	0.4788793	AGE1 EXPDSN TH PSE DL2 DL3
6	0.7835040	0.7185553	7.0000	0.4788793	AGE1 EXPDSN TH PSE DL1 DL3
6	0.7835040	0.7185553	7.0000	0.4788793	AGE1 EXPDSN TH PSE DL1 DL2

NOTE: Models of not full rank are not included

Correlation Analysis
Simple Statistics

Variable	Mean	Std Dev	Sum	Minimum	Maximum
AGE	4.77778	1.64862	129.00000	1.00000	7.00000
TH	14.09259	2.81109	380.50000	9.80000	19.00000
CUMESAL	826563	696944	22317191	53125	2388042
PSE	7.44444	0.97402	201.00000	6.00000	9.00000
DPSE	1.25926	0.90267	34.00000	0	4.00000
DL1	0.44444	0.50637	12.00000	0	1.00000
DL2	0.29630	0.46532	8.00000	0	1.00000
DL3	0.25926	0.44658	7.00000	0	1.00000
AGE1	10.92259	5.00700	294.90990	1.00000	18.52026
DSN	0.11894	0.03667	3.21150	0.03397	0.16838
EXPDSN	1.12703	0.04078	30.42982	1.03455	1.18338

Pearson's Correlation Coefficients : FDBIT Pavements

	Age	Th	C.ESAL	PSE	DSN	Age1	EXPDSN	DPSE
Age	1.00	0.18	0.65	0.42	0.61	0.99	0.42	0.35
Th	-	1.00	0.51	0.25	0.38	0.17	0.25	0.51
C.ESAL	-	-	1.00	0.45	0.69	0.60	0.55	0.55
PSE	-	-	-	1.00	0.43	0.42	0.28	0.65
DSN	-	-	-	-	1.00	0.58	0.99	0.49
Age1	-	-	-	-	-	1.00	0.43	0.68
EXPDSN	-	-	-	-	-	-	1.00	0.61
DPSE	-	-	-	-	-	-	-	1.00