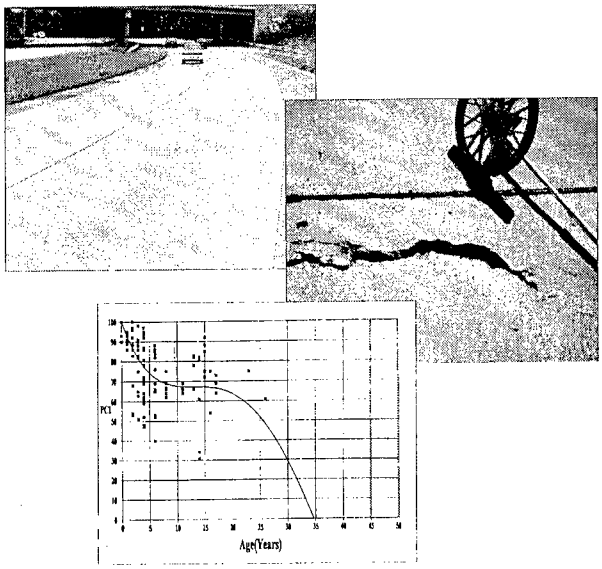
SD97-05-F

PB98-167448

SD Department of Transportation
Office of Research



Statistical Methods for Pavement Performance Curve Building, Historical Analysis, Data Sampling and Storage

Study SD97-05
Final Report
Appendix E and F

Prepared by: APTech

Applied Pavement Technology, Inc.

Providing engineering solutions to improve pavement performance

1606 Willow View Rd.
Suite 2F
Urbana, IL 61802

August 1998

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APPENDIX E

PERFORMANCE MODELS FOR FLEXIBLE PAVEMENT FAMILIES

APPENDIX E1

PERFORMANCE MODELS FOR AONC PAVEMENT FAMILY

APPENDIX E1.1

PERFORMANCE MODELS FOR AONC - O PAVEMENT FAMILY

PAVEMENT FAMILY: AONC – Original

Number of data points available for regression of performance curves : 2004

Range of years of data available for the given family : 03 to 33 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 23 years
   Historical data forced to end at 23 years has a R^2 value of : 0.429
   Optimum forced end point is obtained at 22 years with a R^2 value of : 0.621 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 26 years
   Historical data forced to end at 26 years has a R^2 value of : 0.169
   Optimum forced end point is obtained at 22 years with a R^2 value of : 0.435 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 21 years
   Historical data forced to end at 21 years has a R^2 value of : 0.589
   Optimum forced end point is obtained at 22 years with a R^2 value of : 0.624 ✓

4. Roughness [ROUGH]
   Existing Expert Model ends at @ 18 years
   Historical data forced to end at 18 years has a R^2 value of : 0.293
   Optimum forced end point is obtained at 21 years with a R^2 value of : 0.353 ✓

5. Rut Depth [RUT_DP]
   Existing Expert Model ends at @ 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.413
   Optimum forced end point is obtained at 22 years with a R^2 value of : 0.652 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 26 years
   Historical data forced to end at 26 years has a R^2 value of : 0.004
   Optimum forced end point is obtained at 18 years with a R^2 value of : 0.348 ✓

BLOCK CRACKING ON AONC

DEX = C - M * AGE ^ B

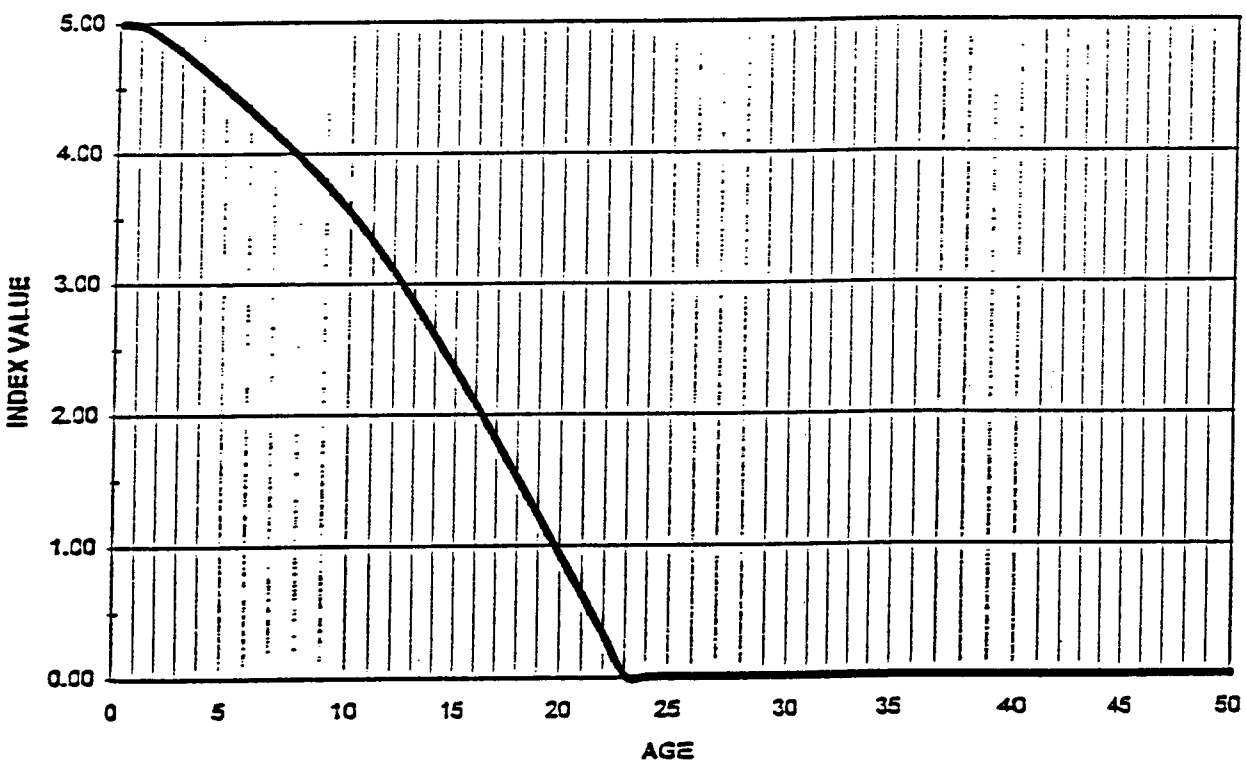
Value: 5.03
Value: 0.051853
Value: 1.46

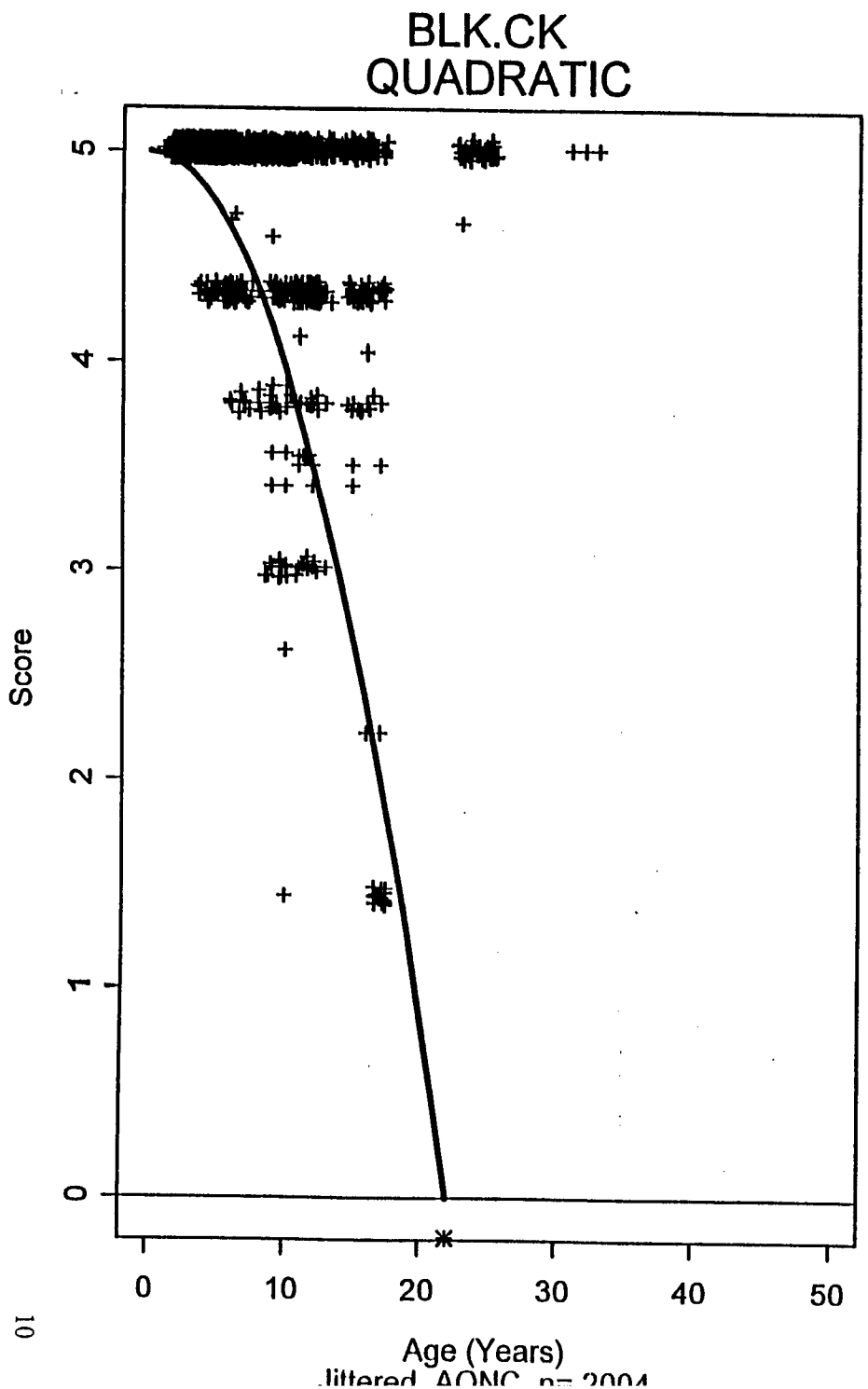
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.98	4.89	4.77	4.64	4.49	4.32	4.14	3.95	3.75	3.53

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.31	3.08	2.84	2.59	2.33	2.06	1.78	1.50	1.21	0.92	0.61

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 09:39:20 1998
Family: AONC
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 22

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.094	0.023	4.045	0.001

R-Squared = 0.506

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.139	0.027	5.115	0

R-Squared = 0.621

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.167	0.034	4.936	0

R-Squared = 0.604

FATIGUE CRACKING ON AONC

NDEX = C - M * AGE ^ B

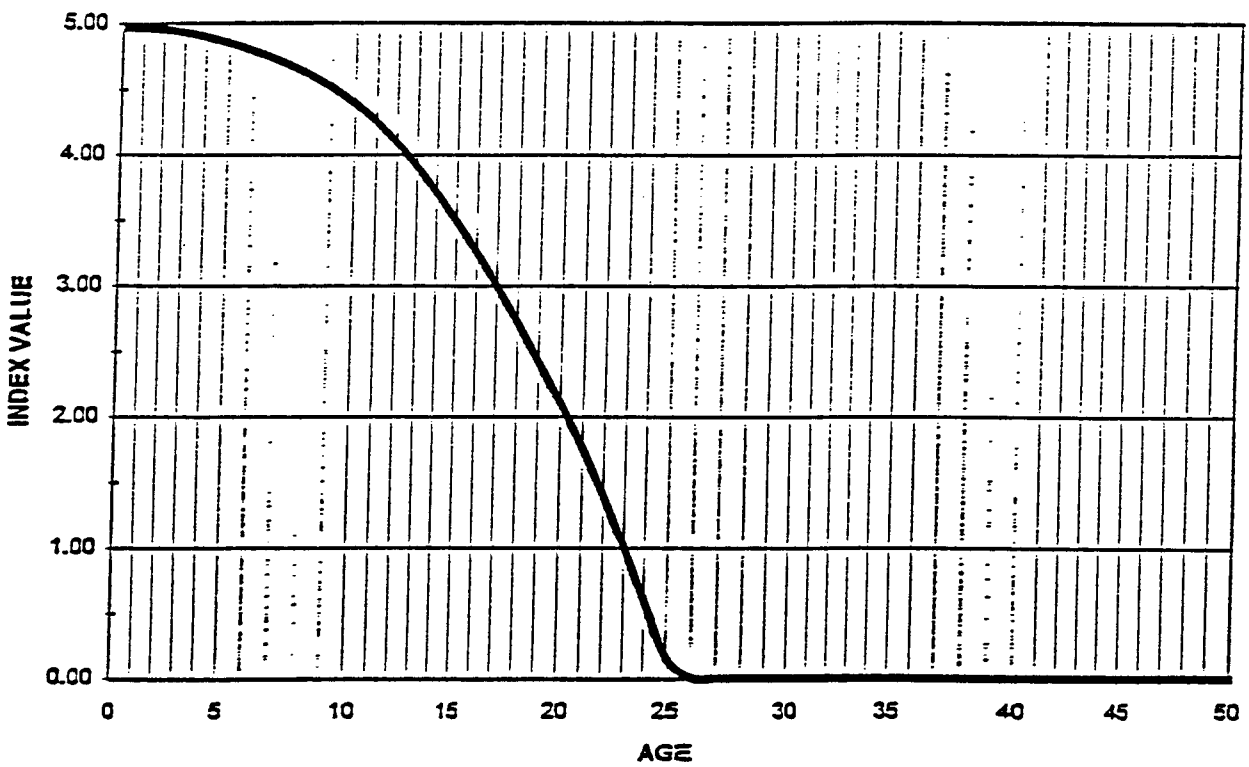
C Value: 4.97
M Value: 0.00294
B Value: 2.30

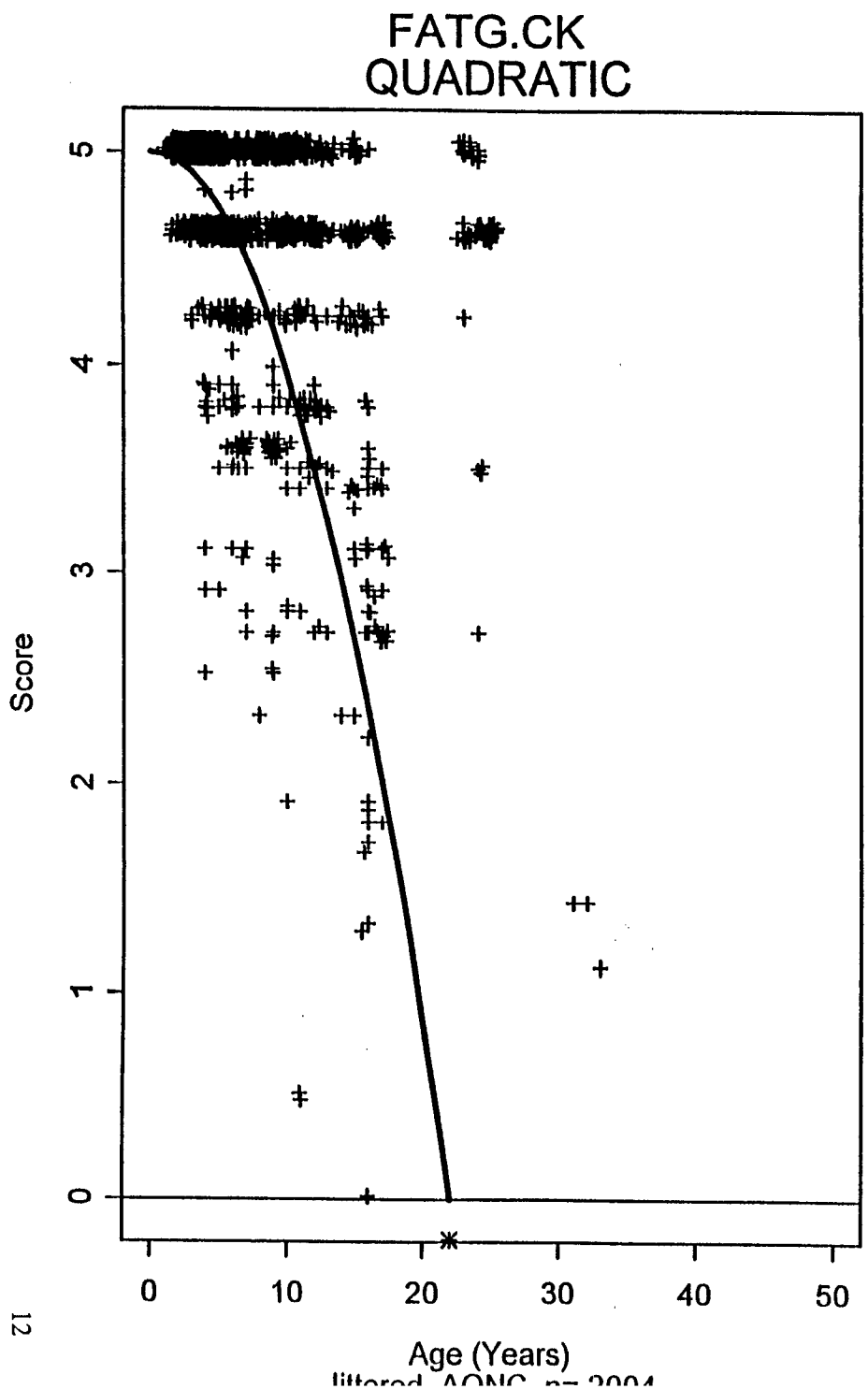
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.97	4.97	4.96	4.93	4.90	4.85	4.79	4.71	4.62	4.51	4.38

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.24	4.08	3.90	3.70	3.48	3.24	2.98	2.70	2.40	2.08	1.74

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.37	0.99	0.58	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:37:47 1998
Family: AONC
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 22

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.034	0.026	1.312	0.208

R-Squared = 0.097

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.11	0.031	3.511	0.003

R-Squared = 0.435

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.141	0.032	4.45	0

R-Squared = 0.553

PATCH DETERIORATION ON AONC

NDEX = C - M * AGE ^ B

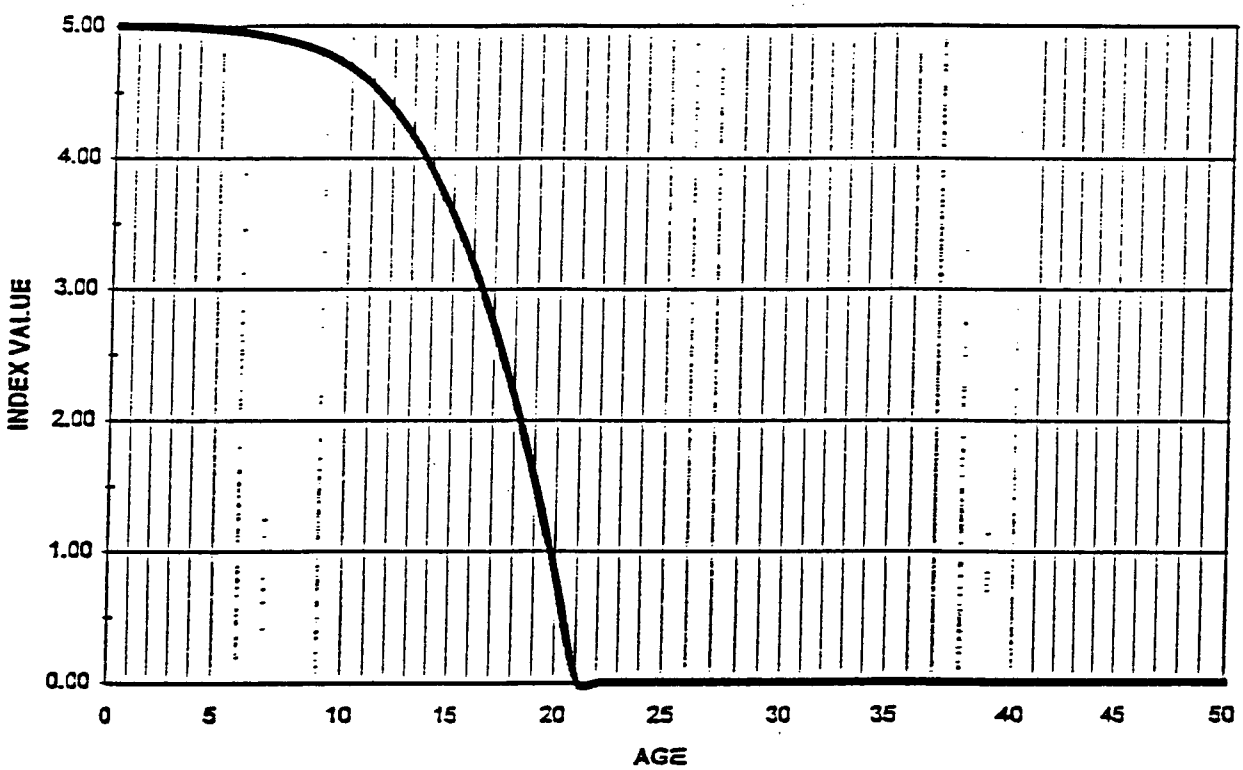
C Value: 5.00
M Value: 0.0000628
B Value: 3.71

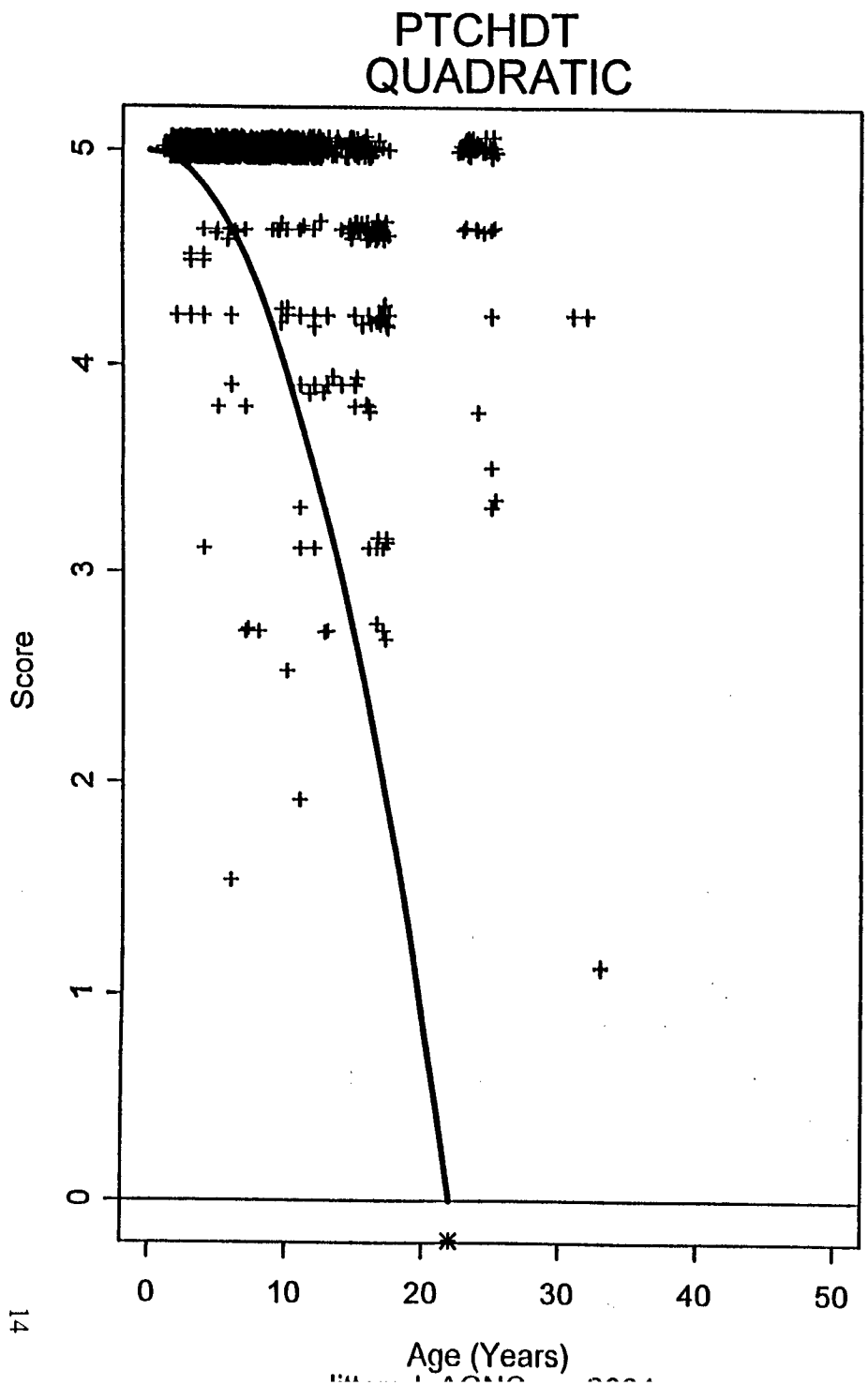
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	4.99	4.98	4.95	4.91	4.86	4.78	4.68

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.54	4.37	4.15	3.88	3.55	3.16	2.59	2.15	1.52	0.79	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:38:46 1998
Family: AONC
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 22

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.162	0.03	5.334	0

R-Squared = 0.64

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.164	0.032	5.155	0

R-Squared = 0.624

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.168	0.035	4.81	0

R-Squared = 0.591

ROUGHNESS ON AONC

NDEX = C - M * AGE ^ B

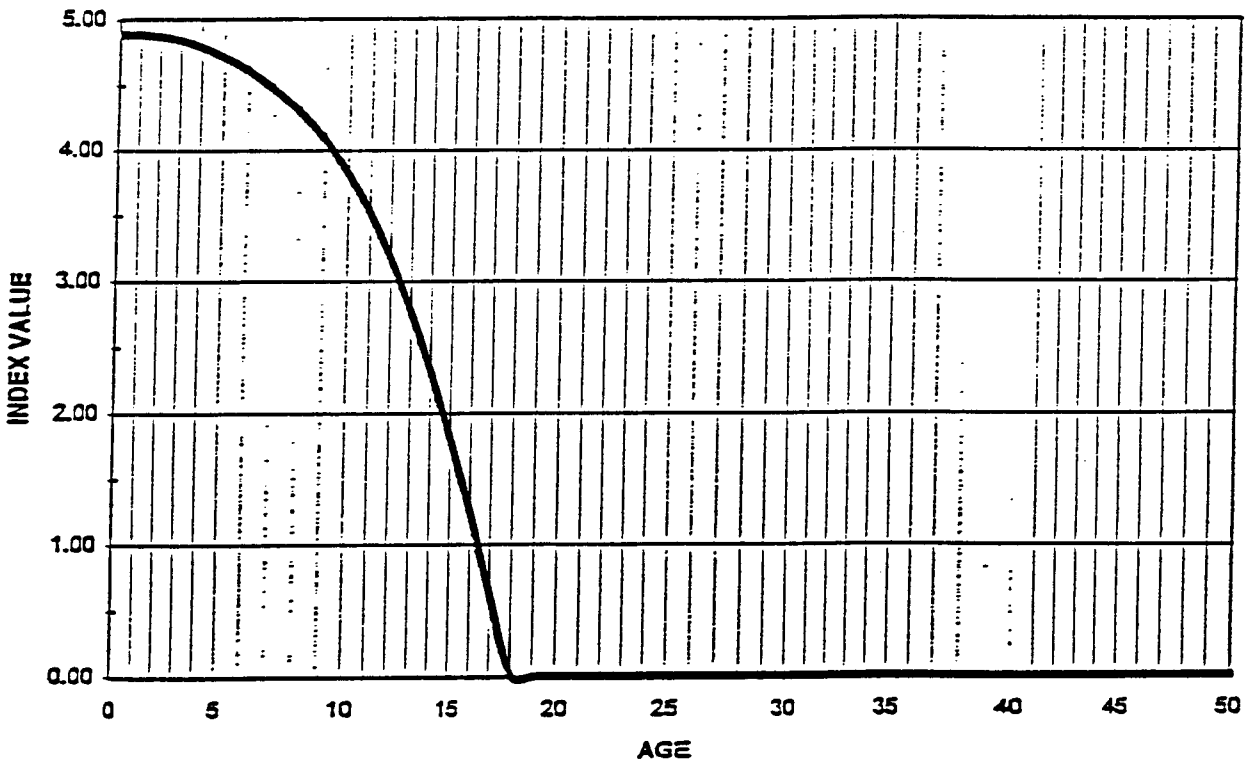
C Value: 4.89
M Value: 0.00279358
B Value: 2.59

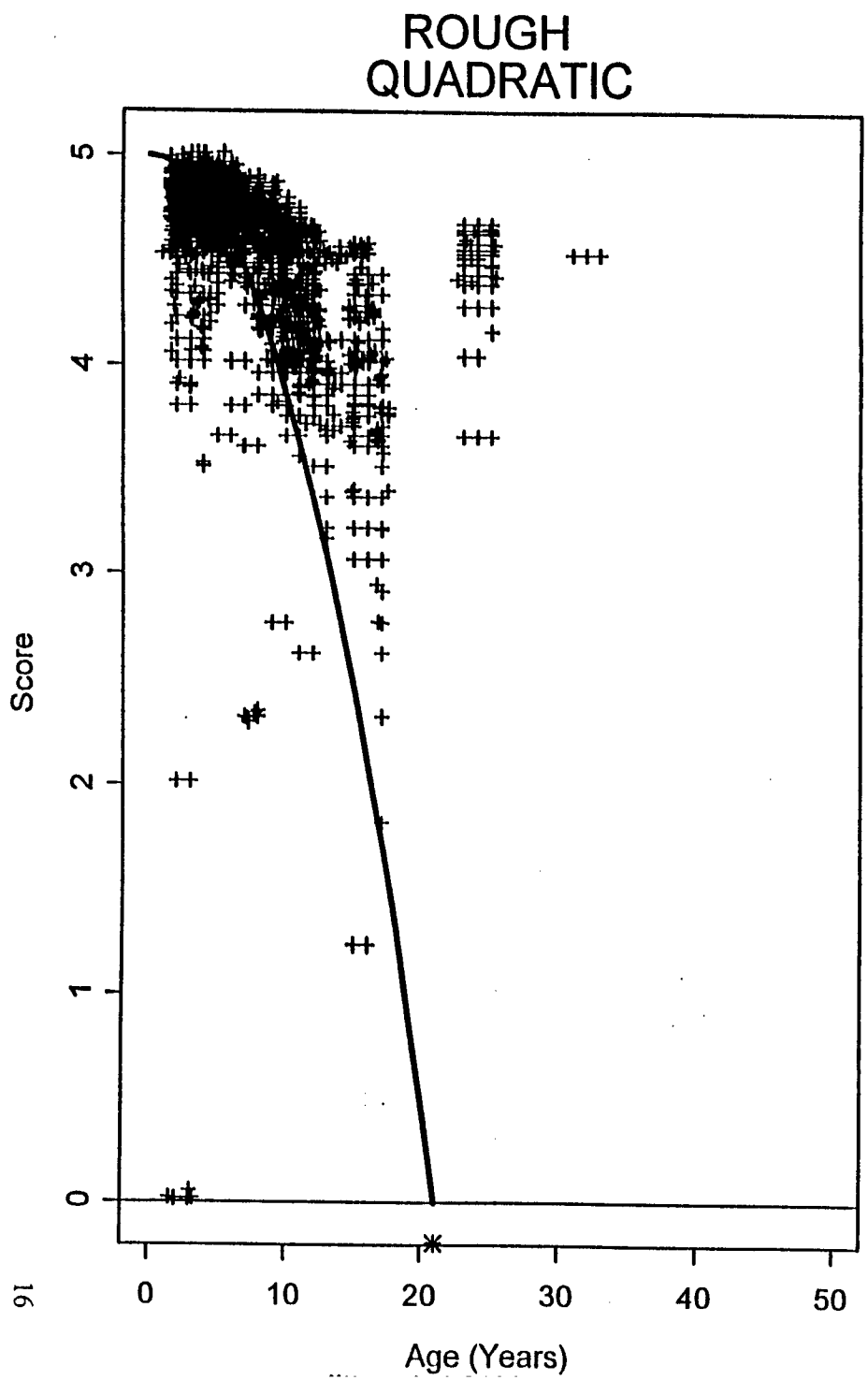
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.89	4.87	4.84	4.79	4.71	4.60	4.46	4.28	4.06	3.80

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.50	3.15	2.75	2.29	1.78	1.22	0.59	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:40:14 1998
Family: AONC
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 21

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.048	0.028	1.748	0.1

R-Squared = 0.16

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.089	0.03	2.953	0.009

R-Squared = 0.353

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.114	0.032	3.54	0.003

R-Squared = 0.439

RUT DEPTH ON AONC

DEX = C - M * AGE ^ B

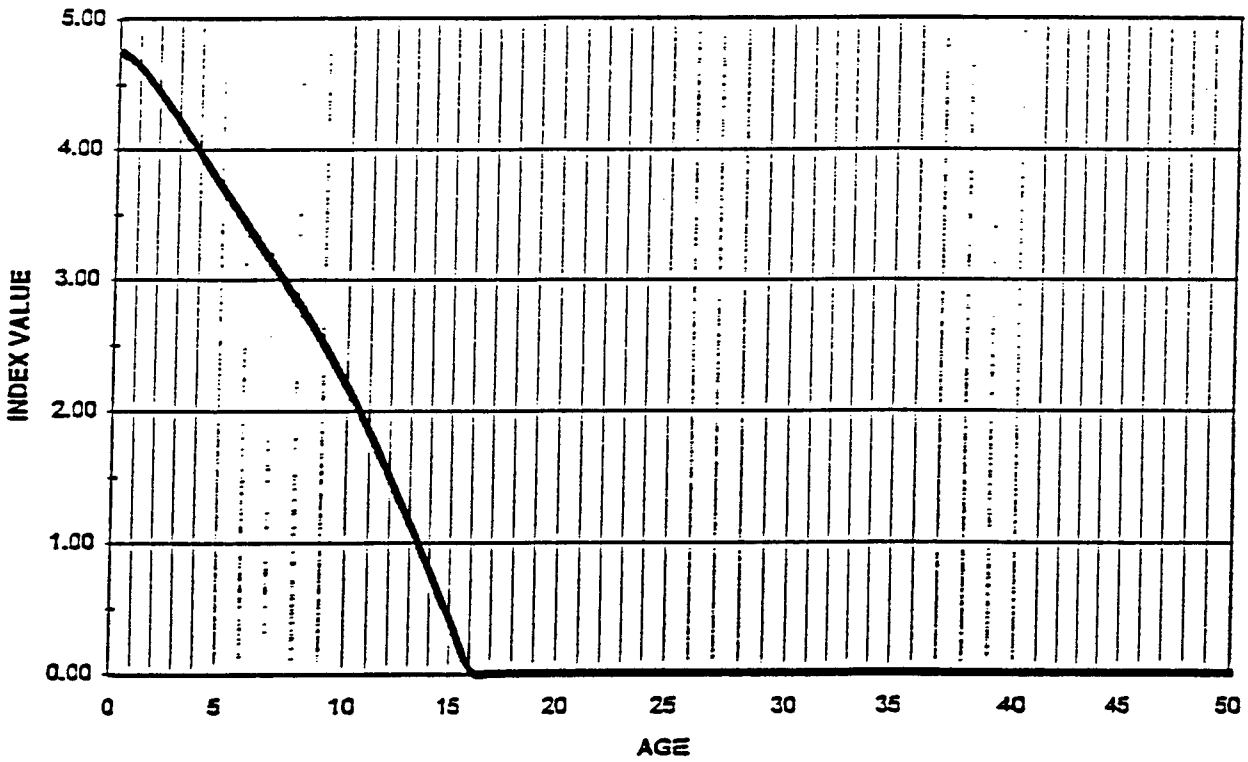
Value: 4.76
Value: 0.1362671
Value: 1.28

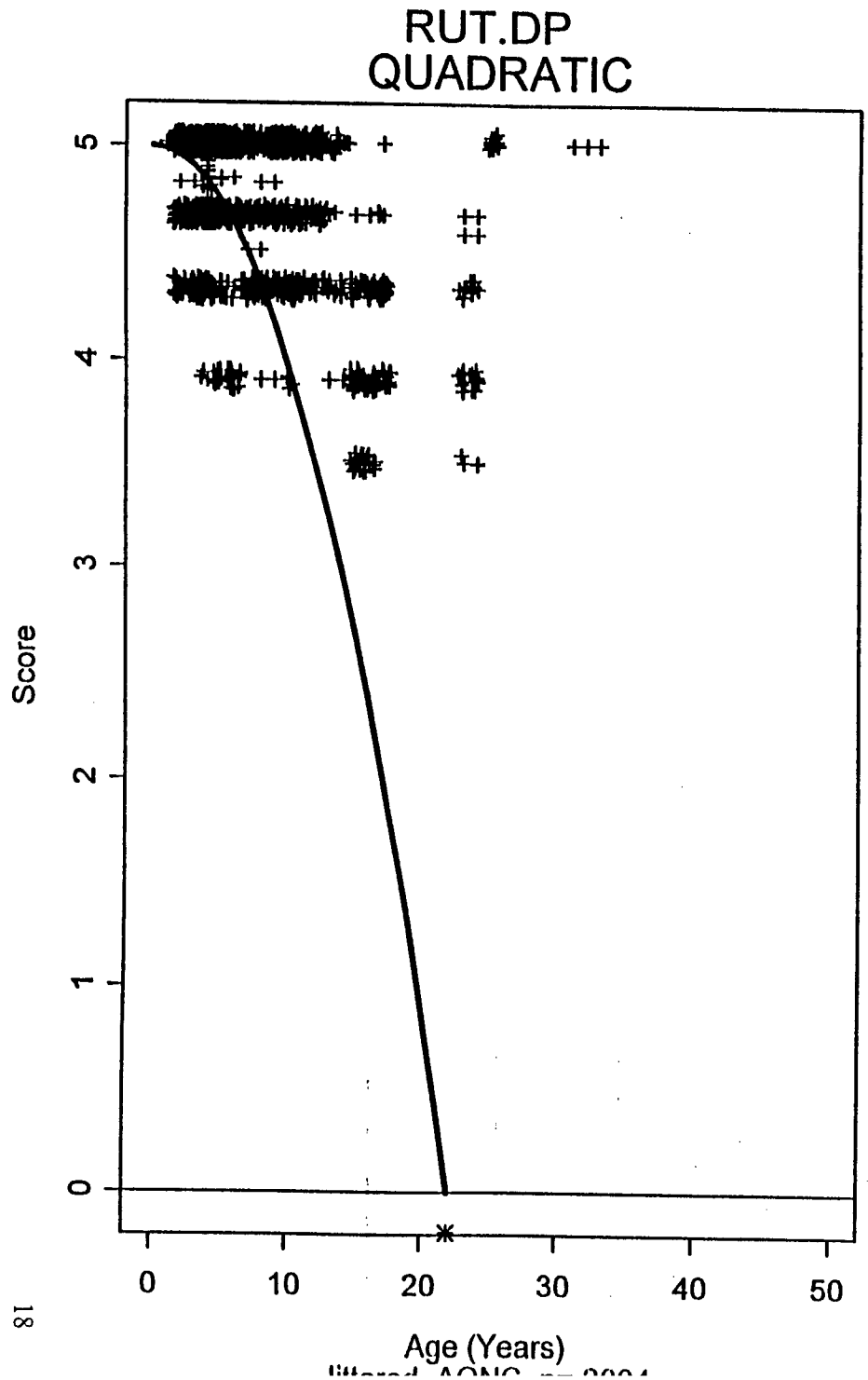
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.76	4.62	4.43	4.20	3.96	3.69	3.41	3.12	2.81	2.49	2.16

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.83	1.48	1.13	0.77	0.40	0.02	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:39:29 1998
Family: AONC
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 22

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.052	0.03	1.742	0.101

R-Squared = 0.159

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.147	0.027	5.478	0

R-Squared = 0.652

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.158	0.029	5.52	0

R-Squared = 0.656

TRANSVERSE CRACKING ON AONC

IDEX = C - M * AGE ^ B

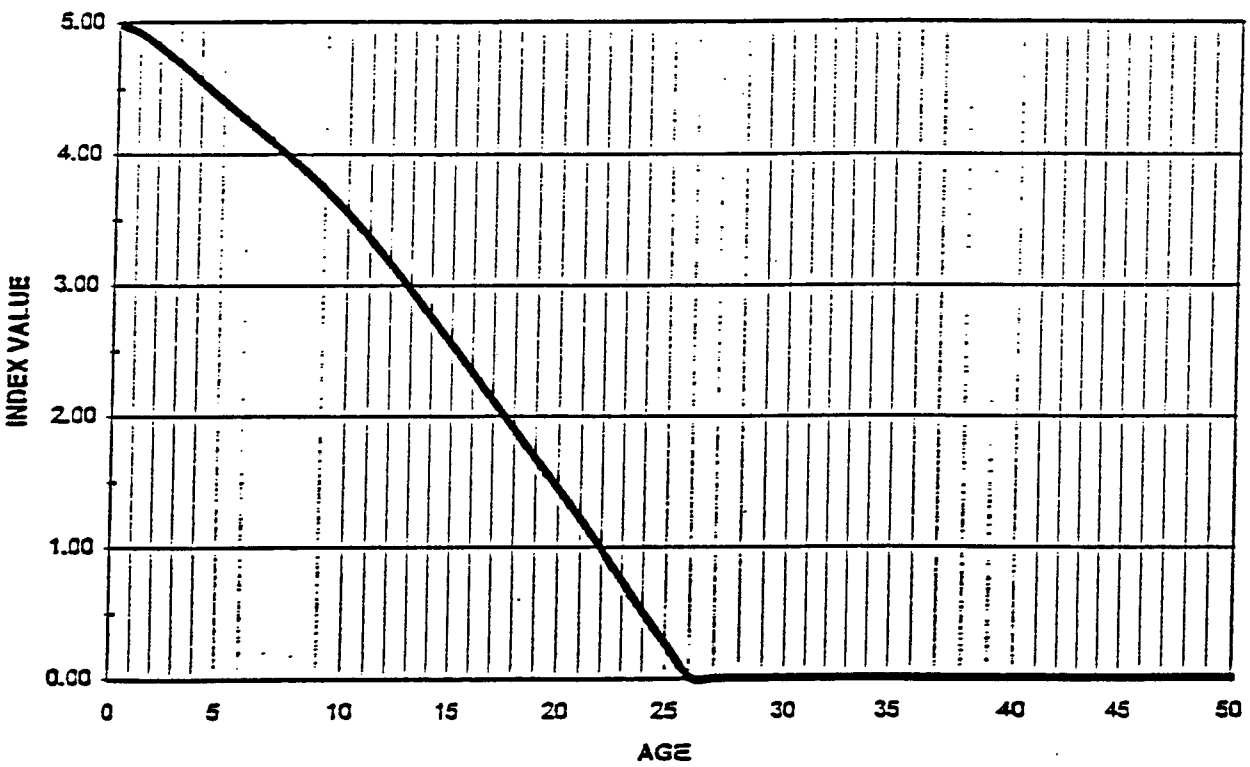
: Value: 4.99
I Value: 0.07459734
: Value: 1.29

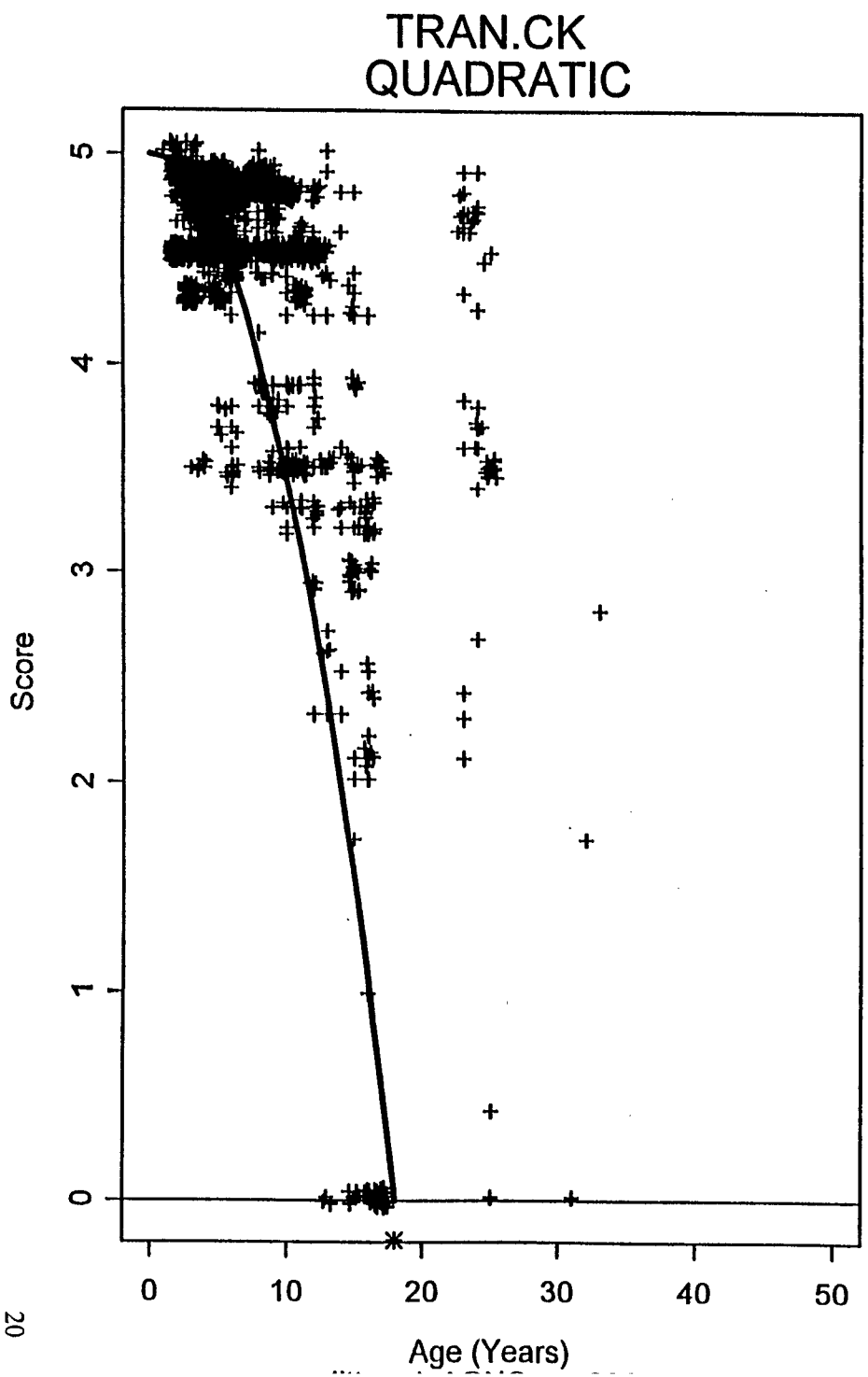
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.99	4.92	4.81	4.68	4.54	4.40	4.24	4.07	3.90	3.72	3.54

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.35	3.15	2.95	2.74	2.54	2.32	2.11	1.89	1.66	1.43	1.20

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.97	0.73	0.49	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:41:09 1998
Family: AONC
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 18

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.055	0.043	1.276	0.22

R-Squared = 0.092

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.122	0.042	2.92	0.01

R-Squared = 0.348

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.163	0.043	3.802	0.002

R-Squared = 0.475

APPENDIX E1.2

PERFORMANCE MODELS FOR AONC - A PAVEMENT FAMILY

PAVEMENT FAMILY: AONC – A [AC Overlay on Original]

Number of data points available for regression of performance curves : 222

Range of years of data available for the given family : 05 to 17 years

1. Block Cracking [BLK_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.743 ✓

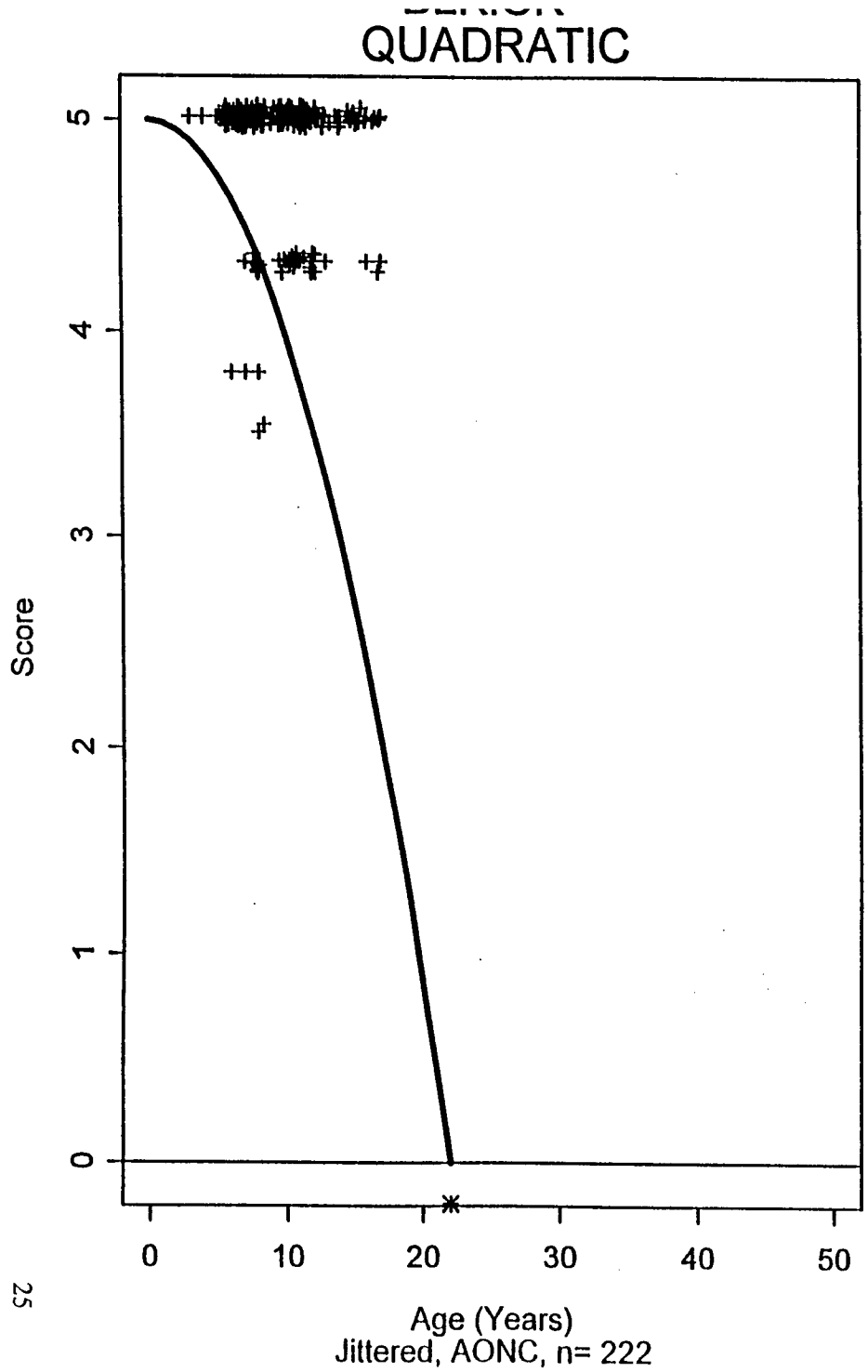
2. Fatigue Cracking [FATG_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 14 years with a R^2 value of : 0.516 ✓

3. Patch Deterioration [PTCH_DT]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 23 years with a R^2 value of : 0.725
   Adjusting from the expert curve of the Original Family use endpoint of 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.723 ✓

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 14 years with a R^2 value of : 0.439 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 23 years with a R^2 value of : 0.656
   Adjusting from the expert curve of the Original Family use endpoint of 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.651 ✓

6. Transverse Cracking [TRAN_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 09 years with a R^2 value of : 0.601 ✓



Date of Analysis: Thu May 7 15:43:09 1998
Family: AONC
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 22

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.183	0.036	5.048	0

R-Squared = 0.645

50TH PERCENTILE
Coefficient Estimates:

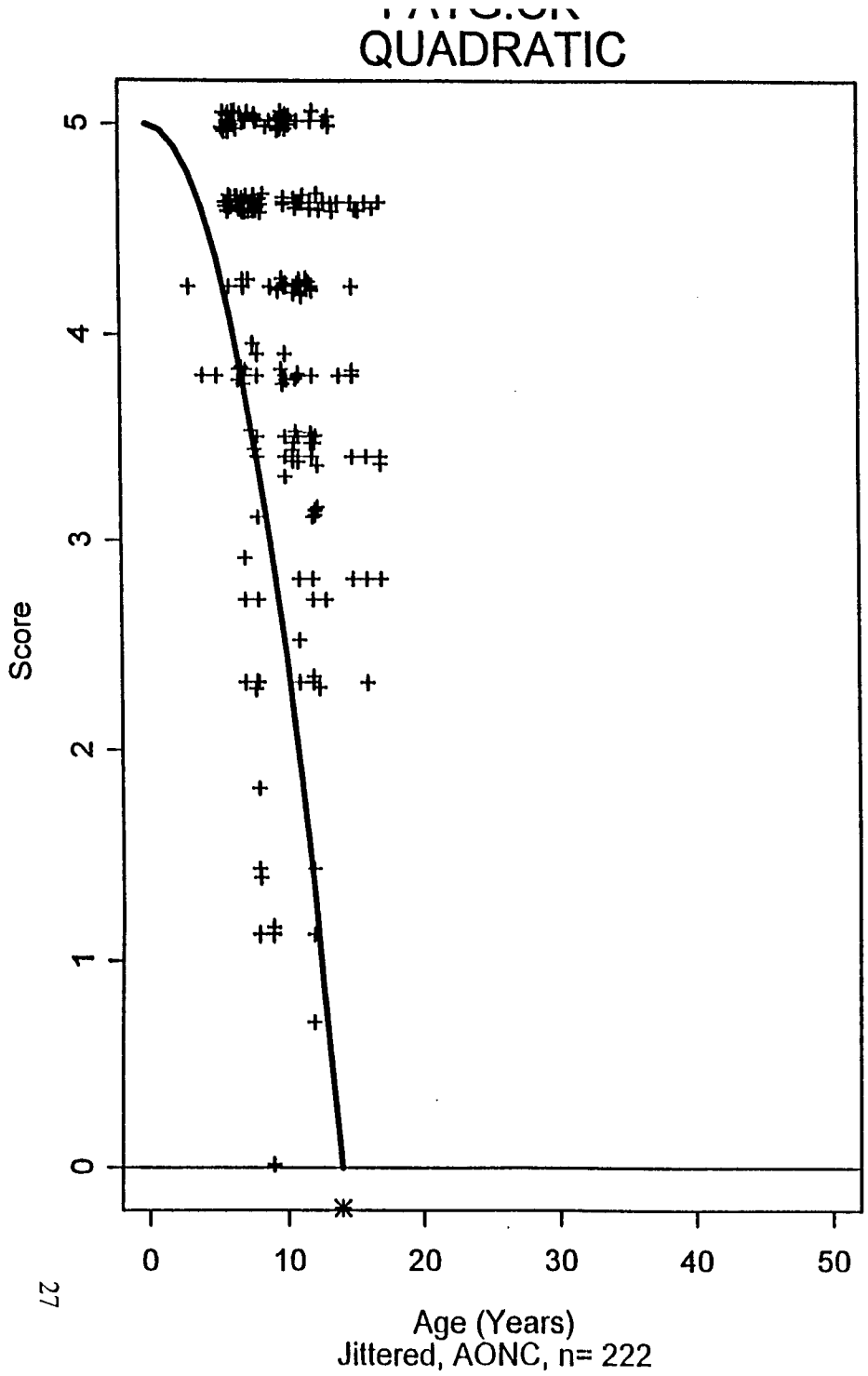
	Value	Std. Error	t value	Pr(>|t|)
1	0.208	0.033	6.369	0

R-Squared = 0.743

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.208	0.033	6.369	0

R-Squared = 0.743



Date of Analysis: Thu May 7 15:43:58 1998
Family: AONC
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 14

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.202	0.136	1.483	0.166

R-Squared = 0.167

50TH PERCENTILE
Coefficient Estimates:

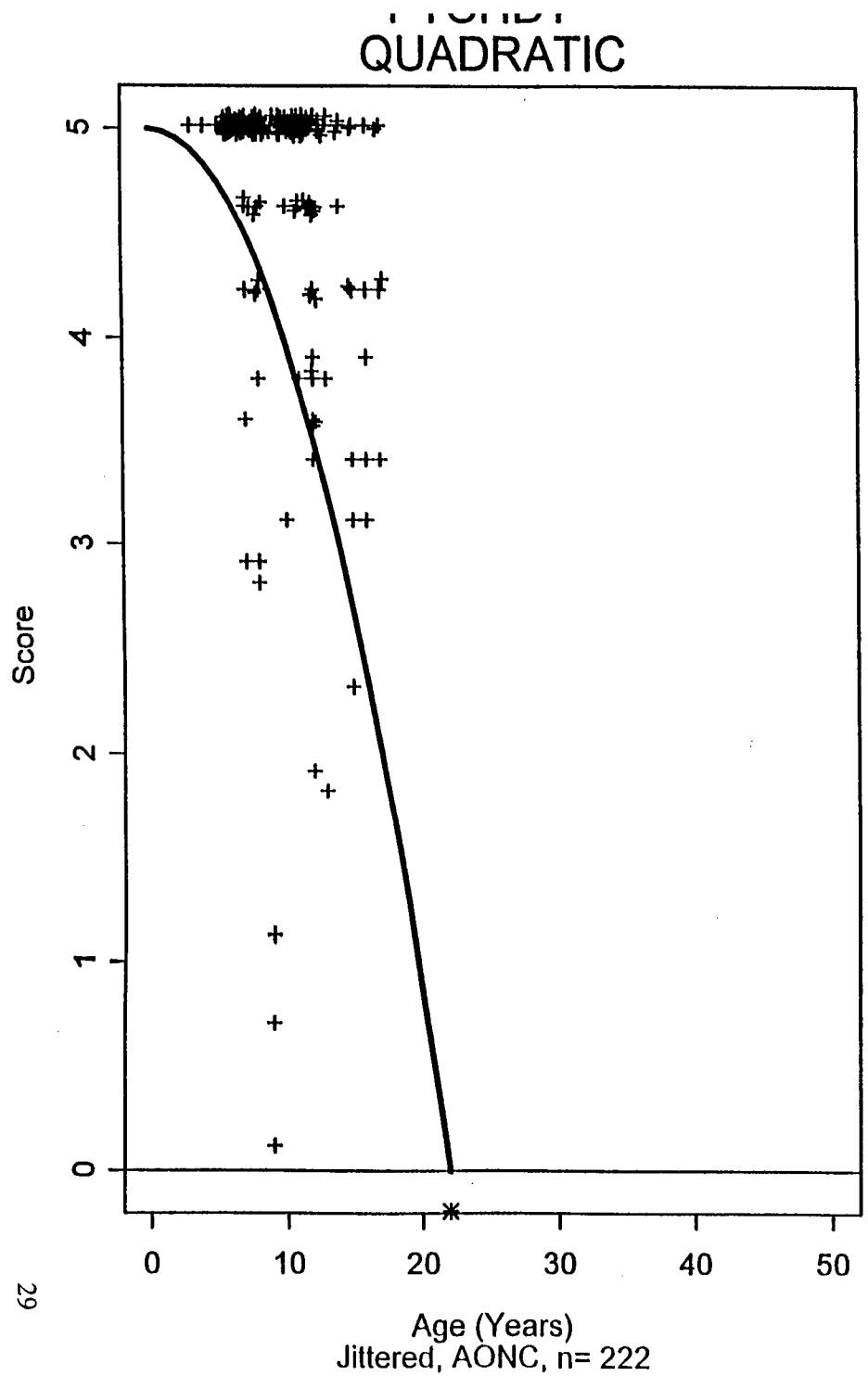
	Value	Std. Error	t value	Pr(>|t|)
1	0.473	0.138	3.421	0.006

R-Squared = 0.515

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.529	0.151	3.494	0.005

R-Squared = 0.526



Date of Analysis: Thu May 7 15:44:50 1998
Family: AONC
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 22

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.125	0.041	3.026	0.009

R-Squared = 0.395

50TH PERCENTILE
Coefficient Estimates:

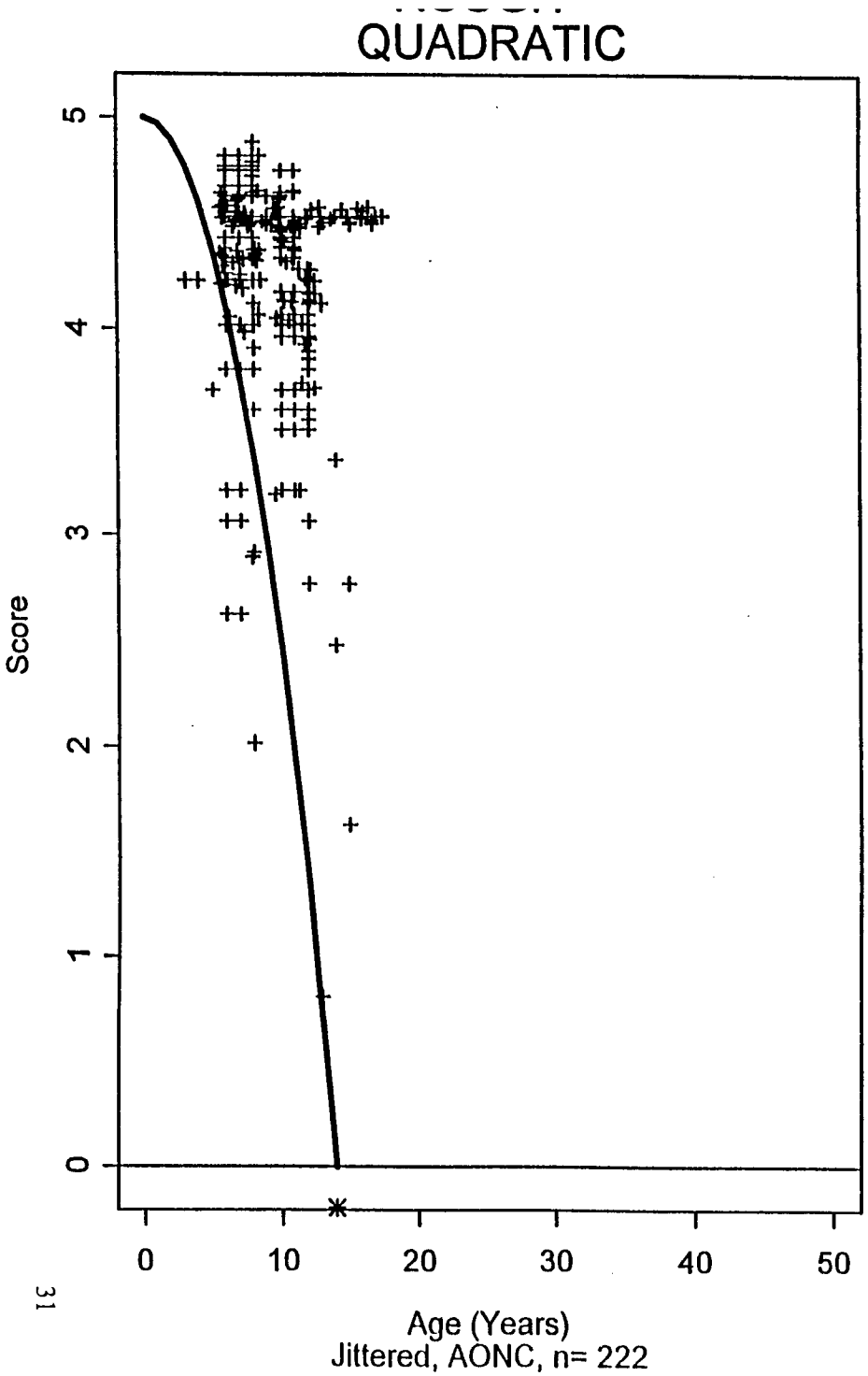
	Value	Std. Error	t value	Pr(>|t|)
1	0.173	0.029	6.046	0

R-Squared = 0.723

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.202	0.029	6.95	0

R-Squared = 0.775



Date of Analysis: Thu May 7 15:45:31 1998
Family: AONC
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 14

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.35	0.131	2.676	0.022

R-Squared = 0.394

50TH PERCENTILE
Coefficient Estimates:

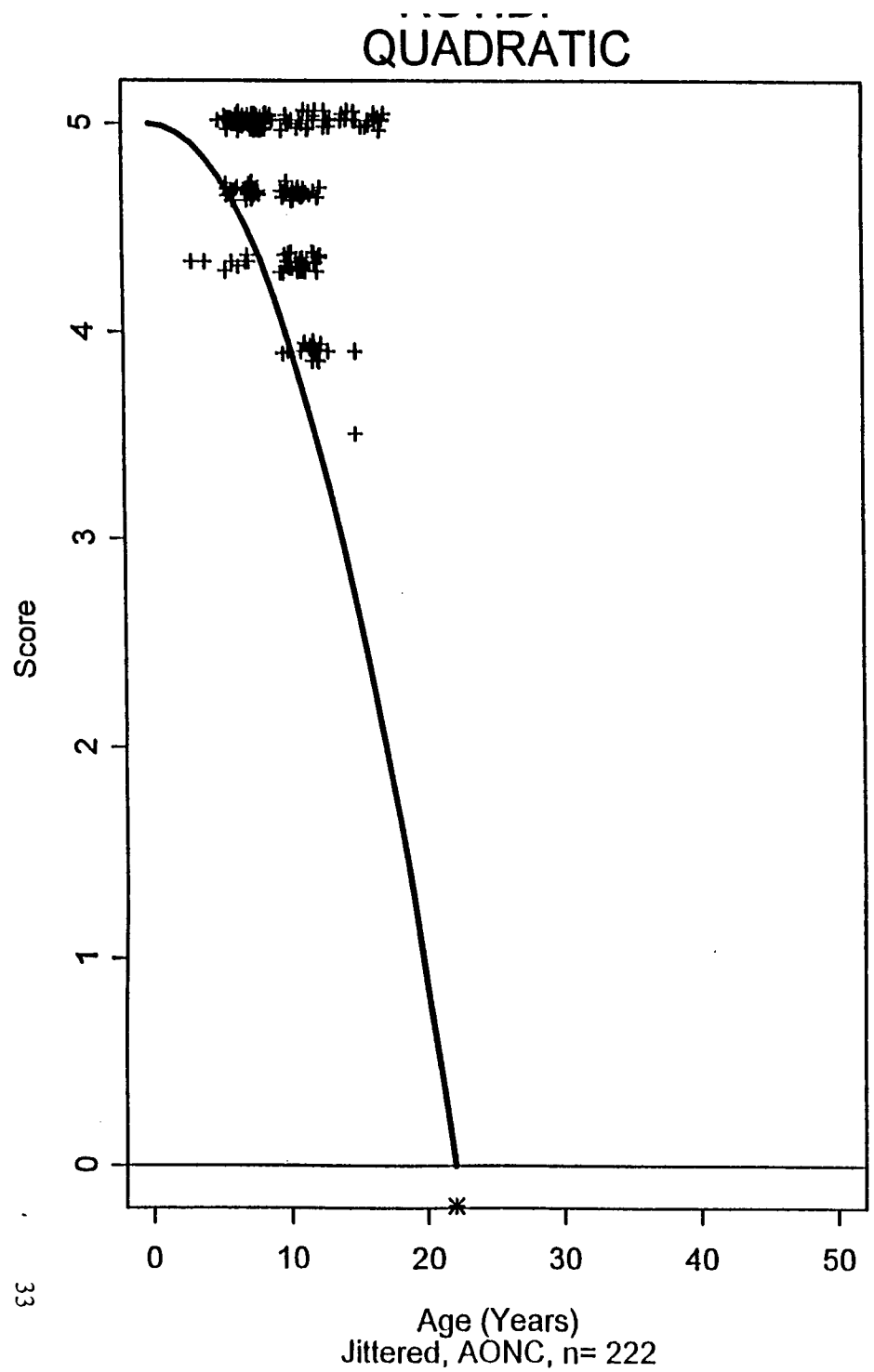
	Value	Std. Error	t value	Pr(>|t|)
1	0.43	0.146	2.936	0.014

R-Squared = 0.439

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.484	0.149	3.241	0.008

R-Squared = 0.489



Date of Analysis: Thu May 7 15:46:13 1998
Family: AONC
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 22

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.114	0.035	3.214	0.006

R-Squared = 0.425

50TH PERCENTILE
Coefficient Estimates:

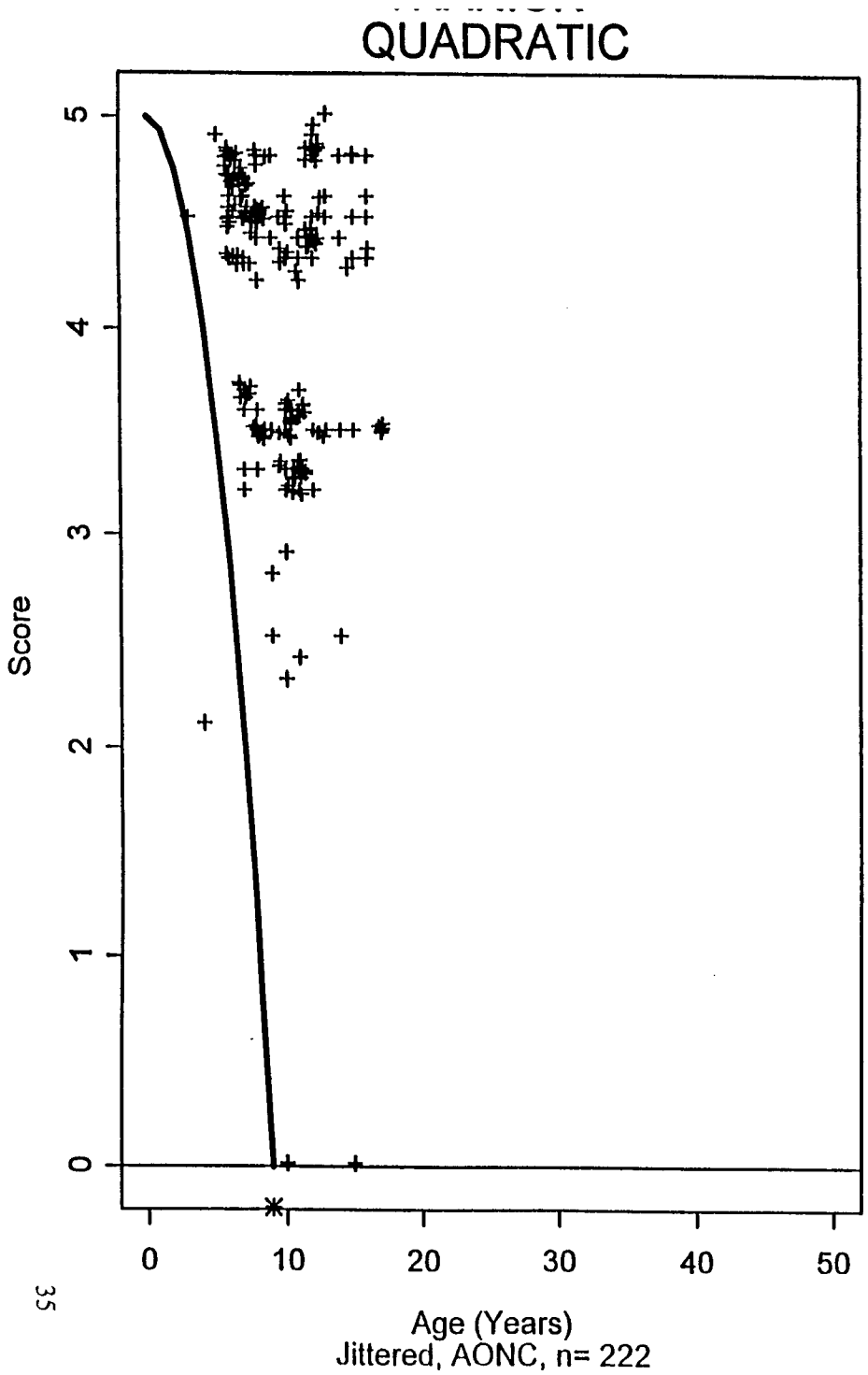
	Value	Std. Error	t value	Pr(>|t|)
1	0.166	0.033	5.114	0

R-Squared = 0.651

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.177	0.033	5.415	0

R-Squared = 0.677



Date of Analysis: Thu May 7 15:47:12 1998
Family: AONC
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 9

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.111	0.337	3.296	0.016

R-Squared = 0.644

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.441	0.479	3.009	0.024

R-Squared = 0.601

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.513	0.505	2.995	0.024

R-Squared = 0.599

APPENDIX E1.3

PERFORMANCE MODELS FOR AONC - M PAVEMENT FAMILY

PAVEMENT FAMILY: AONC – M [Mill and AC Overlay]

Number of data points available for regression of performance curves : 222

Range of years of data available for the given family : 03 to 06 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.096
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.609 ✓

2. Fatigue Cracking [FATG_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.655 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.894 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 21 years
   Historical data forced to end at 21 years has a R^2 value of : 0.382 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.957 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.367
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.641 ✓

BLOCK CRACKING ON AONC AFTER MILL & AC OVERLAY

DEX = C - M * AGE ^ B

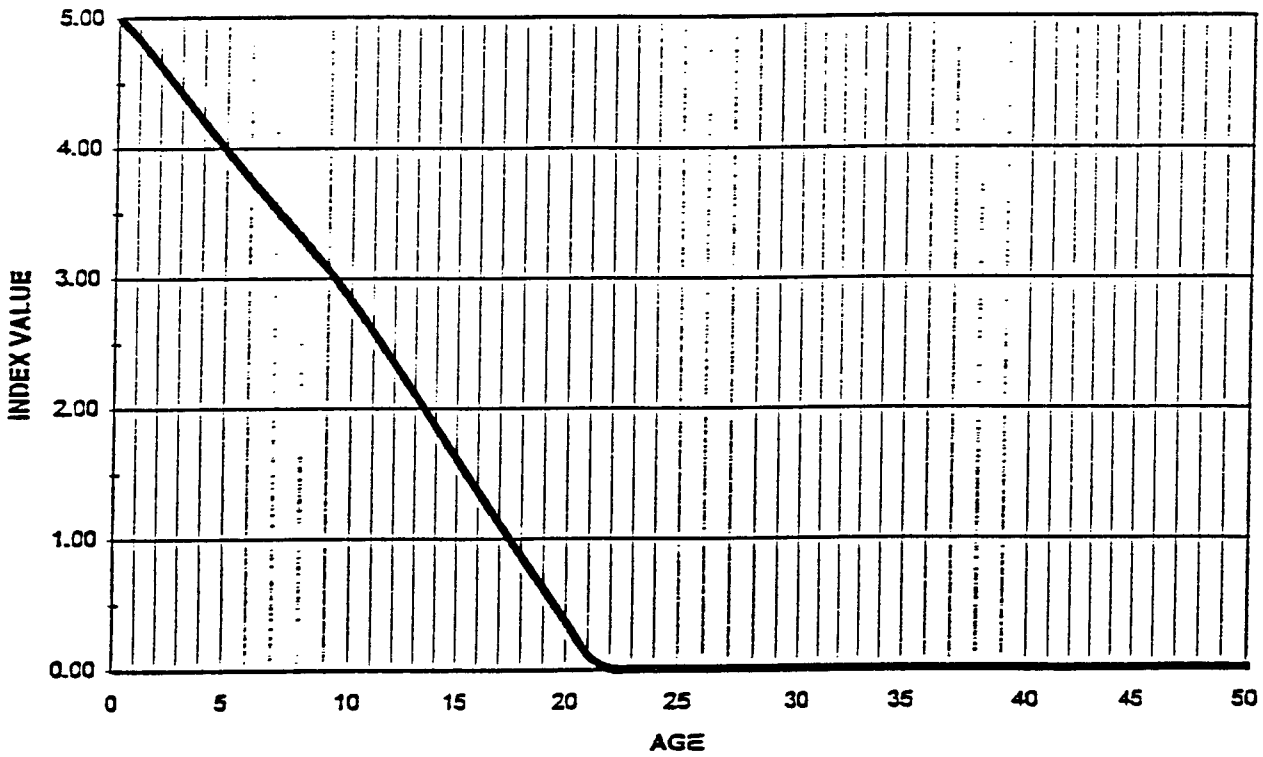
Value: 5.00
Value: 0.1776464
Value: 1.09

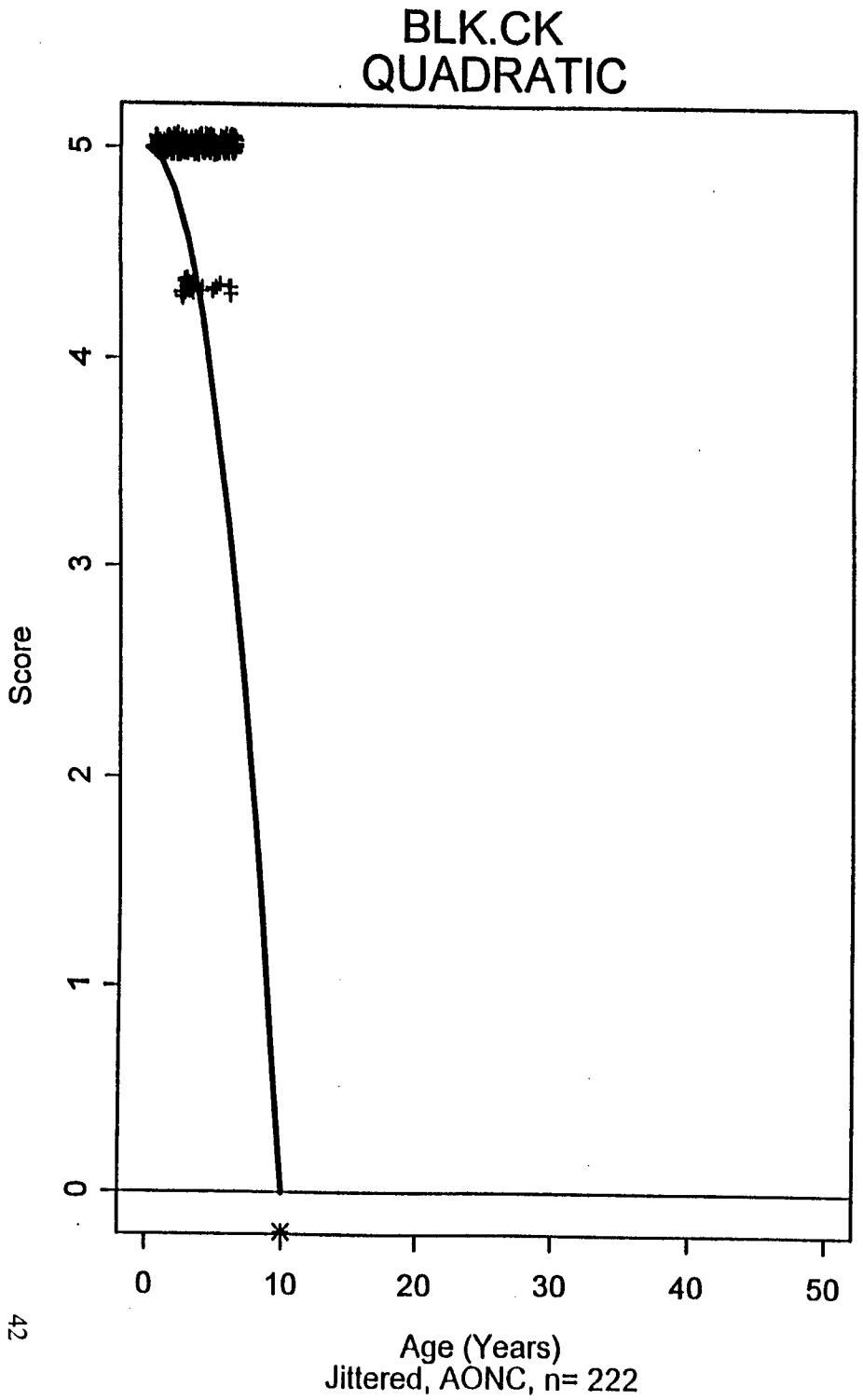
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.82	4.62	4.41	4.19	3.97	3.75	3.52	3.29	3.05	2.81

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.58	2.33	2.09	1.85	1.60	1.35	1.10	0.85	0.60	0.35	0.09

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:55:13 1998
Family: AONC
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.366	0.131	2.792	0.038

R-Squared = 0.609

50TH PERCENTILE
Coefficient Estimates:

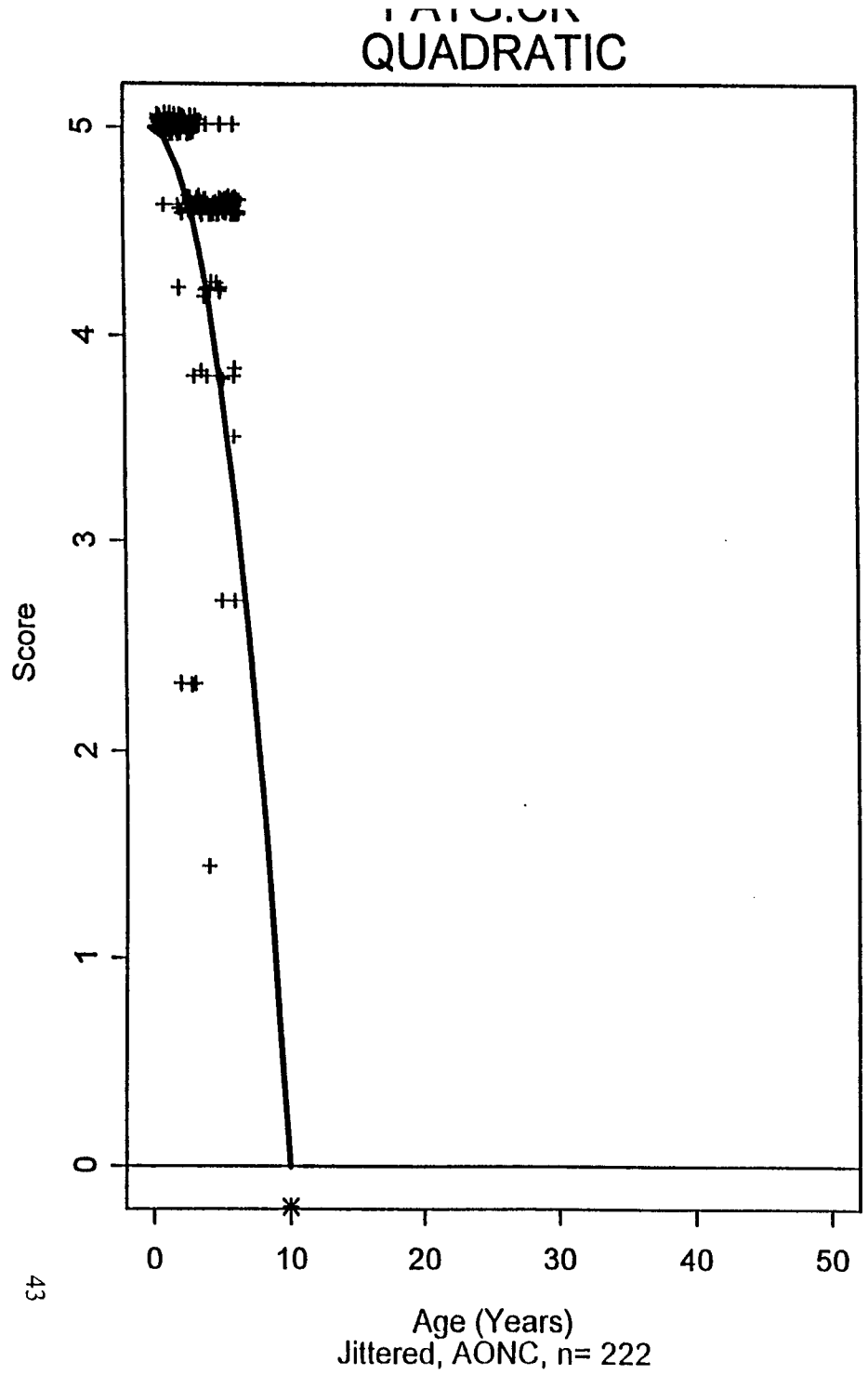
	Value	Std. Error	t value	Pr(>|t|)
1	0.366	0.131	2.792	0.038

R-Squared = 0.609

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.422	0.098	4.317	0.008

R-Squared = 0.788



Date of Analysis: Thu May 7 15:56:01 1998
Family: AONC
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.274	0.089	3.078	0.028

R-Squared = 0.655

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.274	0.089	3.078	0.028

R-Squared = 0.655

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.306	0.076	4.026	0.01

R-Squared = 0.764

PATCH DETERIORATION ON AONC AFTER MILL & AC OVERLAY

NDEX = C - M * AGE ^ B

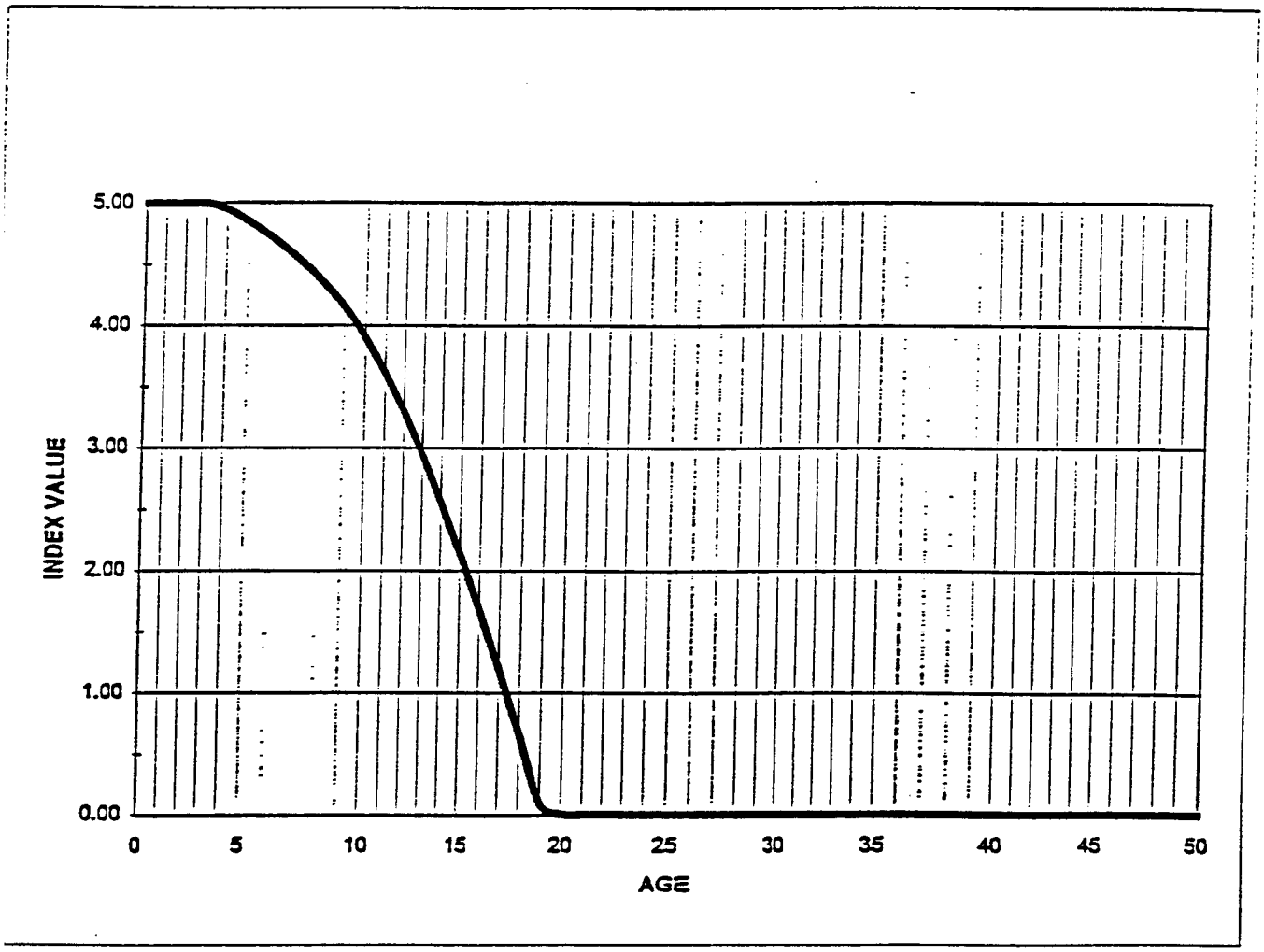
C Value: 5.11
M Value: 0.007735915
B Value: 2.20

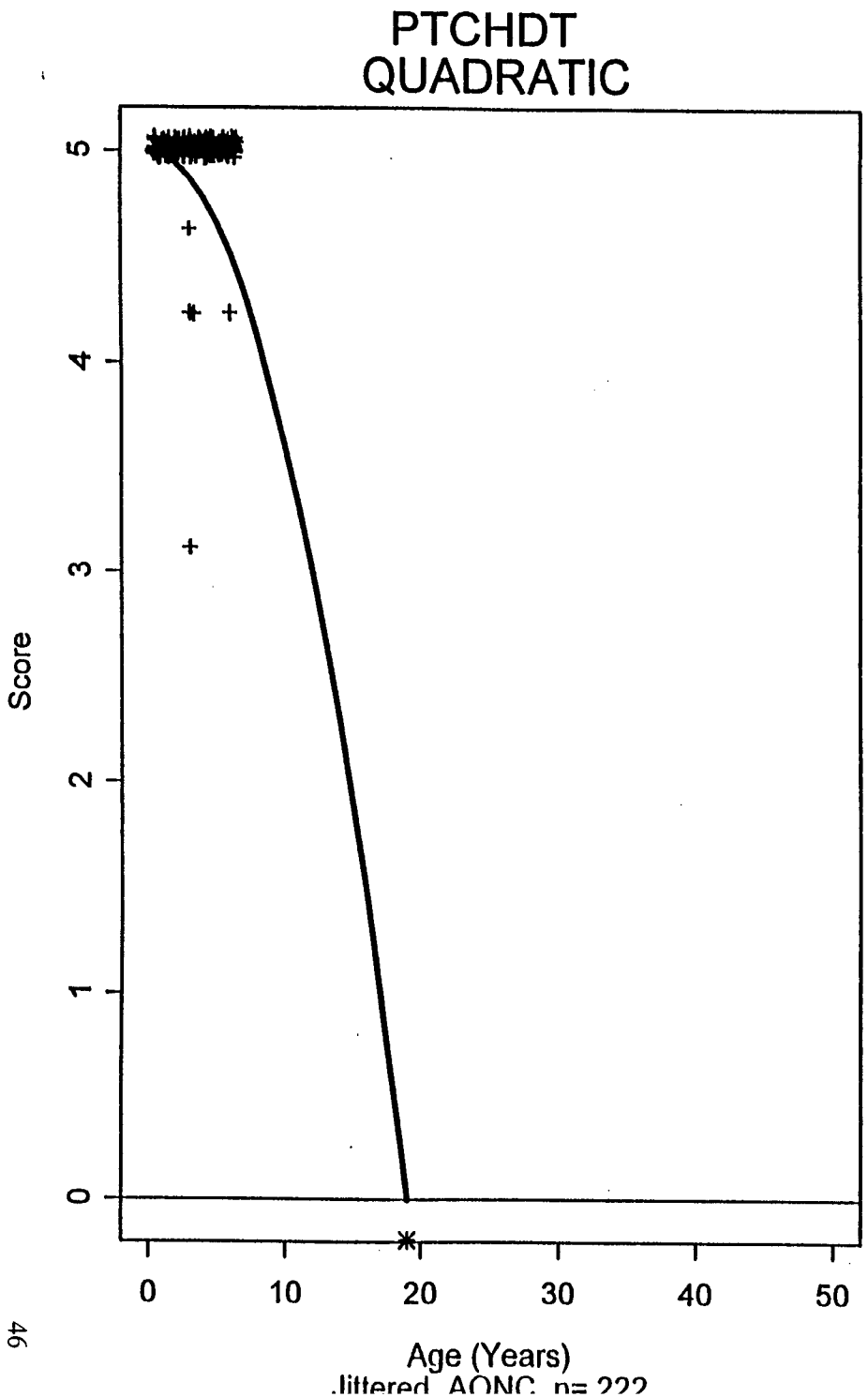
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	4.95	4.84	4.71	4.55	4.36	4.14	3.88

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.60	3.28	2.93	2.54	2.12	1.66	1.17	0.64	0.08	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:56:59 1998
Family: AONC
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 19

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.088	0.014	6.506	0.001

R-Squared = 0.894

50TH PERCENTILE
Coefficient Estimates:

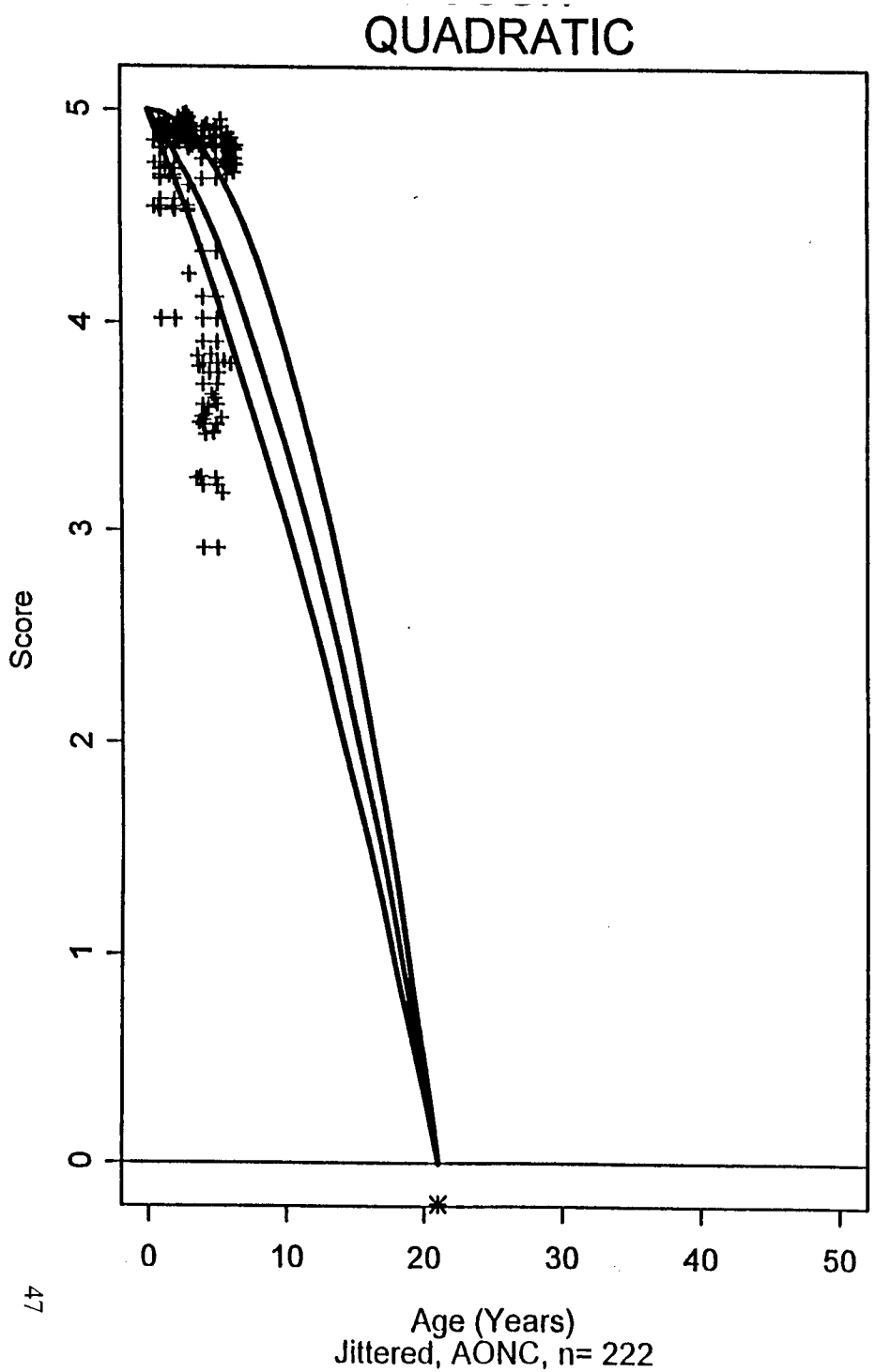
	Value	Std. Error	t value	Pr(>|t|)
1	0.088	0.014	6.506	0.001

R-Squared = 0.894

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.088	0.014	6.506	0.001

R-Squared = 0.894



Date of Analysis: Thu May 7 15:57:53 1998
Family: AONC
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 21

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.159	0.076	-2.09	0.091

R-Squared = 0.466

50TH PERCENTILE
Coefficient Estimates:

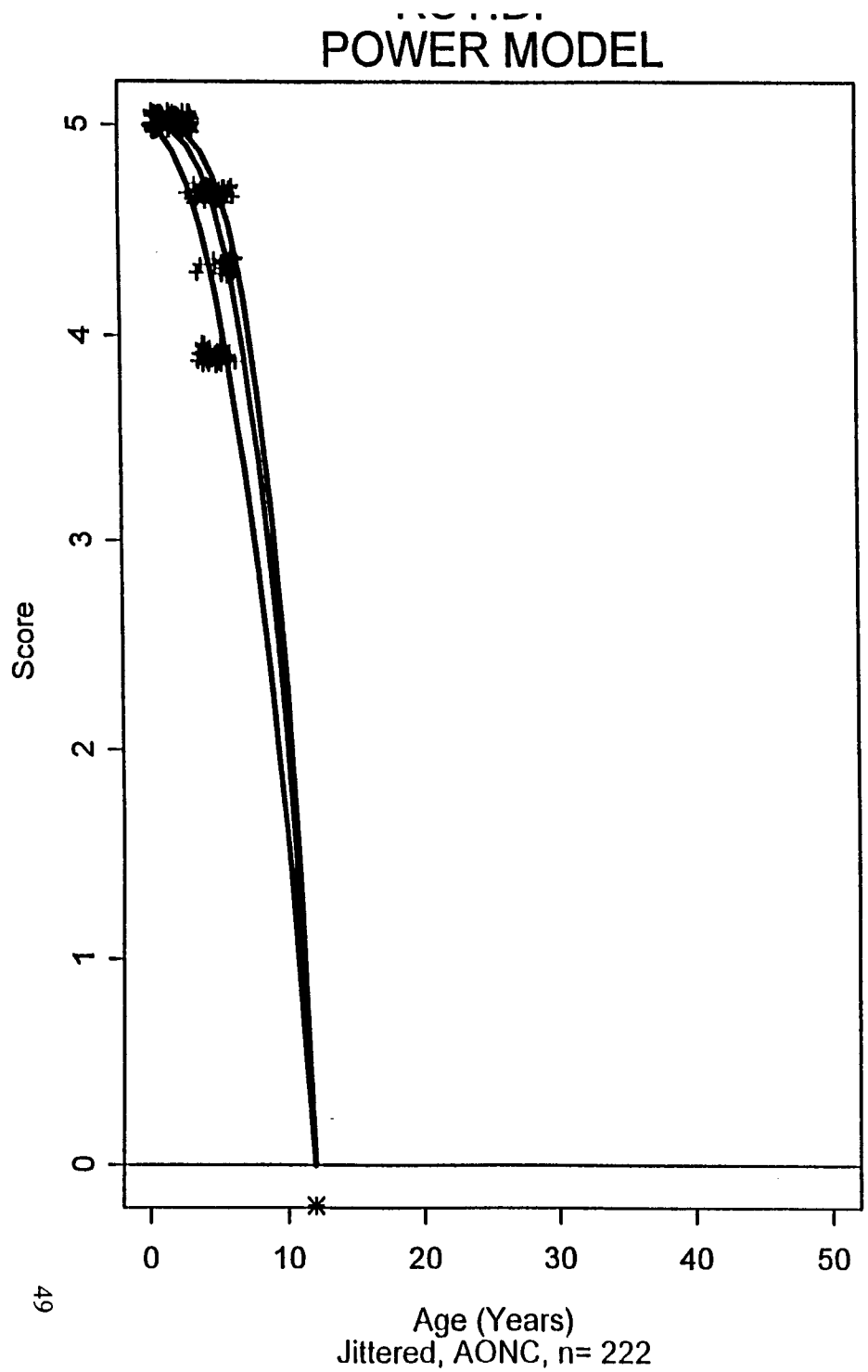
	Value	Std. Error	t value	Pr(>|t|)
1	-0.088	0.05	-1.758	0.139

R-Squared = 0.382

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.023	0.014	1.667	0.156

R-Squared = 0.357



Date of Analysis: Fri May 8 11:01:17 1998
Family: AONC
Index: RUT.DP
Year(s): ALL
Model Type: POWER MODEL
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	2.077	0.299	6.939

R-Squared = 0.739

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	2.855	0.12	23.772

R-Squared = 0.957

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	3.353	0.287	11.693

R-Squared = 0.784

TRANSVERSE CRACKING ON AONC AFTER MILL & AC OVERLAY

IDEX = C - M * AGE ^ B

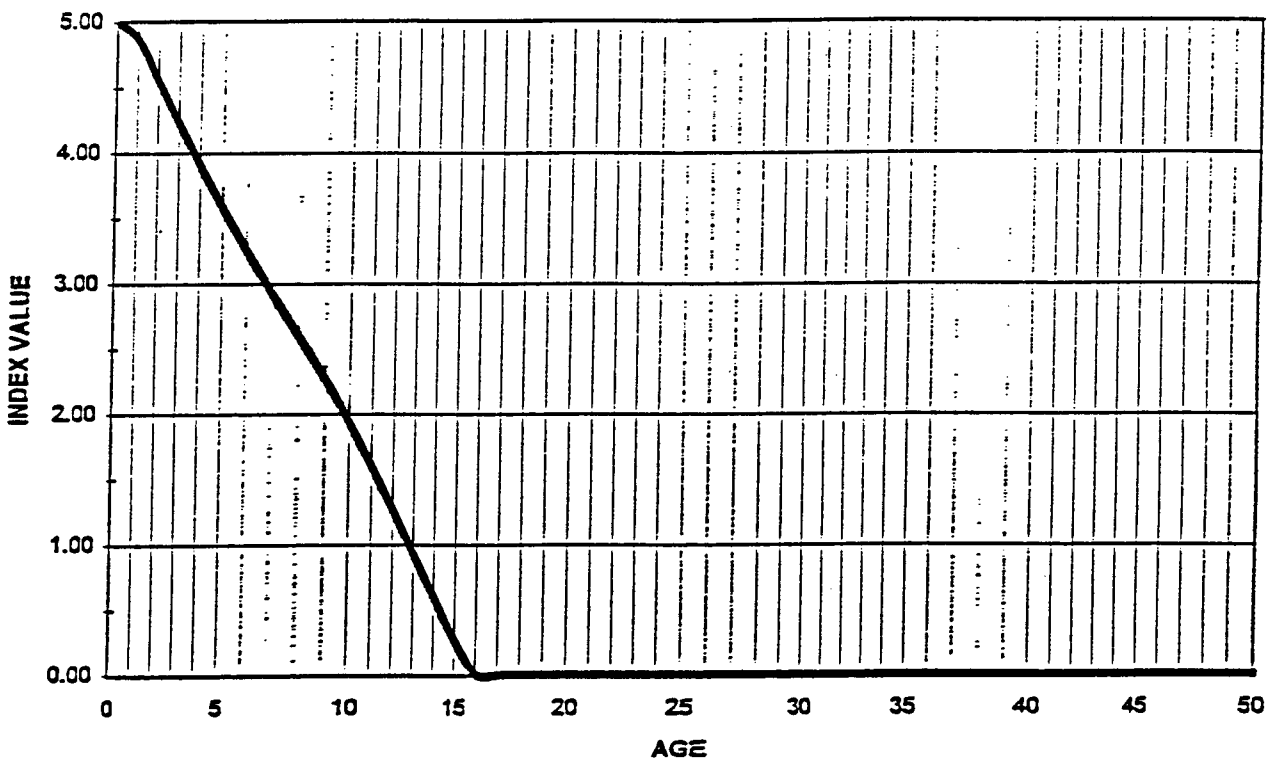
: Value: 5.17
| Value: 0.3106222
Value: 1.02

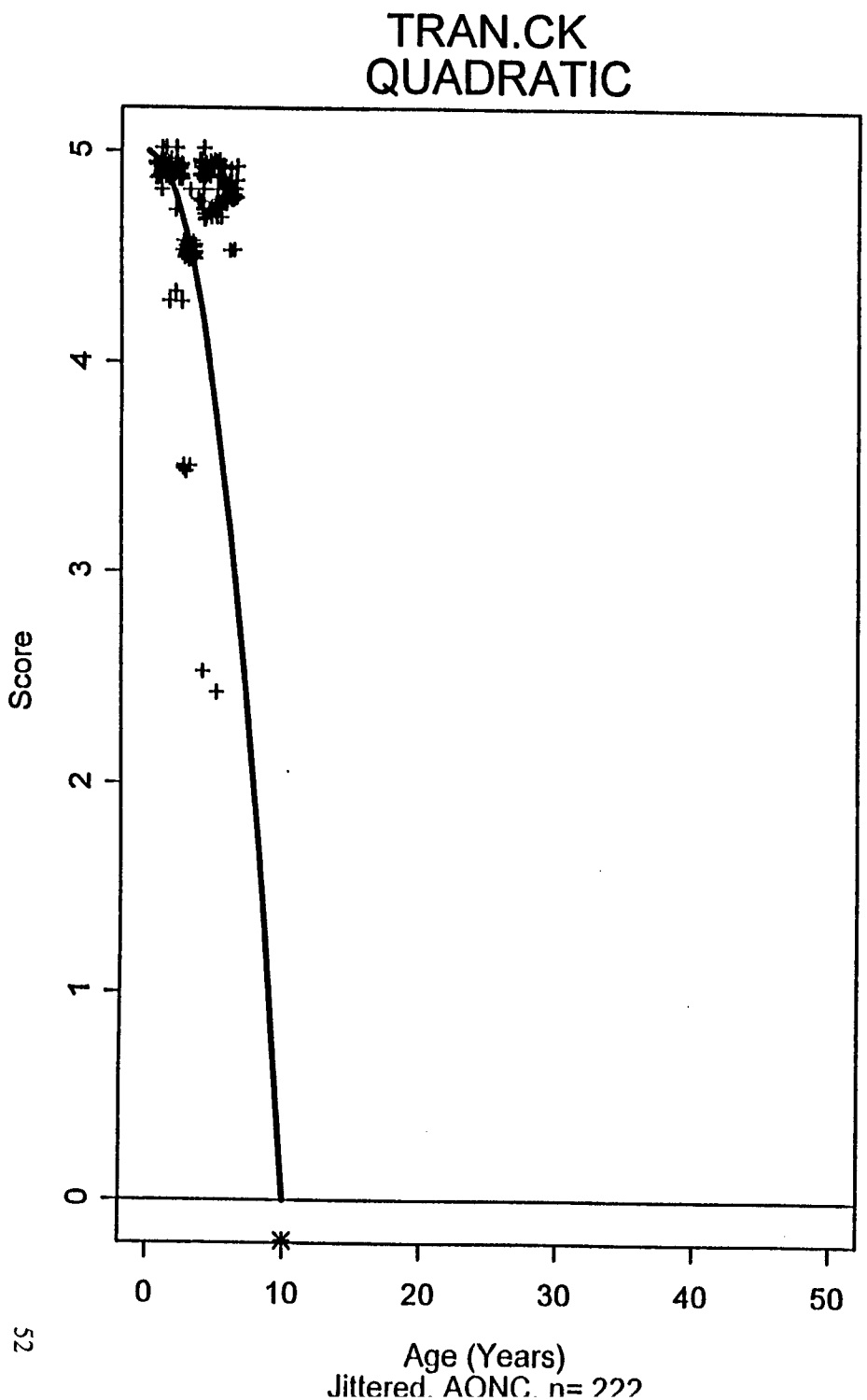
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.86	4.54	4.22	3.89	3.57	3.24	2.91	2.58	2.25	1.92

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.59	1.25	0.92	0.59	0.25	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 15:59:38 1998
Family: AONC
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.298	0.11	2.704	0.043

R-Squared = 0.594

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.334	0.112	2.985	0.031

R-Squared = 0.64

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.334	0.112	2.985	0.031

R-Squared = 0.64

APPENDIX E2

PERFORMANCE MODELS FOR FD PAVEMENT FAMILY

APPENDIX E2.1

PERFORMANCE MODELS FOR FD - O PAVEMENT FAMILY

PAVEMENT FAMILY: FD – Original

Number of data points available for regression of performance curves : 3

Range of years of data available for the given family : 14 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 28 years
   Historical data forced to end at 28 years has a R^2 value of : N/A ✓
   Optimum forced end point is obtained at ** years with a R^2 value of : N/A

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 26 years
   Historical data forced to end at 26 years has a R^2 value of : N/A ✓
   Optimum forced end point is obtained at ** years with a R^2 value of : N/A

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : N/A ✓
   Optimum forced end point is obtained at ** years with a R^2 value of : N/A

4. Roughness [ROUGH]
   Existing Expert Model ends at @ 17 years
   Historical data forced to end at 17 years has a R^2 value of : N/A ✓
   Optimum forced end point is obtained at ** years with a R^2 value of : N/A

5. Rut Depth [RUT_DP]
   Existing Expert Model ends at @ 17 years
   Historical data forced to end at 17 years has a R^2 value of : N/A ✓
   Optimum forced end point is obtained at ** years with a R^2 value of : N/A

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 27 years
   Historical data forced to end at 27 years has a R^2 value of : N/A ✓
   Optimum forced end point is obtained at ** years with a R^2 value of : N/A

In absence of sufficient data it is recommended that the existing expert models be used until more data for this family becomes available.

BLOCK CRACKING ON FD

INDEX = C - M * AGE ^ B

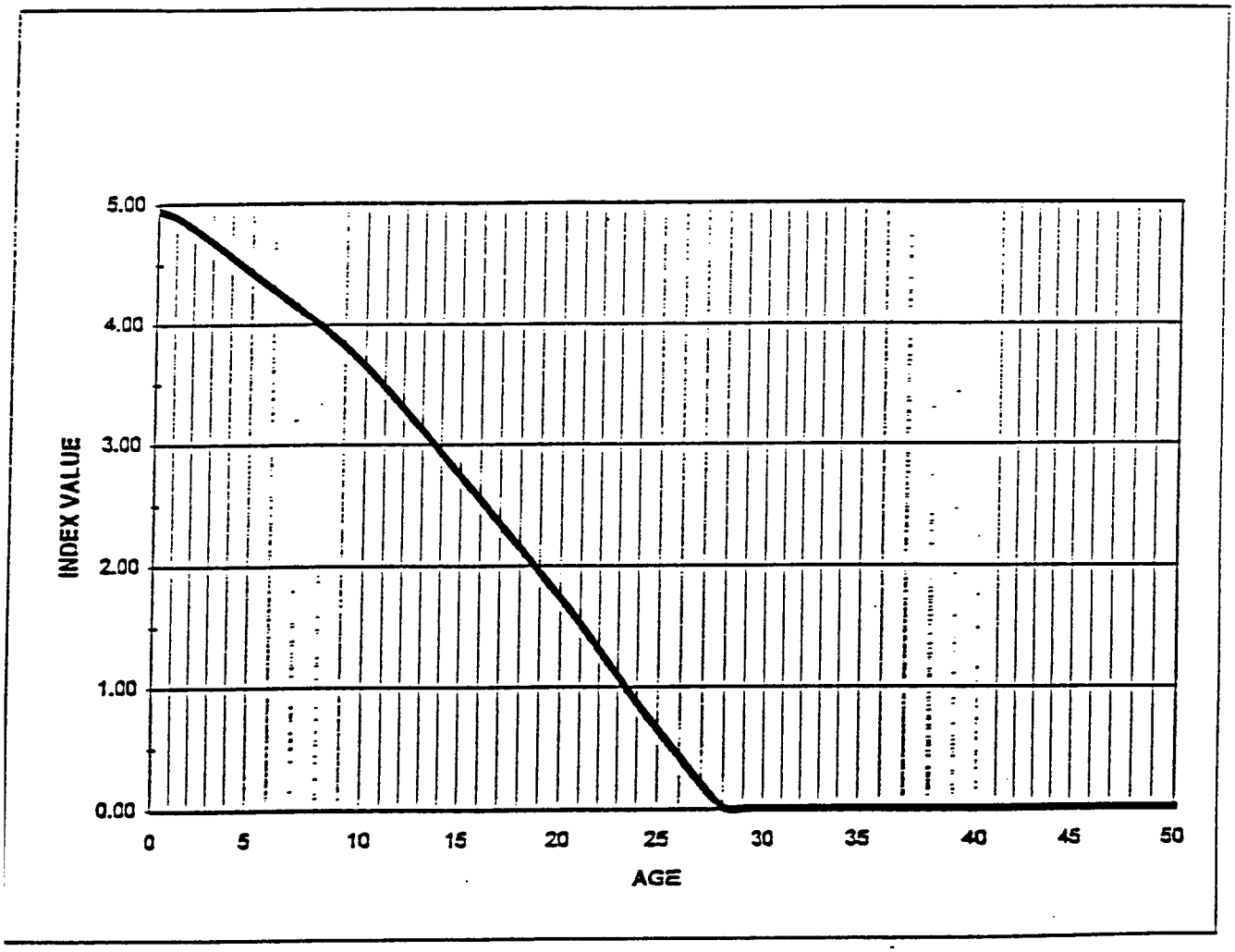
C Value: 4.95
M Value: 0.06572
B Value: 1.30

AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.95	4.88	4.79	4.68	4.55	4.42	4.28	4.13	3.97	3.81	3.64

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.47	3.29	3.11	2.92	2.73	2.53	2.34	2.13	1.93	1.72	1.51

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.30	1.08	0.86	0.63	0.41	0.18	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



FATIGUE CRACKING ON FD

INDEX = C - M * AGE ^ B

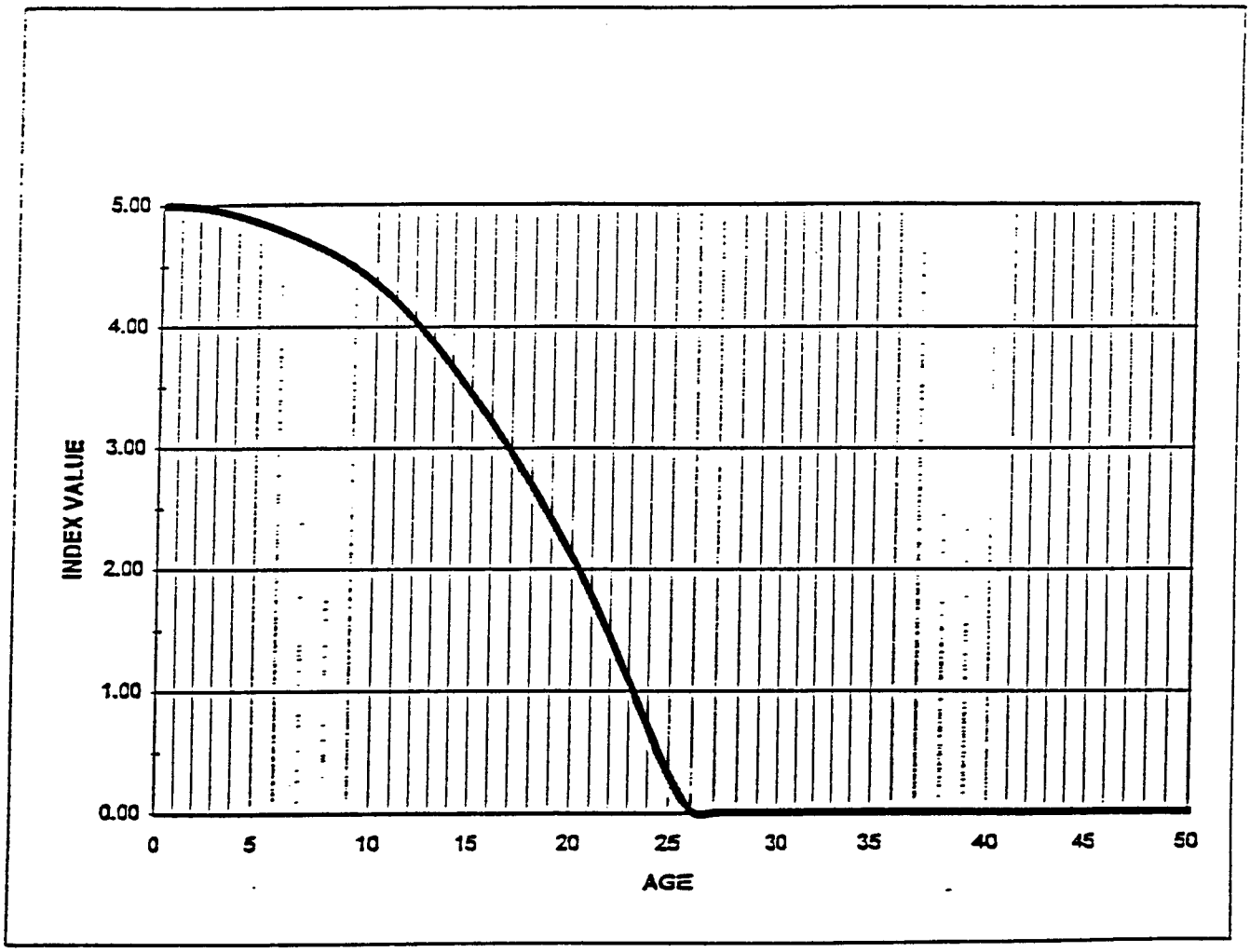
C Value: 5.00
M Value: 0.00465
B Value: 2.15

AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.98	4.95	4.91	4.85	4.78	4.69	4.59	4.48	4.34

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.19	4.03	3.85	3.65	3.43	3.20	2.94	2.68	2.39	2.08	1.76

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.42	1.06	0.69	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



PATCH DETERIORATION ON FD

DEX = C - M * AGE ^ B

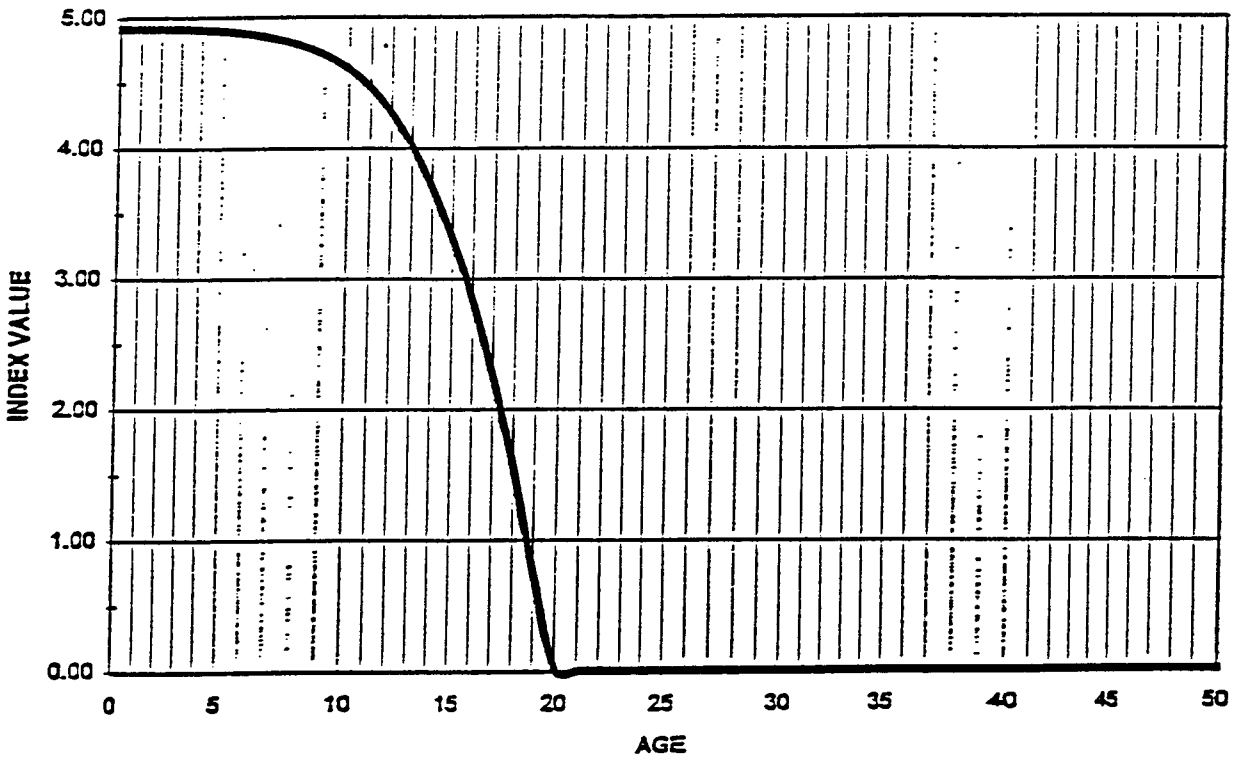
Value: 4.92
Value: 0.0000323
Value: 4.00

AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.92	4.92	4.92	4.92	4.91	4.90	4.88	4.84	4.79	4.71	4.60

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.45	4.25	4.00	3.68	3.28	2.80	2.22	1.53	0.71	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



ROUGHNESS ON FD

NDEX = C - M * AGE ^ B

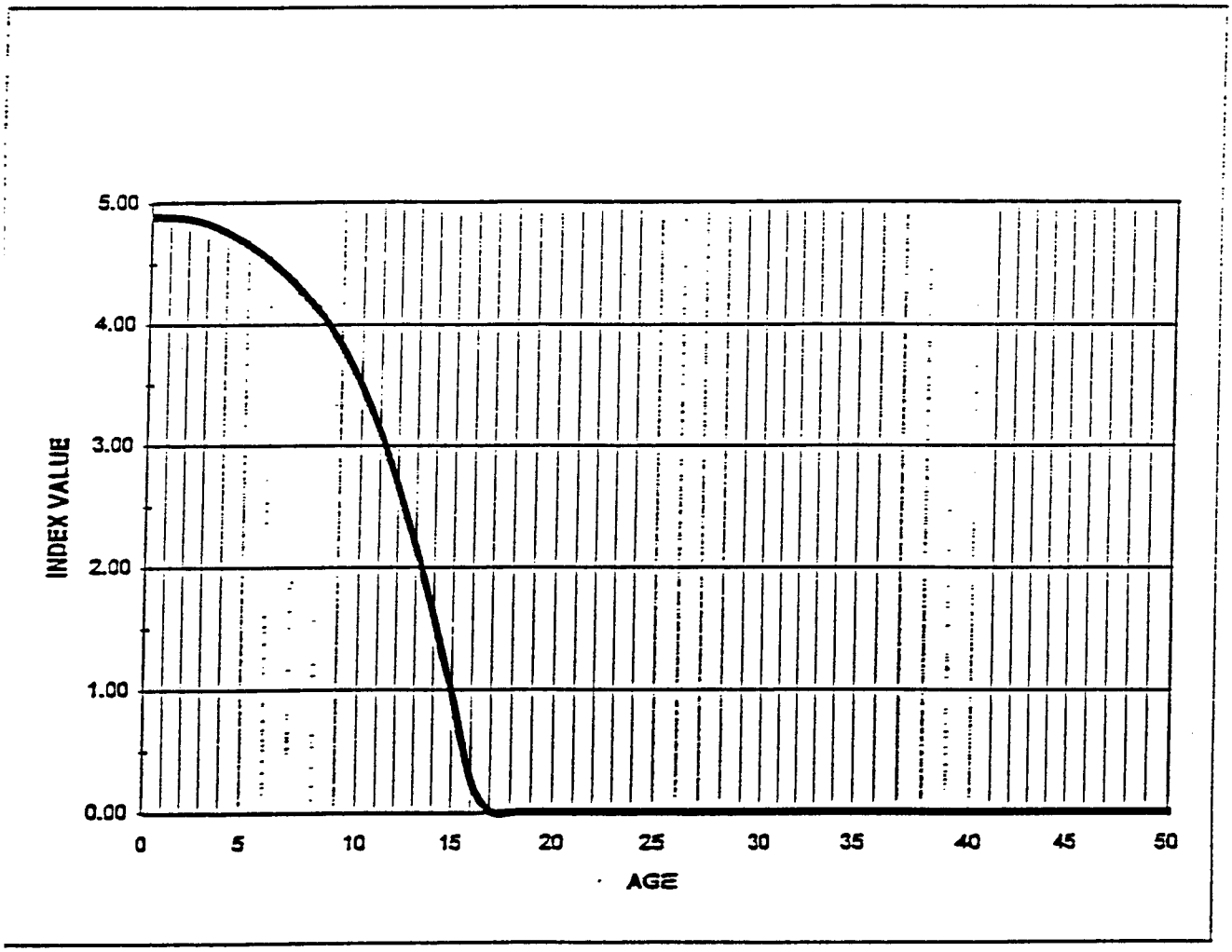
C Value: 4.89
M Value: 0.004182348
B Value: 2.53

AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.89	4.87	4.82	4.75	4.64	4.50	4.32	4.08	3.80	3.47

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.09	2.64	2.14	1.57	0.94	0.24	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



RUT DEPTH ON FD

INDEX = C - M * AGE ^ B

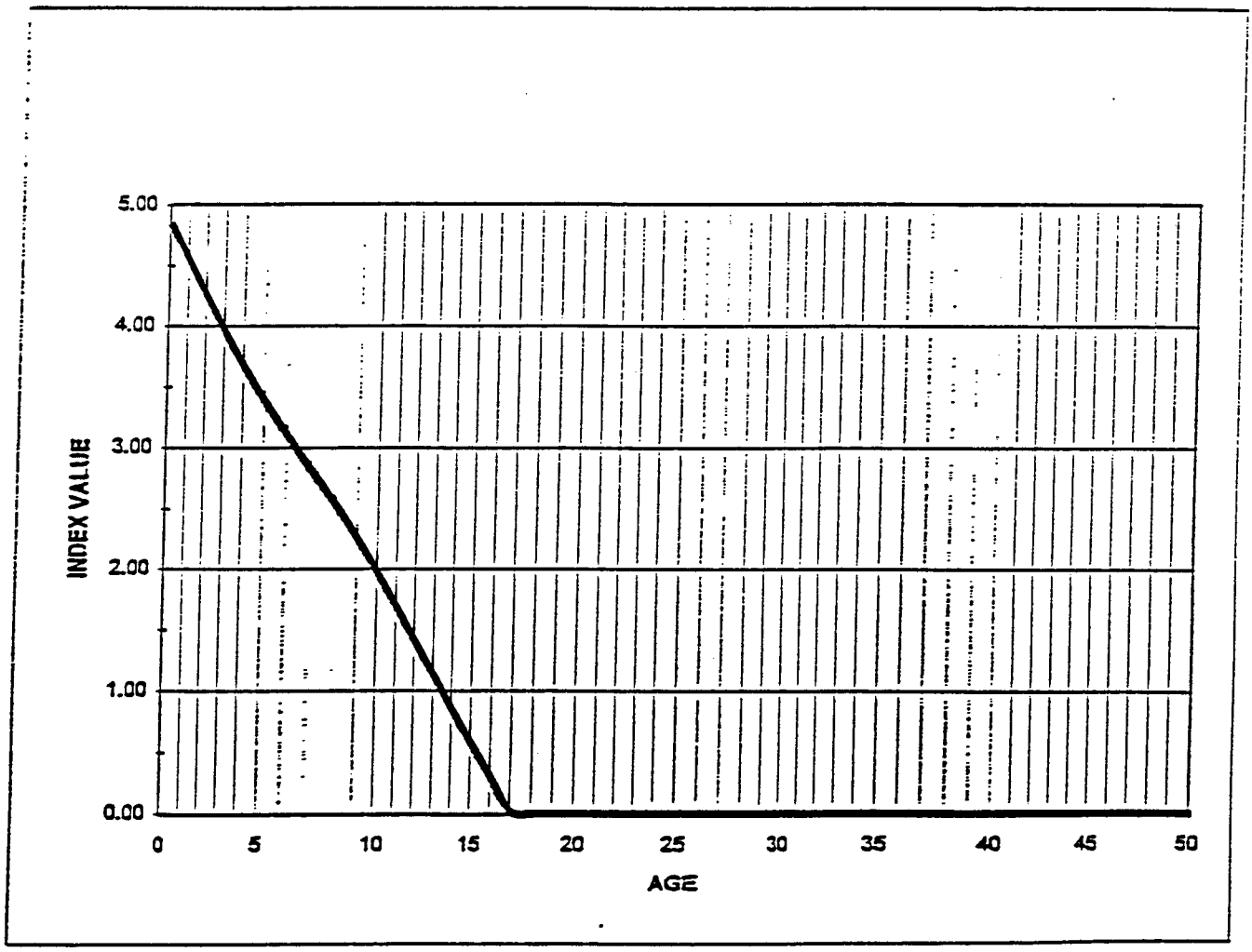
C Value: 4.85
M Value: 0.3095394
B Value: 0.97

AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.85	4.54	4.24	3.95	3.66	3.38	3.09	2.81	2.52	2.24	1.96

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.68	1.40	1.12	0.85	0.57	0.29	0.02	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



TRANSVERSE CRACKING ON FD

INDEX = C - M * AGE ^ B

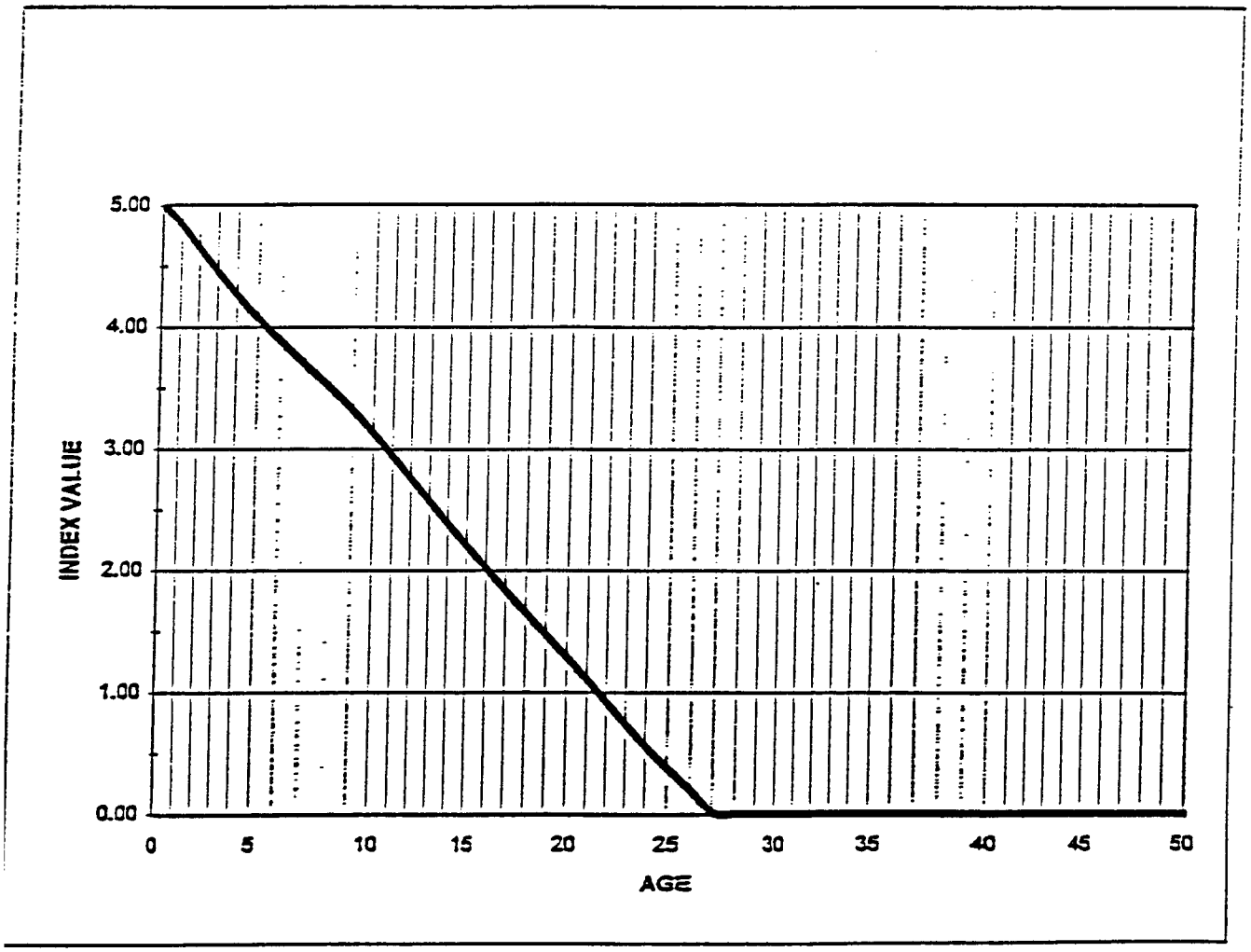
C Value: 5.04
M Value: 0.2059277
B Value: 0.97

AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.83	4.64	4.44	4.25	4.06	3.87	3.68	3.49	3.30	3.12

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.93	2.75	2.56	2.38	2.19	2.01	1.82	1.64	1.46	1.28	1.09

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.91	0.73	0.55	0.37	0.18	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



APPENDIX E2.2

PERFORMANCE MODELS FOR FD - A PAVEMENT FAMILY

PAVEMENT FAMILY: FD – A [AC Overlay on Original]

Number of data points available for regression of performance curves : 1038

Range of years of data available for the given family : 05 to 19 years

1. Block Cracking [BLK_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 26 years with a R^2 value of : 0.729 ✓

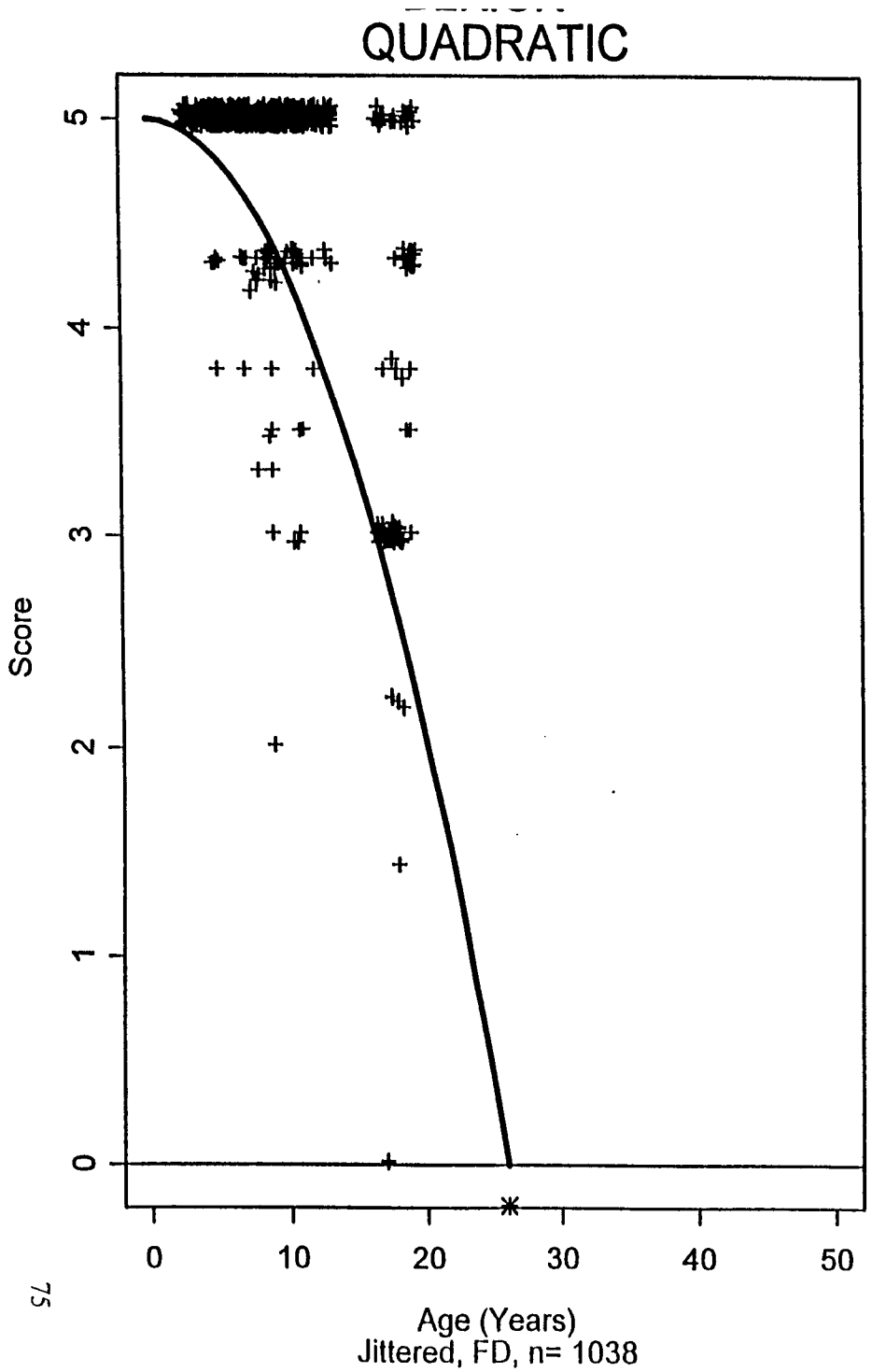
2. Fatigue Cracking [FATG_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.713 ✓

3. Patch Deterioration [PTCH_DT]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 28 years with a R^2 value of : 0.815
   Adjusting from the expert curve of the Original Family use endpoint of 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.531 ✓

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.579 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.471 ✓

6. Transverse Cracking [TRAN_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 14 years with a R^2 value of : 0.408 ✓



Date of Analysis: Thu May 7 16:02:50 1998
Family: FD
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 26

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.105	0.018	5.916	0

R-Squared = 0.729

50TH PERCENTILE
Coefficient Estimates:

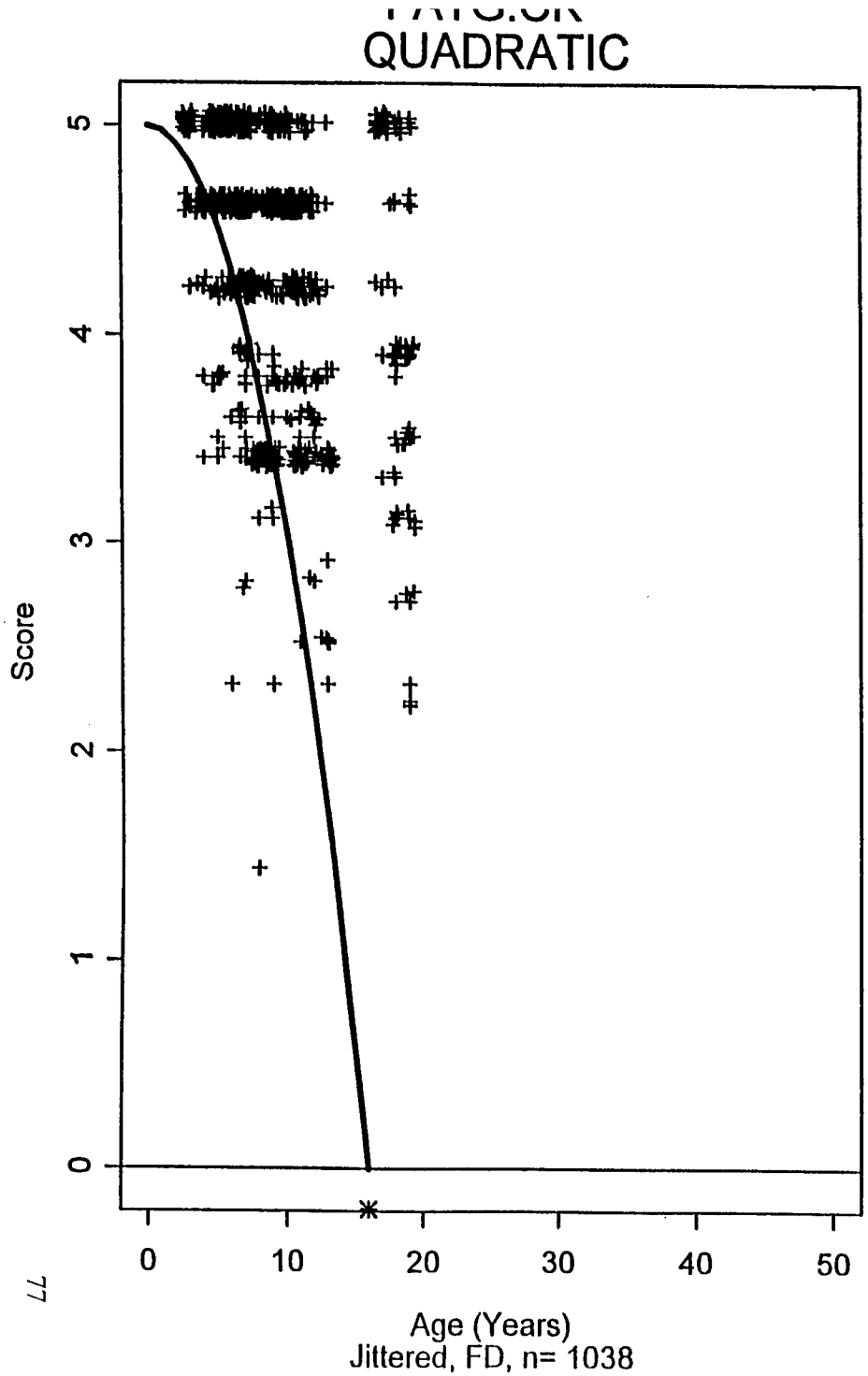
	Value	Std. Error	t value	Pr(>|t|)
1	0.105	0.018	5.916	0

R-Squared = 0.729

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.124	0.026	4.799	0

R-Squared = 0.639



Date of Analysis: Thu May 7 16:03:36 1998
Family: FD
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.114	0.049	2.346	0.041

R-Squared = 0.355

50TH PERCENTILE
Coefficient Estimates:

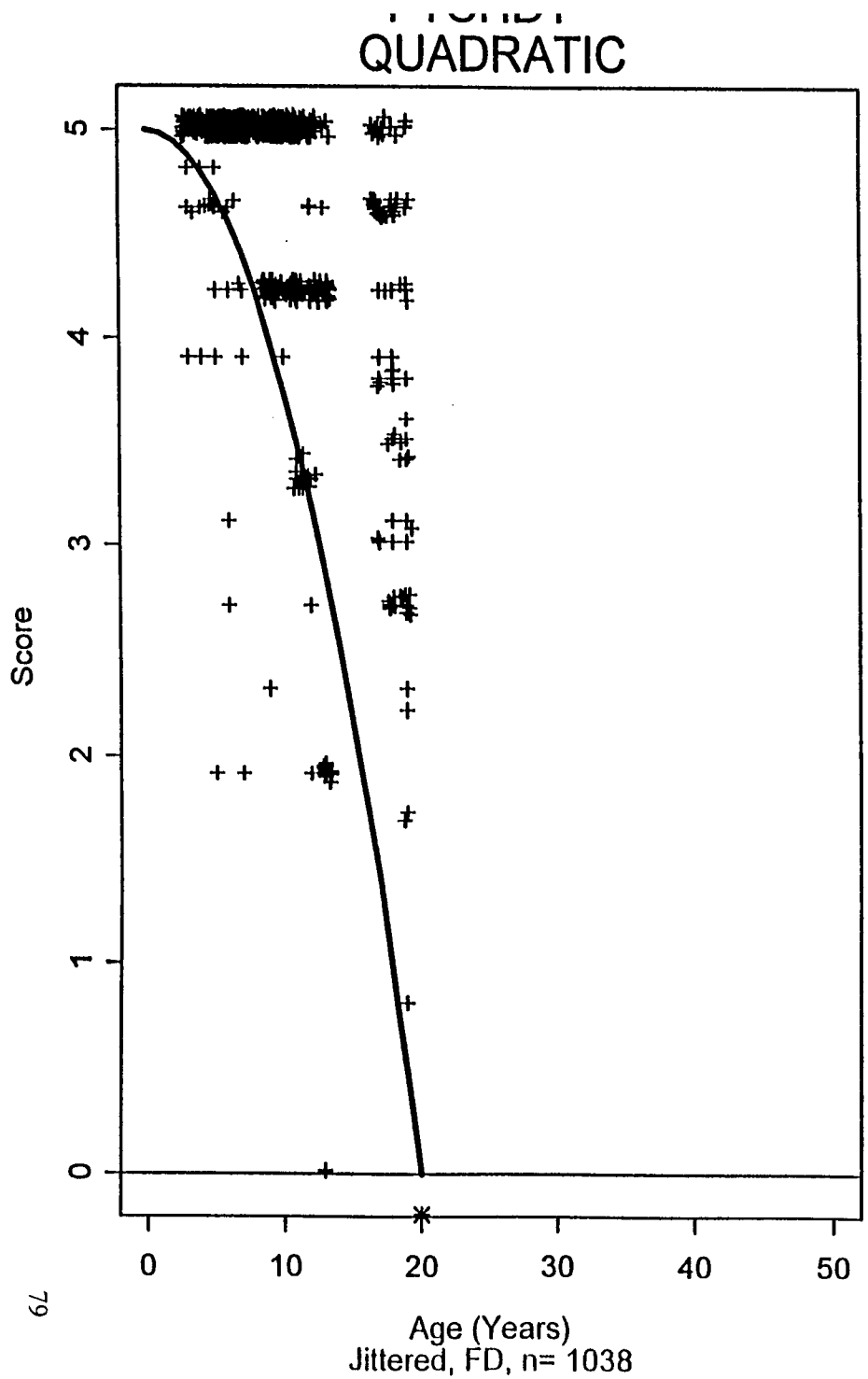
	Value	Std. Error	t value	Pr(>|t|)
1	0.243	0.049	4.986	0.001

R-Squared = 0.713

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.288	0.053	5.399	0

R-Squared = 0.745



Date of Analysis: Thu May 7 16:04:27 1998
Family: FD
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.134	0.05	2.701	0.018

R-Squared = 0.359

50TH PERCENTILE
Coefficient Estimates:

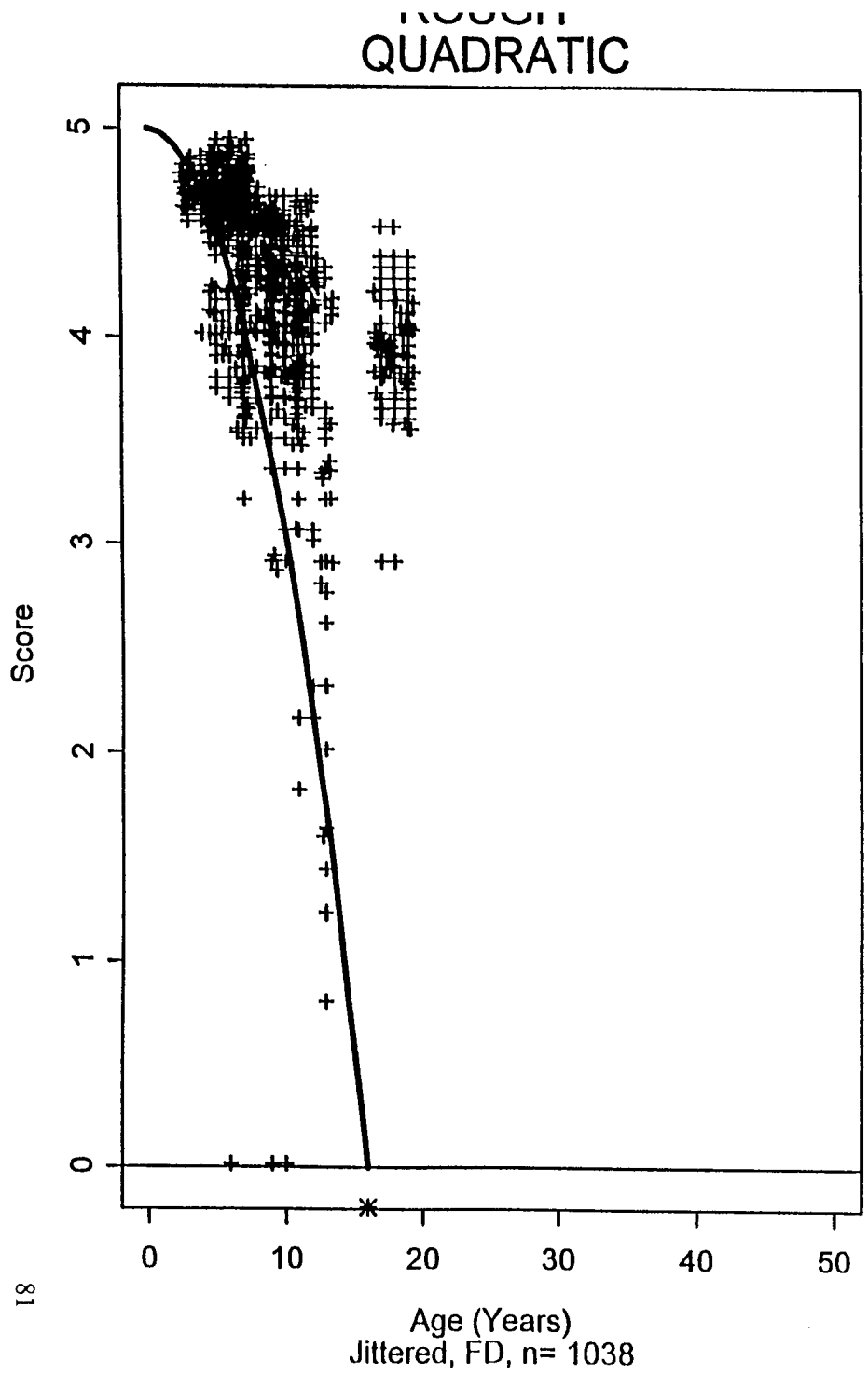
	Value	Std. Error	t value	Pr(>|t|)
1	0.208	0.054	3.836	0.002

R-Squared = 0.531

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.216	0.067	3.217	0.007

R-Squared = 0.443



Date of Analysis: Thu May 7 16:05:15 1998
Family: FD
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.13	0.043	3.05	0.012

R-Squared = 0.482

50TH PERCENTILE
Coefficient Estimates:

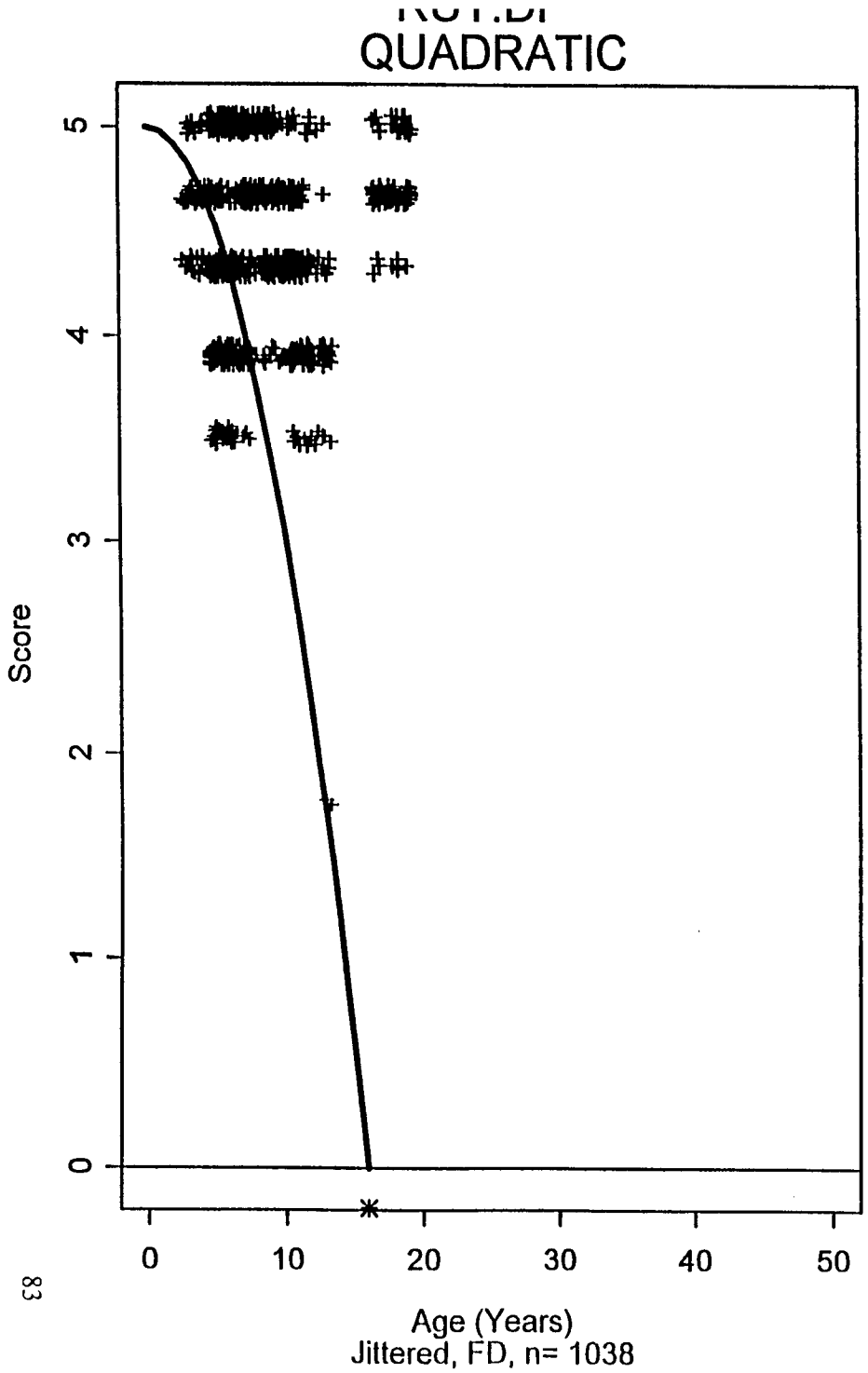
	Value	Std. Error	t value	Pr(>|t|)
1	0.187	0.05	3.711	0.004

R-Squared = 0.579

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.225	0.054	4.156	0.002

R-Squared = 0.633



Date of Analysis: Thu May 7 16:06:04 1998
Family: FD
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.115	0.071	1.611	0.138

R-Squared = 0.206

50TH PERCENTILE
Coefficient Estimates:

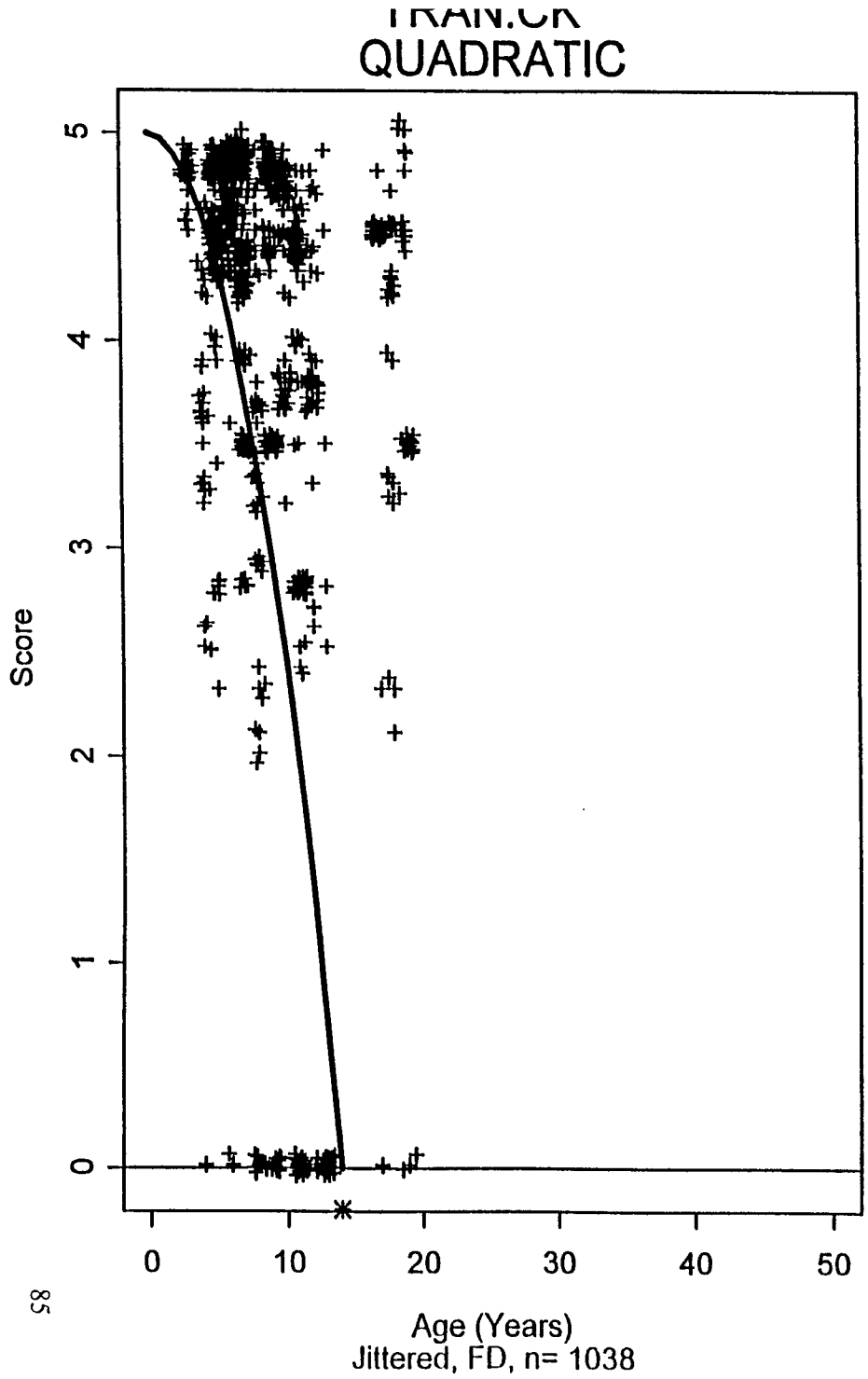
	Value	Std. Error	t value	Pr(>|t|)
1	0.193	0.065	2.982	0.014

R-Squared = 0.471

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.305	0.057	5.336	0

R-Squared = 0.74



Date of Analysis: Thu May 7 16:06:51 1998
Family: FD
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 14

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.111	0.081	1.381	0.197

R-Squared = 0.16

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.258	0.098	2.624	0.025

R-Squared = 0.408

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.352	0.102	3.453	0.006

R-Squared = 0.544

APPENDIX E2.3

PERFORMANCE MODELS FOR FD - F PAVEMENT FAMILY

PAVEMENT FAMILY: FD – F [Mill & AC OL on Original]

Number of data points available for regression of performance curves : 582

Range of years of data available for the given family : 06 to 15 years

1. Block Cracking [BLK_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.888 ✓

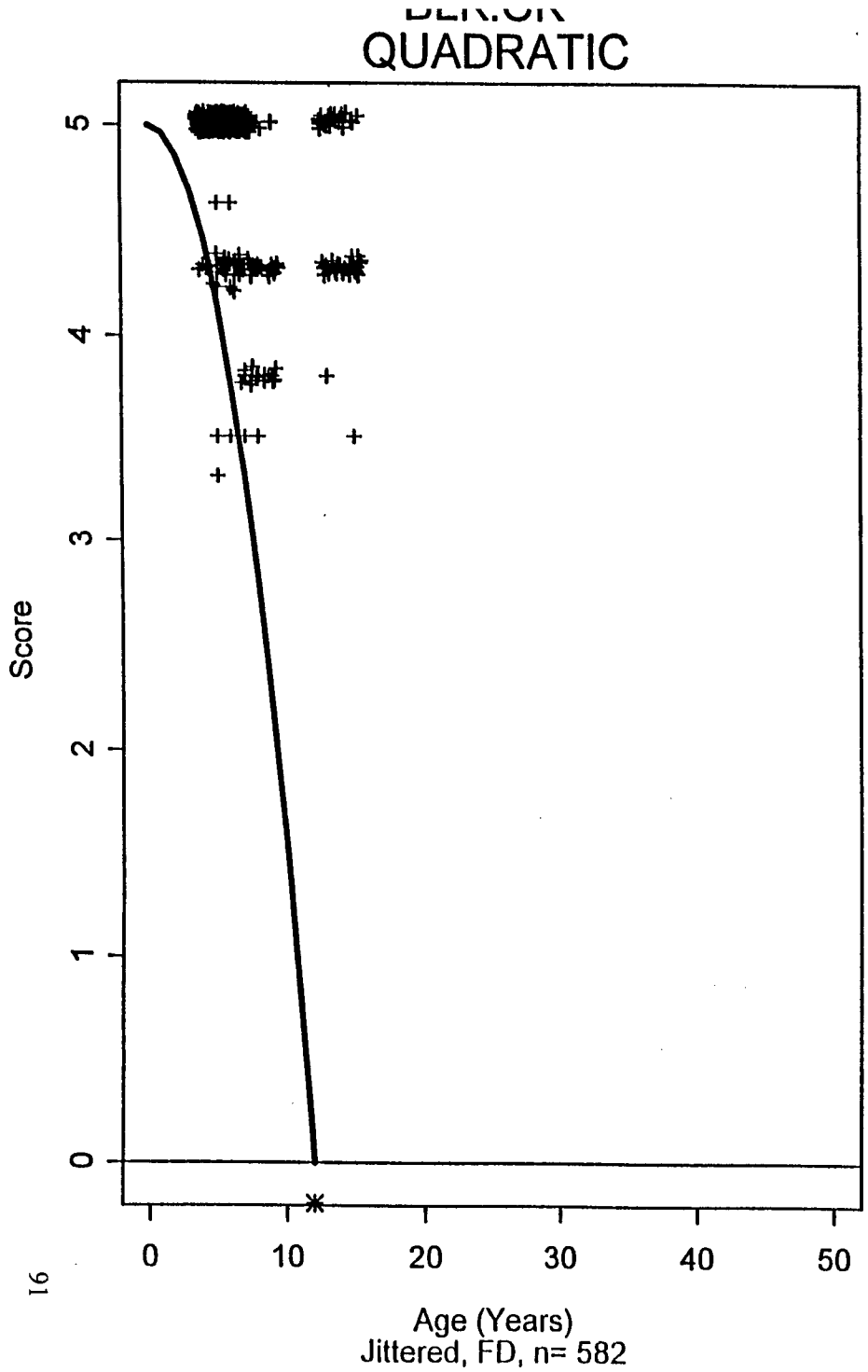
2. Fatigue Cracking [FATG_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.823 ✓

3. Patch Deterioration [PTCH_DT]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.893 ✓

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.638 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.771 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.264
   Optimum forced end point is obtained at 09 years with a R^2 value of : 0.767 ✓



Date of Analysis: Thu May 7 16:09:46 1998
Family: FD
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.394	0.057	6.91	0.001

R-Squared = 0.905

50TH PERCENTILE
Coefficient Estimates:

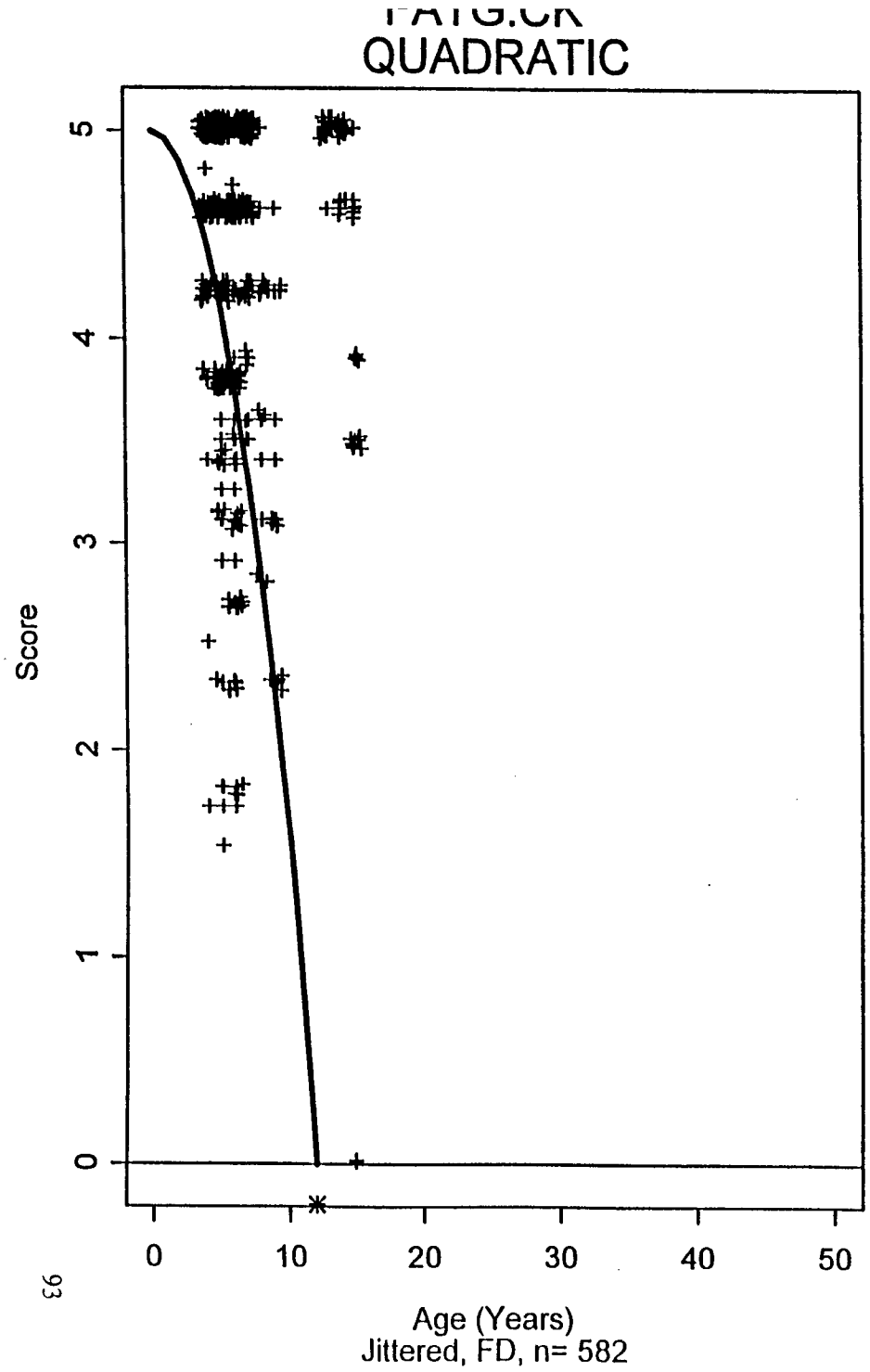
	Value	Std. Error	t value	Pr(>|t|)
1	0.403	0.064	6.281	0.002

R-Squared = 0.888

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.403	0.064	6.281	0.002

R-Squared = 0.888



Date of Analysis: Thu May 7 16:11:02 1998
Family: FD
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.073	0.09	0.812	0.454

R-Squared = 0.116

50TH PERCENTILE
Coefficient Estimates:

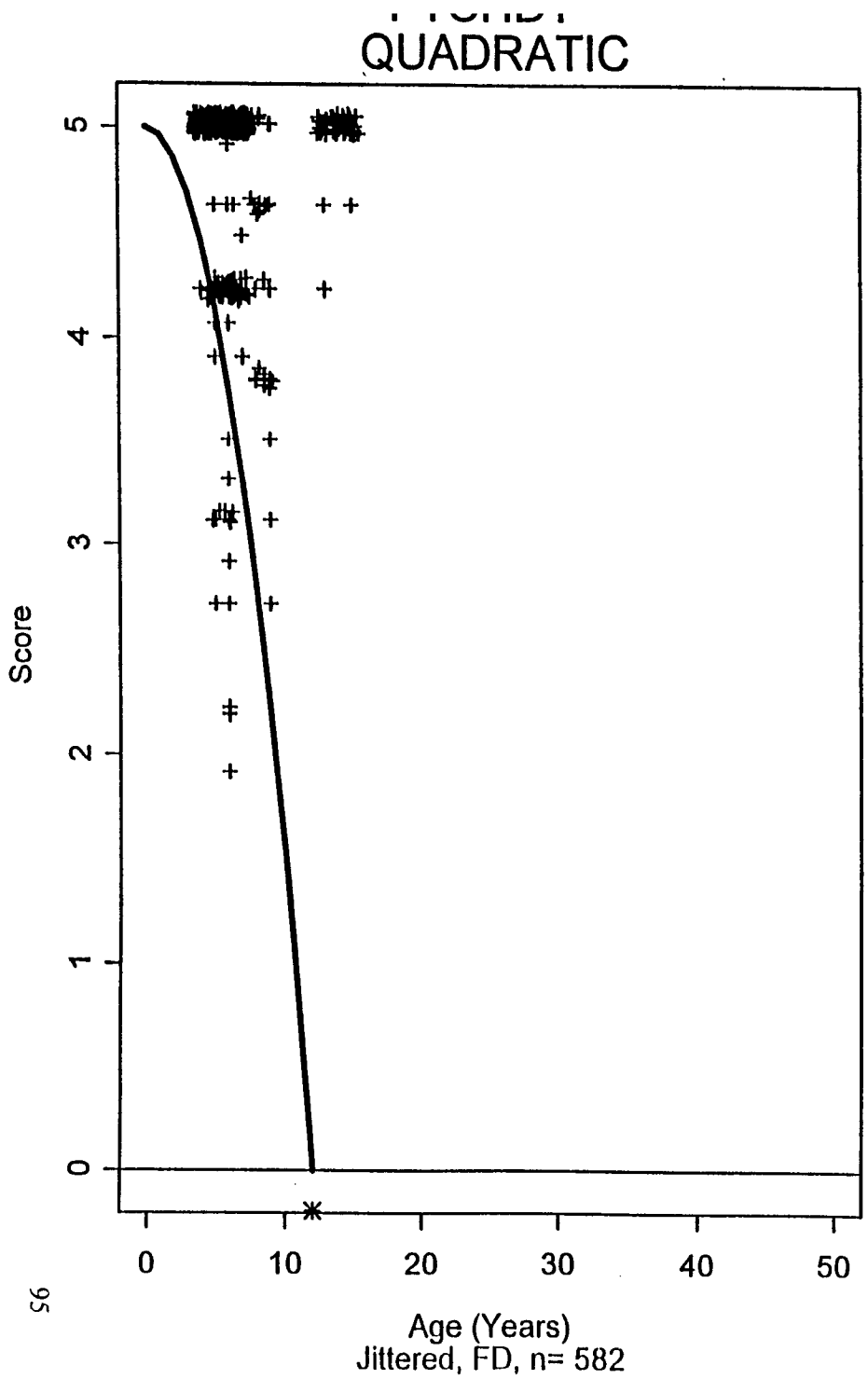
	Value	Std. Error	t value	Pr(>|t|)
1	0.324	0.067	4.82	0.005

R-Squared = 0.823

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.353	0.061	5.785	0.002

R-Squared = 0.87



Date of Analysis: Thu May 7 16:12:13 1998
Family: FD
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.313	0.078	3.998	0.01

R-Squared = 0.762

50TH PERCENTILE
Coefficient Estimates:

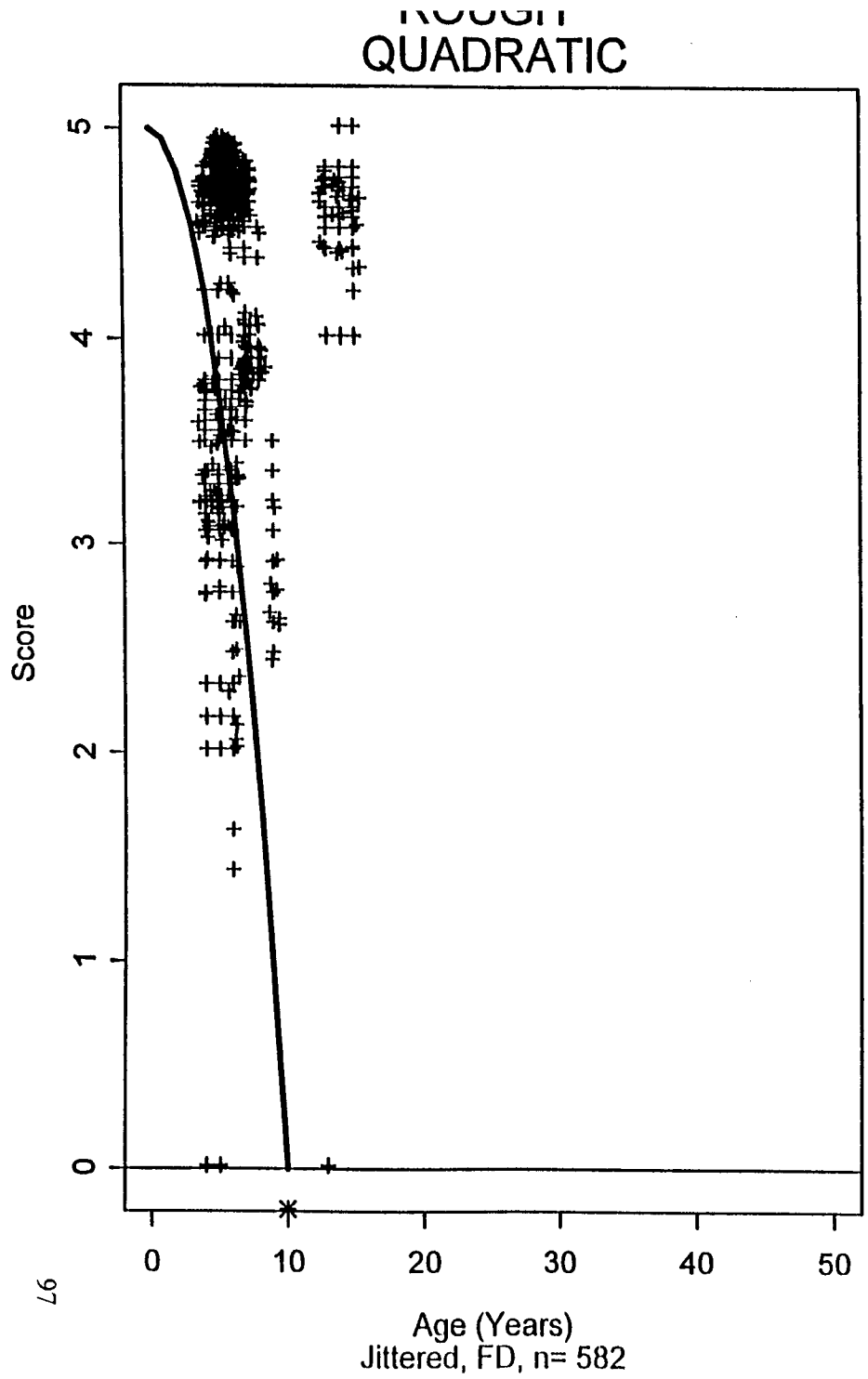
	Value	Std. Error	t value	Pr(>|t|)
1	0.403	0.062	6.449	0.001

R-Squared = 0.893

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.412	0.074	5.55	0.003

R-Squared = 0.86



Date of Analysis: Thu May 7 16:13:26 1998
Family: FD
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.137	0.156	0.878	0.42

R-Squared = 0.134

50TH PERCENTILE
Coefficient Estimates:

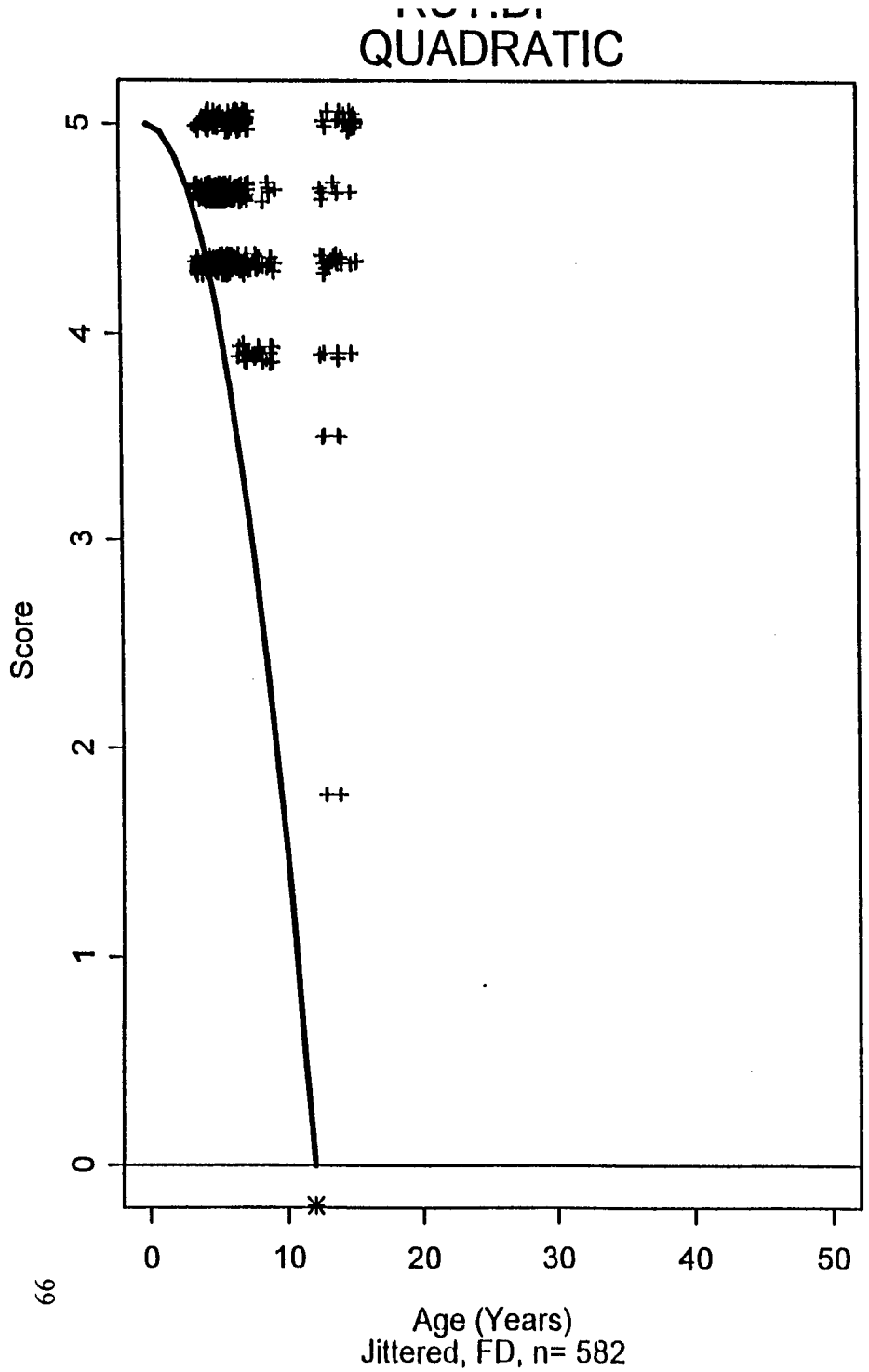
	Value	Std. Error	t value	Pr(>|t|)
1	0.482	0.162	2.971	0.031

R-Squared = 0.638

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.584	0.135	4.314	0.008

R-Squared = 0.788



Date of Analysis: Thu May 7 16:14:42 1998
Family: FD
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.166	0.069	2.39	0.062

R-Squared = 0.533

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.286	0.07	4.108	0.009

R-Squared = 0.771

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.303	0.083	3.664	0.015

R-Squared = 0.729

TRANSVERSE CRACKING ON FD AFTER MILL & AC OVERLAY

IDEX = C - M * AGE ^ B

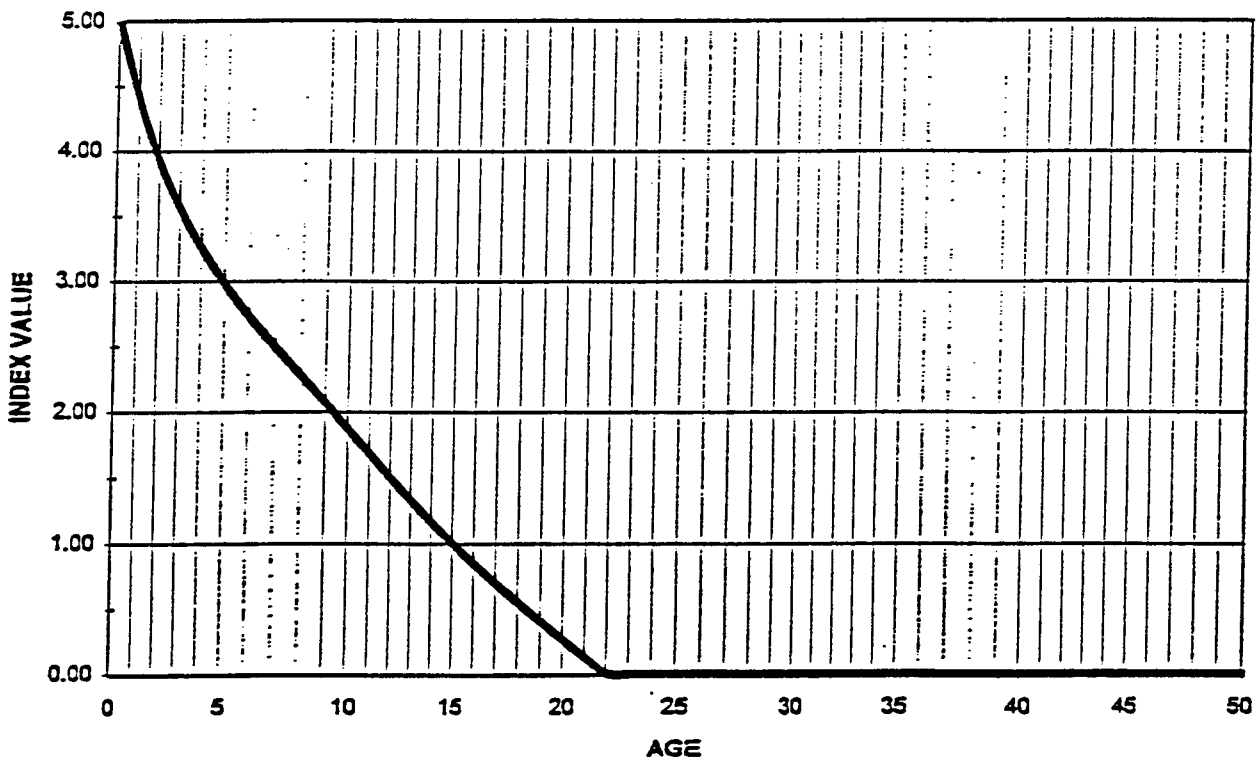
: Value: 5.40
I Value: 1.020175
Value: 0.54

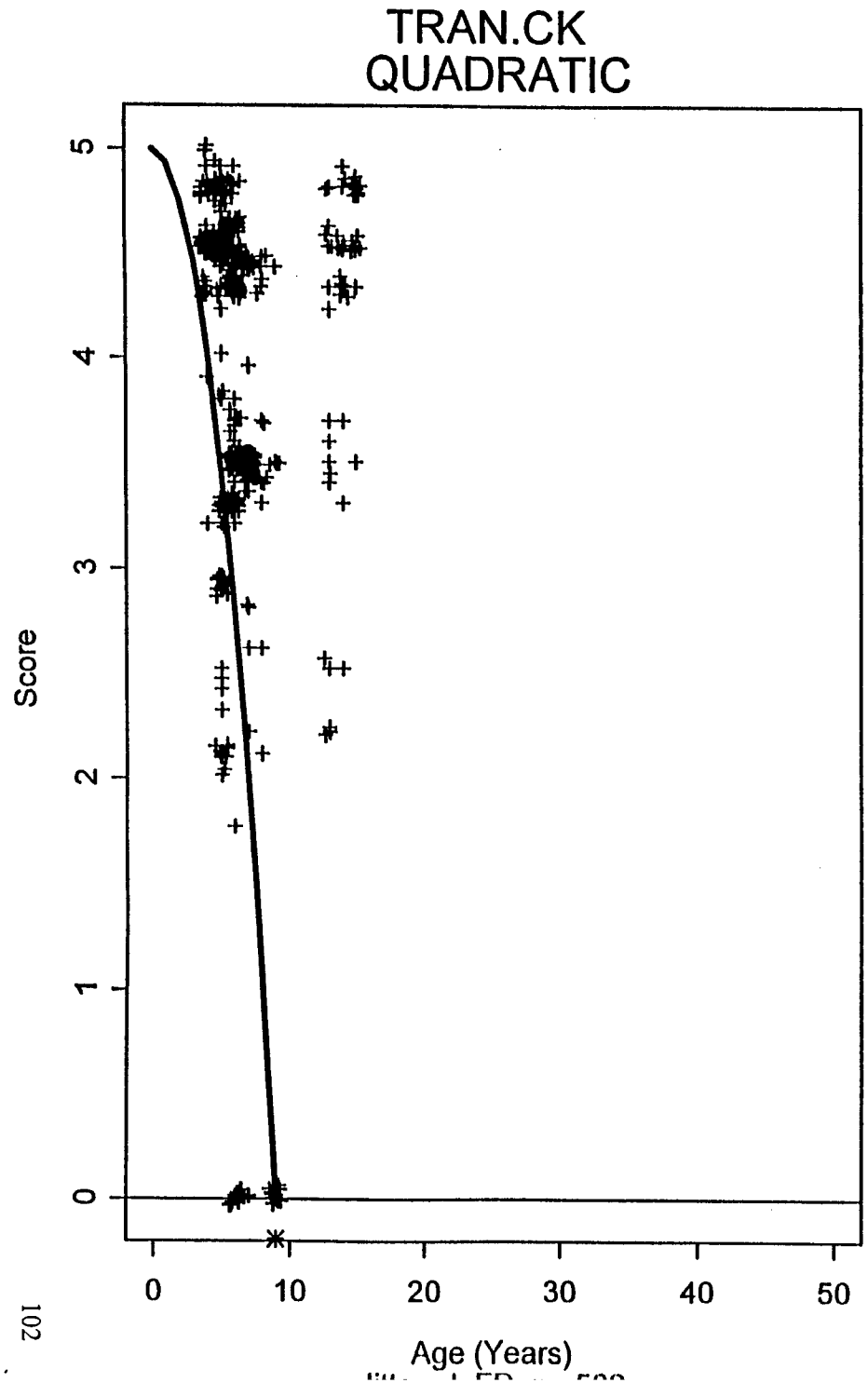
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.38	3.92	3.55	3.24	2.97	2.72	2.48	2.26	2.06	1.86

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.68	1.50	1.32	1.16	1.00	0.84	0.69	0.54	0.40	0.26	0.12

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:16:04 1998
Family: FD
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 9

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.26	0.17	1.531	0.186

R-Squared = 0.319

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.5	0.123	4.059	0.01

R-Squared = 0.767

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.646	0.209	3.084	0.027

R-Squared = 0.655

APPENDIX E3

PERFORMANCE MODELS FOR THK PAVEMENT FAMILY

APPENDIX E3.1

PERFORMANCE MODELS FOR THK - O PAVEMENT FAMILY

PAVEMENT FAMILY: THK – Original

Number of data points available for regression of performance curves : 1179

Range of years of data available for the given family : 03 to 26 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 25 years
   Historical data forced to end at 25 years has a R^2 value of : 0.319
   Optimum forced end point is obtained at 17 years with a R^2 value of : 0.480 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.208
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.368 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.219
   Optimum forced end point is obtained at 17 years with a R^2 value of : 0.438 ✓

4. Roughness [ROUGH]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.033
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.254 ✓

5. Rut Depth [RUT_DP]
   Existing Expert Model ends at @ 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.244 ✓
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.244

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 40 years
   Historical data forced to end at 40 years has a R^2 value of : 0.208 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

BLOCK CRACKING ON THK

NDEX = C - M * AGE ^ B

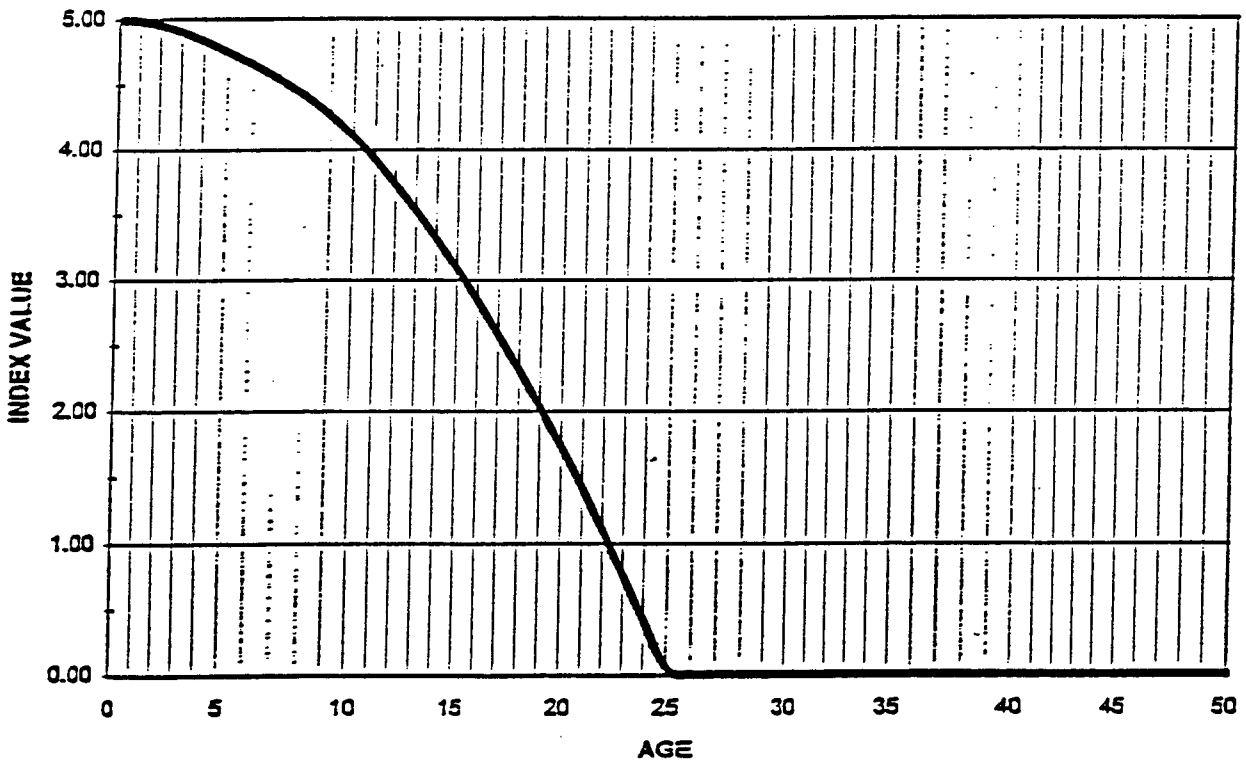
C Value: 5.00
M Value: 0.012873
B Value: 1.85

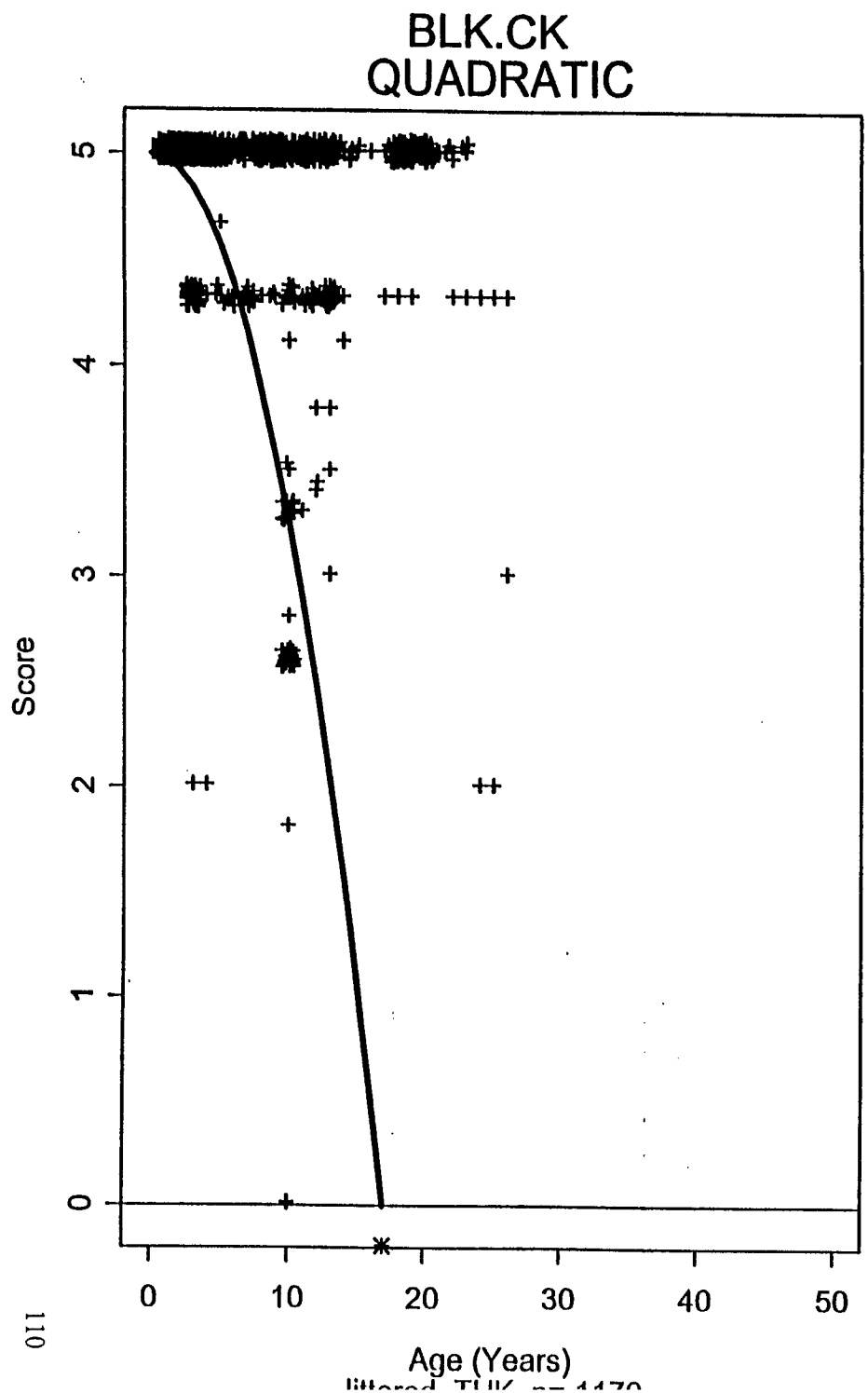
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.99	4.95	4.90	4.83	4.75	4.65	4.53	4.40	4.25	4.09

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.91	3.72	3.52	3.30	3.07	2.83	2.57	2.30	2.01	1.71	1.40

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.08	0.75	0.40	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 28 15:00:00 1998
Family: THK
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 17

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.192	0.078	2.465	0.025

R-Squared = 0.275

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.269	0.07	3.844	0.001

R-Squared = 0.48

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.316	0.067	4.722	0

R-Squared = 0.582

FATIGUE CRACKING ON THK

NDEX = C - M * AGE ^ B

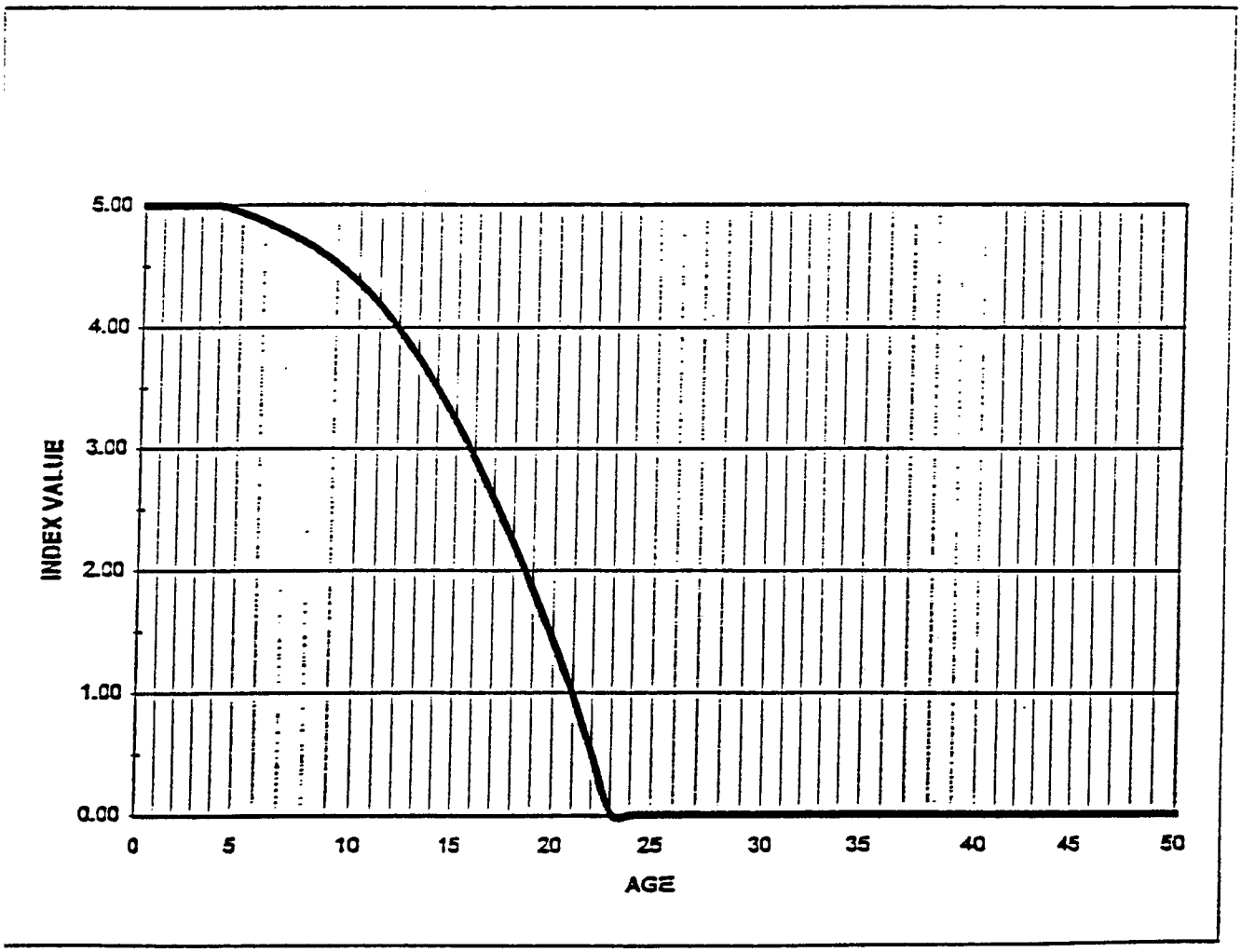
C Value: 5.08
M Value: 0.003323627
B Value: 2.34

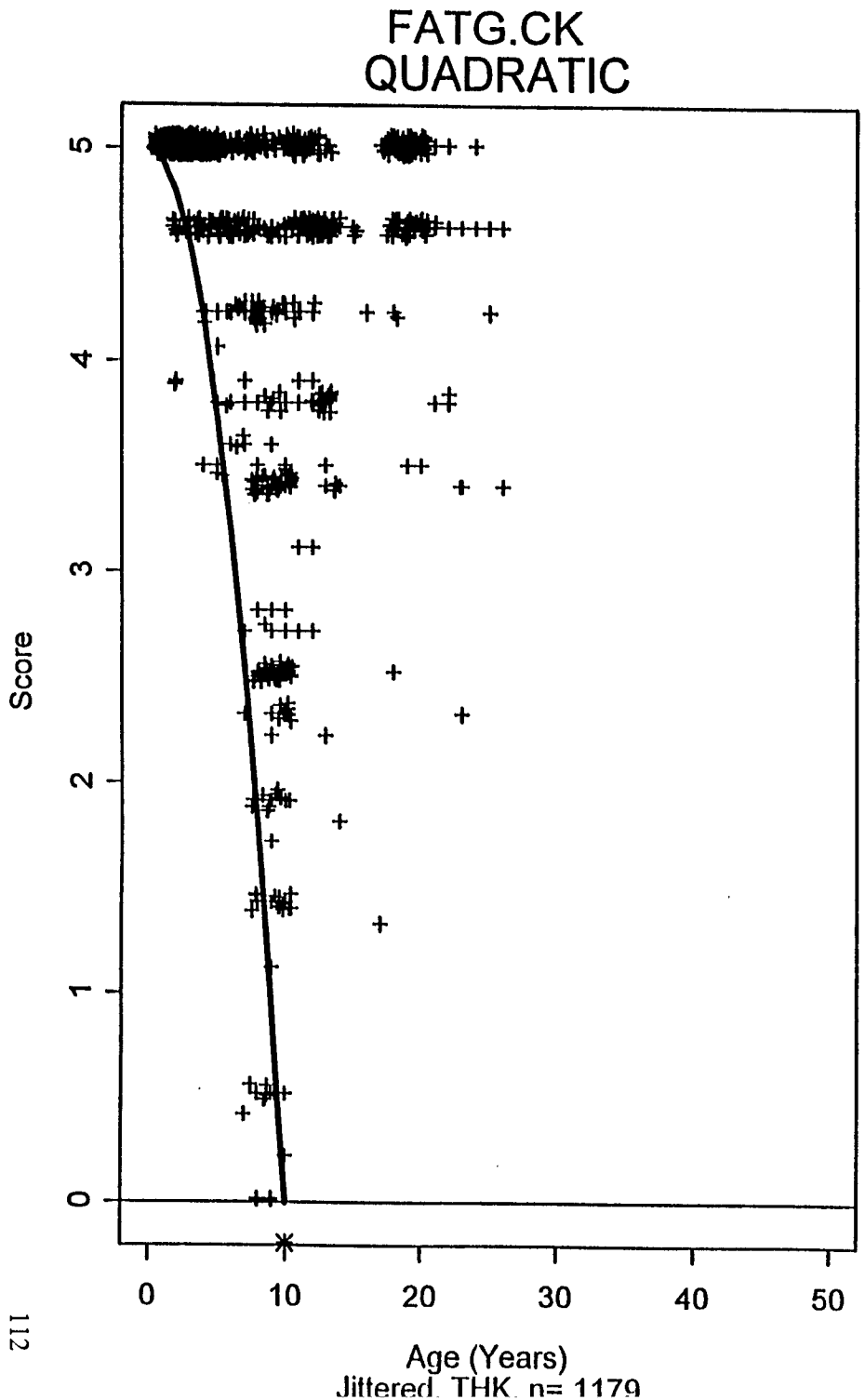
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	4.99	4.94	4.86	4.76	4.65	4.51	4.35

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.17	3.97	3.74	3.48	3.20	2.90	2.56	2.20	1.81	1.40	0.95

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:19:46 1998
Family: THK
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.343	0.153	2.245	0.051

R-Squared = 0.359

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.459	0.2	2.29	0.048

R-Squared = 0.368

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.528	0.277	1.904	0.089

R-Squared = 0.287

PATCH DETERIORATION ON THK

INDEX = C - M * AGE ^ B

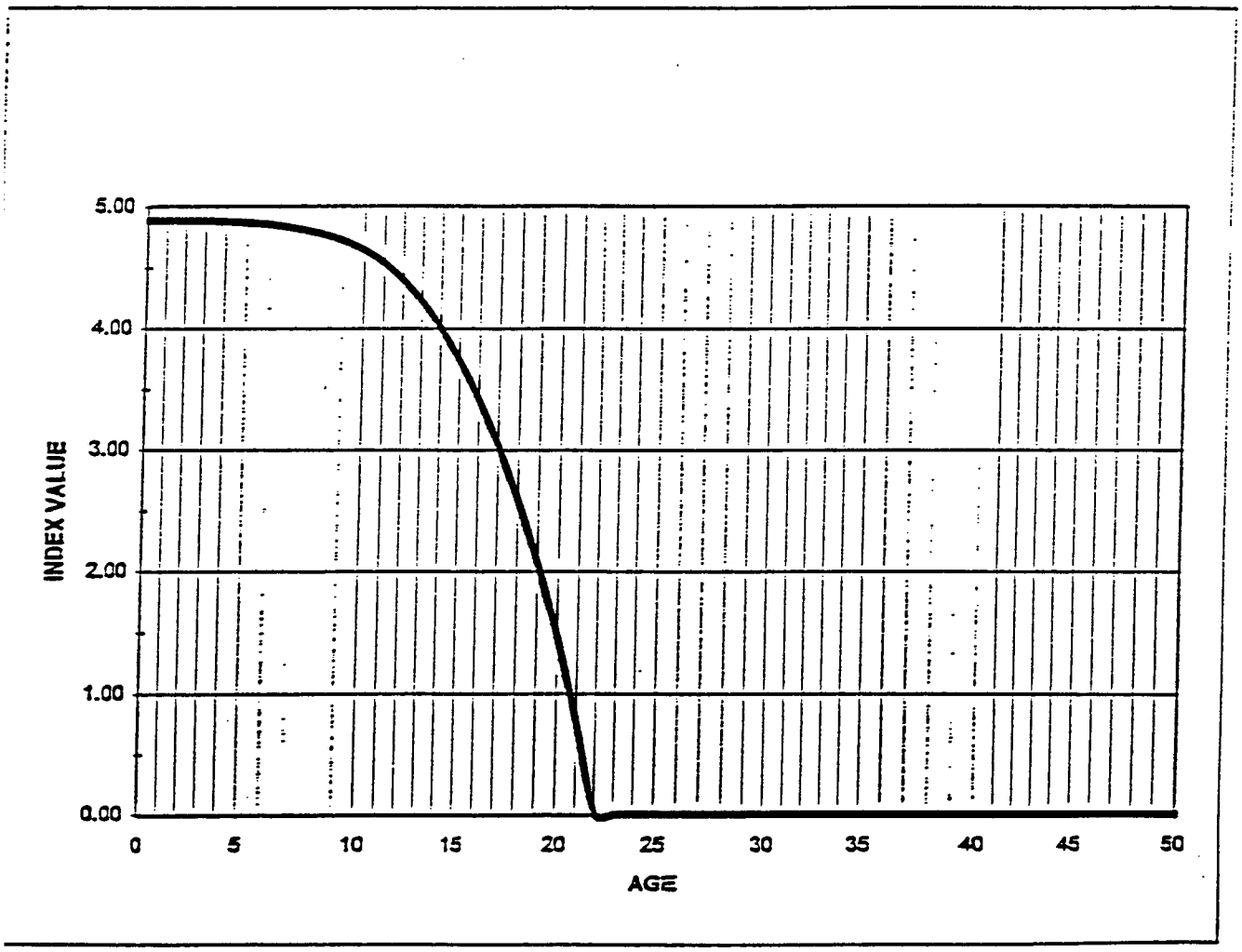
C Value: 4.89
M Value: 0.0000431
B Value: 3.77

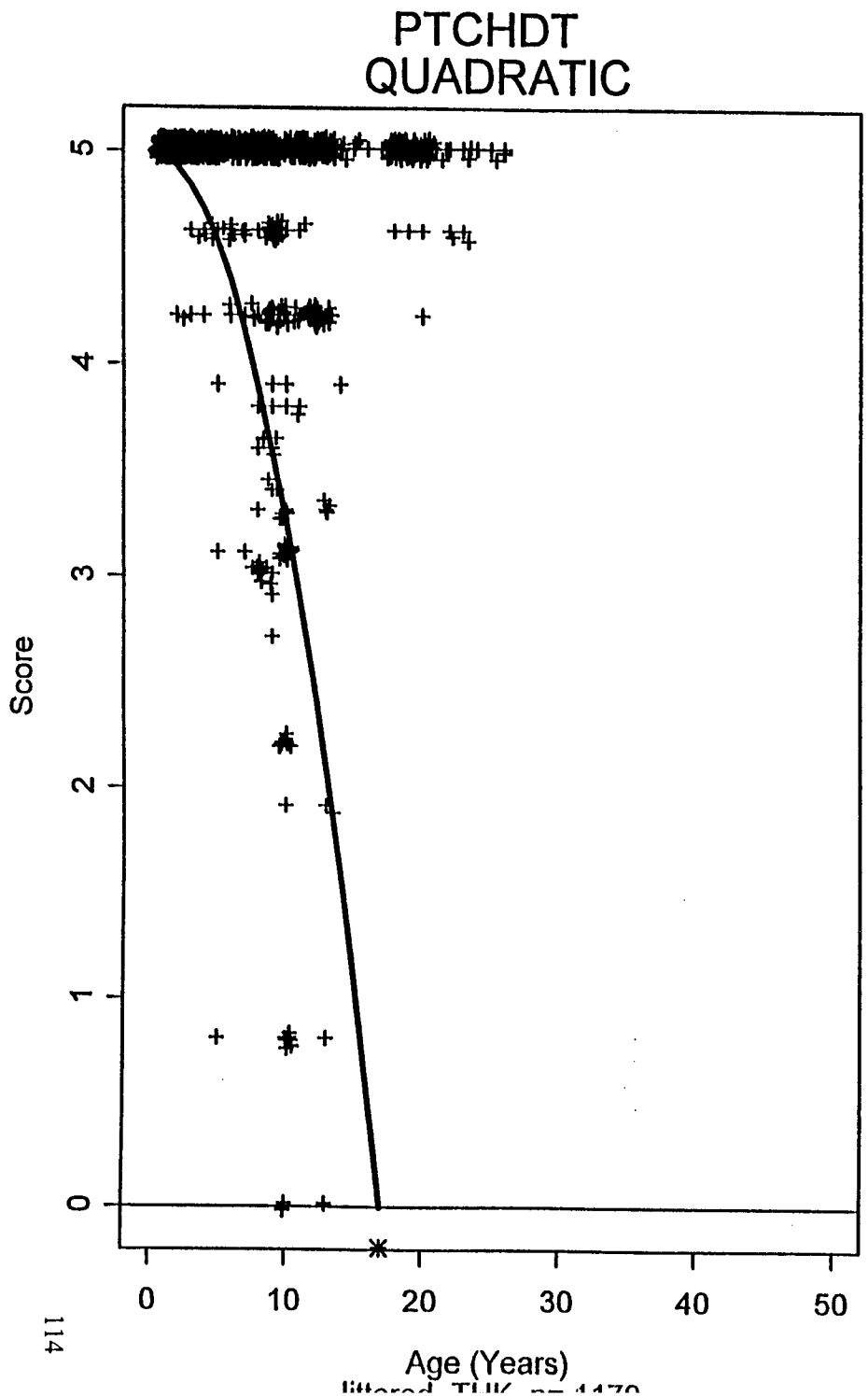
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.89	4.89	4.89	4.88	4.87	4.85	4.82	4.78	4.72	4.64

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.53	4.39	4.21	3.99	3.72	3.40	3.01	2.56	2.04	1.43	0.73

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:21:29 1998
Family: THK
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 17

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.208	0.06	3.473	0.003

R-Squared = 0.43

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.25	0.071	3.529	0.003

R-Squared = 0.438

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.313	0.067	4.695	0

R-Squared = 0.579

ROUGHNESS ON THK

NDEX = C - M * AGE ^ B

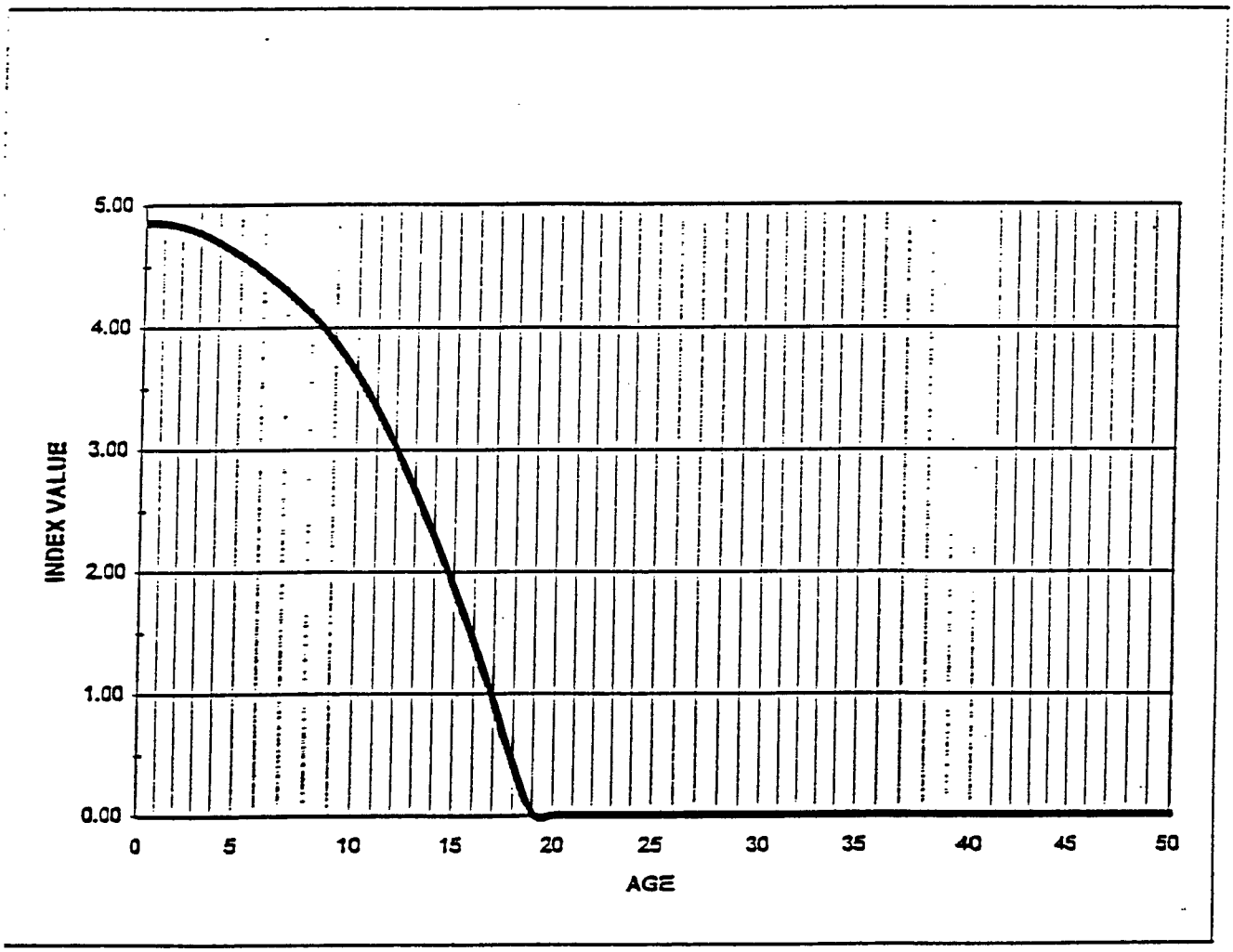
C Value: 4.86
M Value: 0.008684264
B Value: 2.16

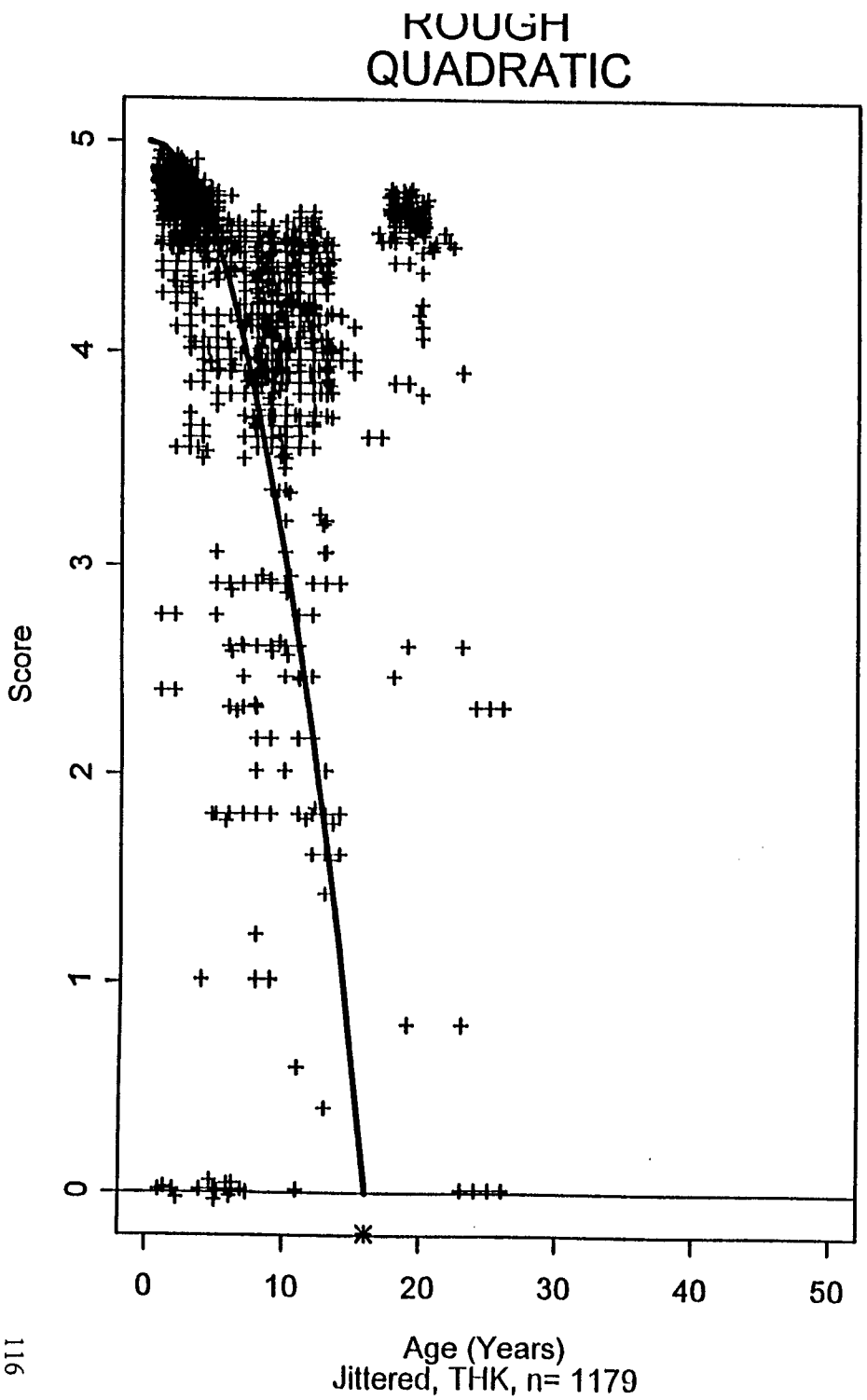
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.86	4.85	4.82	4.77	4.69	4.58	4.44	4.28	4.08	3.86	3.60

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.32	3.00	2.65	2.26	1.85	1.40	0.91	0.39	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:22:45 1998
Family: THK
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.039	0.069	0.567	0.579

R-Squared = 0.021

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.15	0.066	2.261	0.039

R-Squared = 0.254

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.207	0.074	2.812	0.013

R-Squared = 0.345

RUT DEPTH ON THK

NDEX = C - M * AGE ^ B

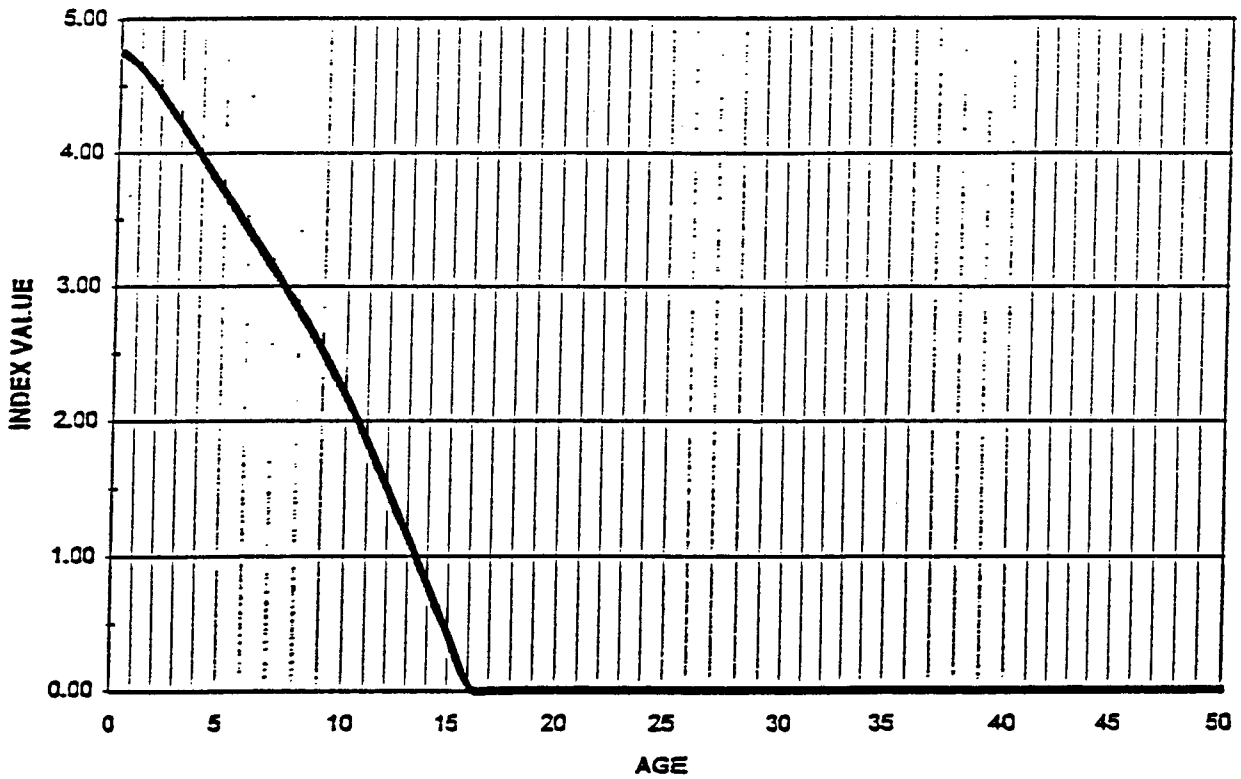
C Value: 4.76
M Value: 0.1362671
B Value: 1.28

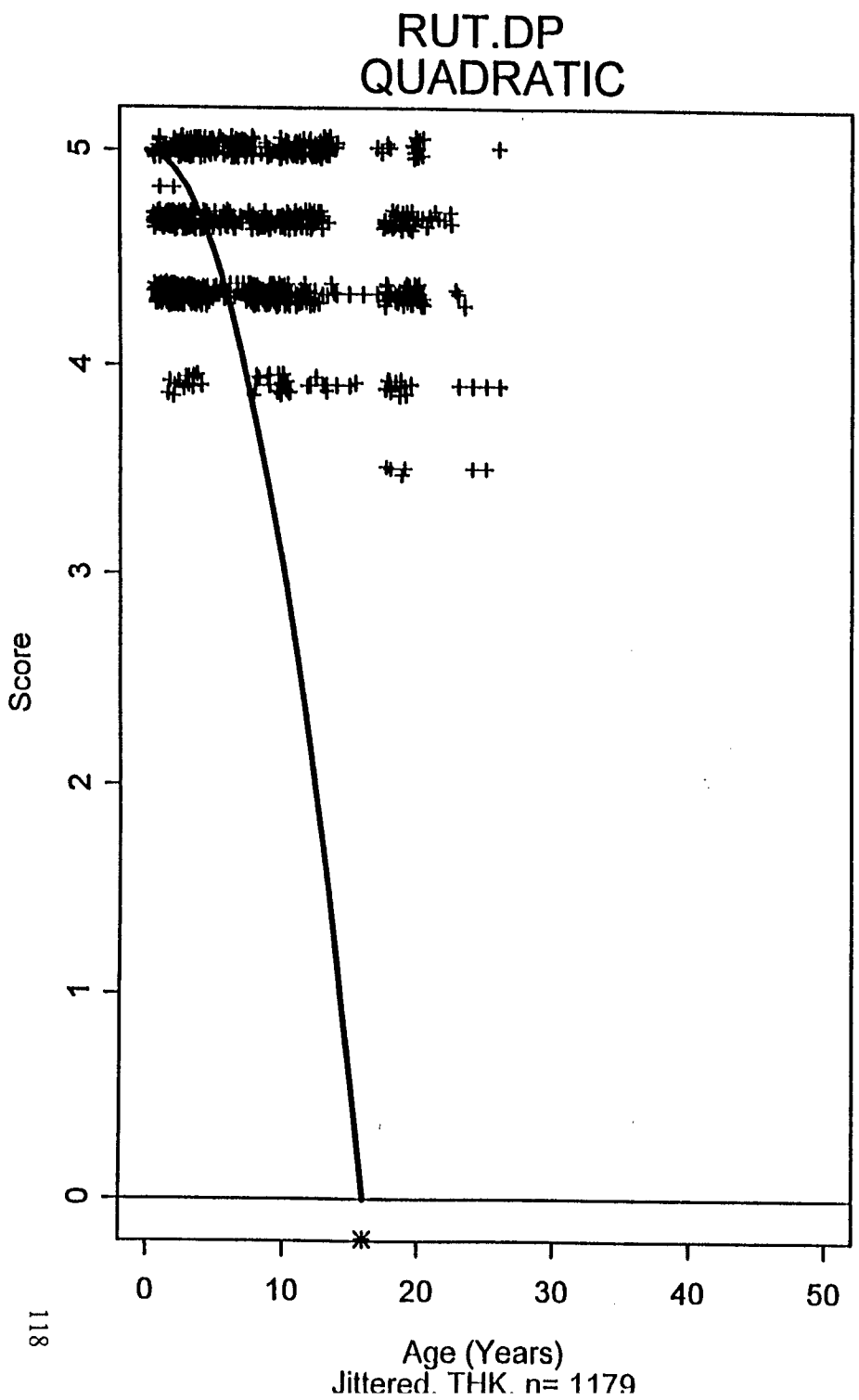
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.76	4.62	4.43	4.20	3.96	3.69	3.41	3.12	2.81	2.49	2.16

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.83	1.48	1.13	0.77	0.40	0.02	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:23:57 1998
Family: THK
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.175	0.097	1.804	0.091

R-Squared = 0.178

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.207	0.094	2.202	0.044

R-Squared = 0.244

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.305	0.09	3.404	0.004

R-Squared = 0.436

TRANSVERSE CRACKING ON THK

INDEX = C - M * AGE ^ B

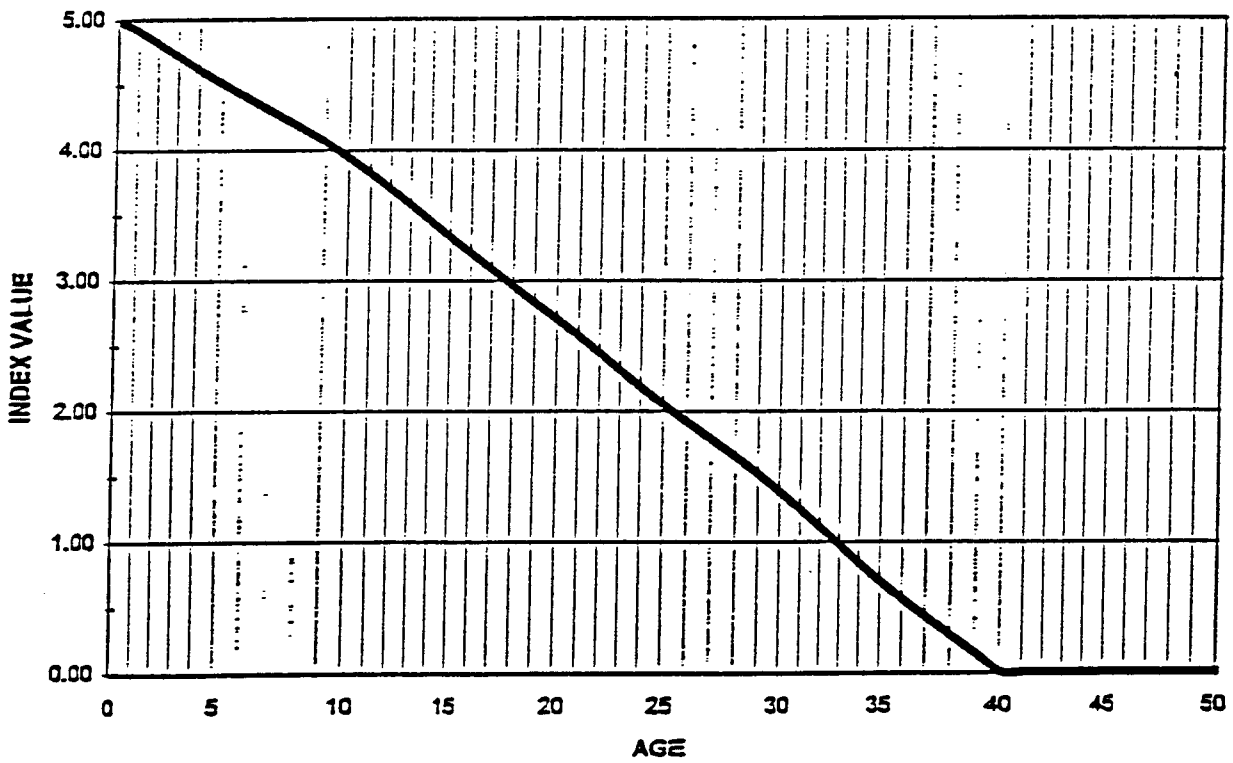
C Value: 4.99
M Value: 0.08015749
B Value: 1.12

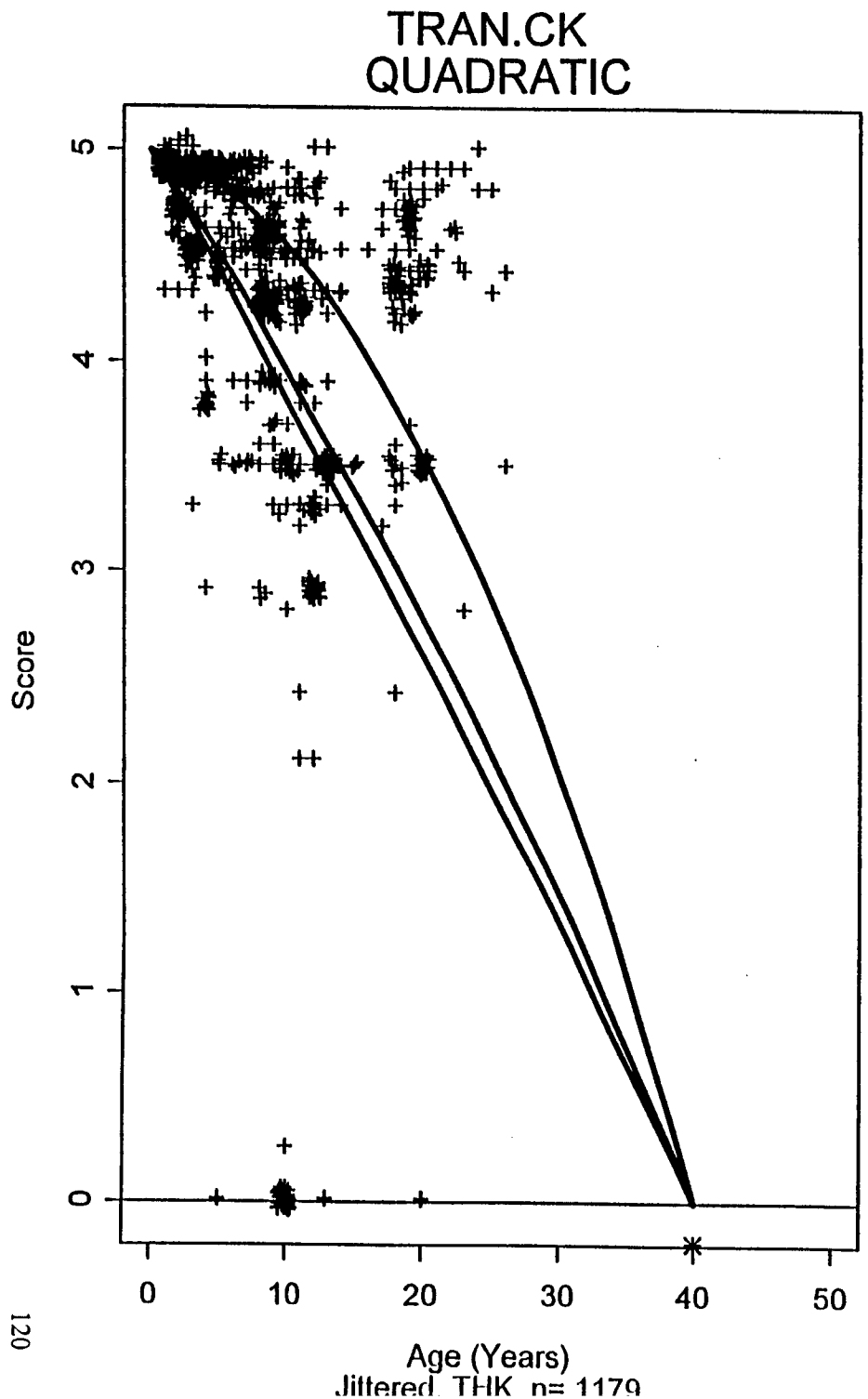
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.99	4.91	4.82	4.72	4.61	4.50	4.39	4.28	4.17	4.05	3.93

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.81	3.69	3.57	3.45	3.33	3.20	3.08	2.95	2.82	2.69	2.56

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	2.43	2.30	2.17	2.04	1.91	1.78	1.64	1.51	1.37	1.24	1.10

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.97	0.83	0.69	0.55	0.42	0.28	0.14	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:25:17 1998
Family: THK
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 40

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.115	0.037	-3.159	0.004

R-Squared = 0.285

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.097	0.038	-2.562	0.017

R-Squared = 0.208

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.02	0.016	-1.251	0.222

R-Squared = 0.059

APPENDIX E3.2

PERFORMANCE MODELS FOR THK - A PAVEMENT FAMILY

PAVEMENT FAMILY: THK – A [AC Overlay on Original]

Number of data points available for regression of performance curves : 18939
Range of years of data available for the given family : 03 to 40 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.485
   Optimum forced end point is obtained at 29 years with a R^2 value of : 0.694 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.356
   Optimum forced end point is obtained at 21 years with a R^2 value of : 0.422
   Adjusting from the expert curve of the Original Family use endpoint of 10 years
   Historical data forced to end at 10 years has a R^2 value of : 0.375 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.485
   Optimum forced end point is obtained at 33 years with a R^2 value of : 0.659
   Adjusting from the expert curve of the Original Family use endpoint of 17 years
   Historical data forced to end at 17 years has a R^2 value of : 0.378 ✓

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 21 years with a R^2 value of : 0.363
   Adjusting from the expert curve of the Original Family use endpoint of 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.296 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 29 years with a R^2 value of : 0.472
   Adjusting from the expert curve of the Original Family use endpoint of 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.364 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 29 years
   Historical data forced to end at 29 years has a R^2 value of : 0.037
   Optimum forced end point is obtained at 15 years with a R^2 value of : 0.339 ✓

BLOCK CRACKING ON THK AFTER ASPHALT OVERLAY

NDEX = C - M * AGE ^ B

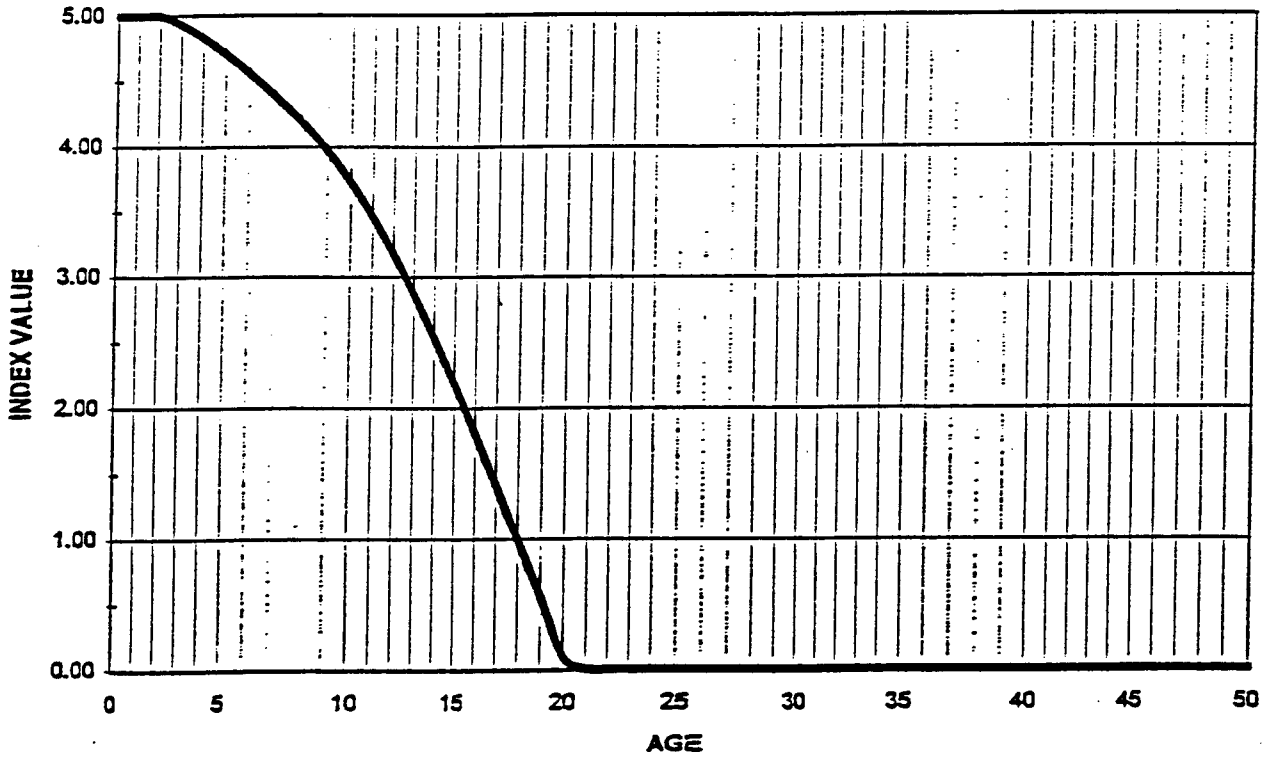
C Value: 5.07
M Value: 0.01787804
B Value: 1.88

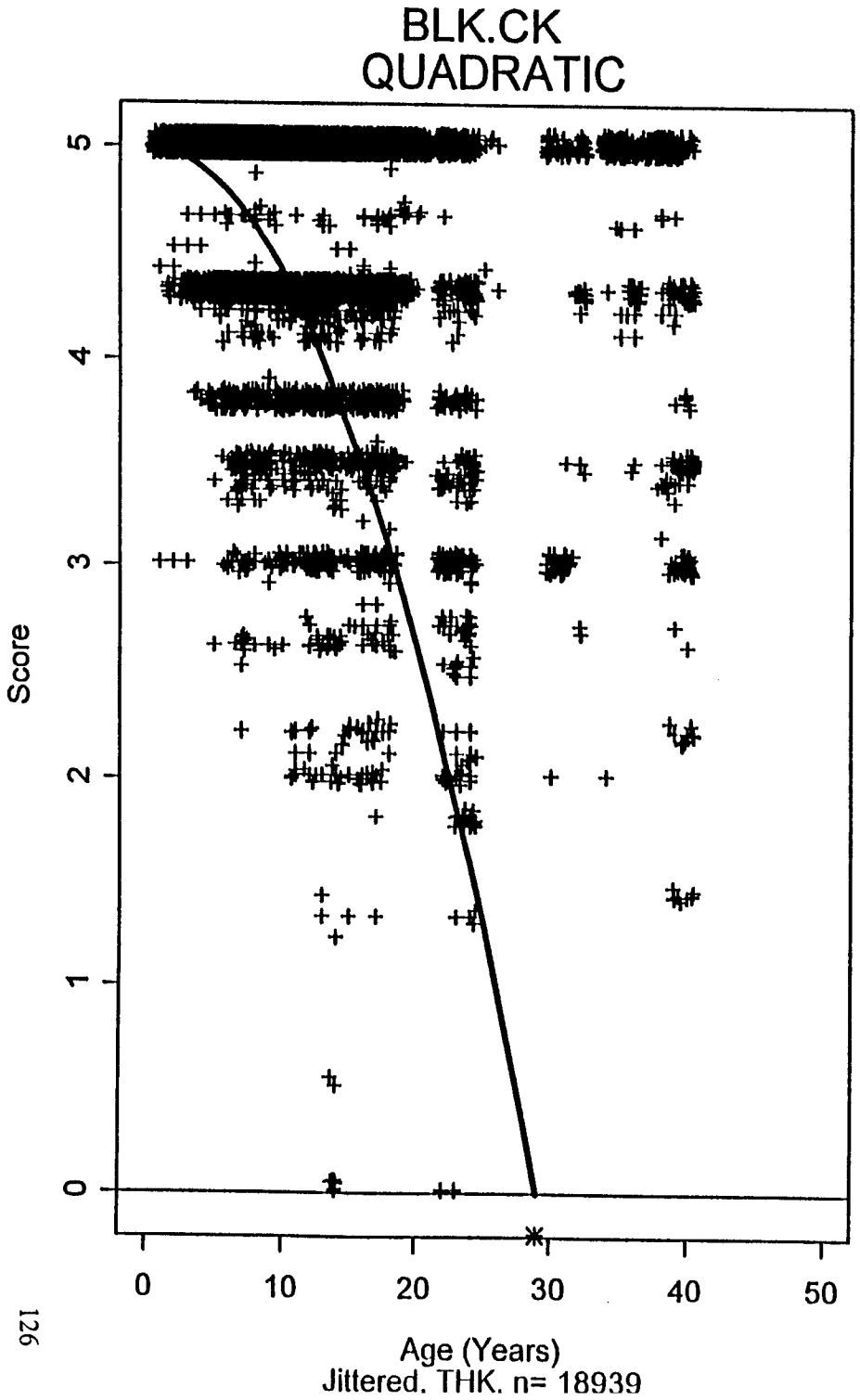
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	4.93	4.83	4.70	4.55	4.38	4.18	3.96	3.71

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.45	3.16	2.85	2.52	2.16	1.79	1.39	0.98	0.54	0.08	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:42:54 1998
Family: THK
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 29

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.09	0.014	6.552	0

R-Squared = 0.632

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.135	0.018	7.532	0

R-Squared = 0.694

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.137	0.02	6.92	0

R-Squared = 0.657

FATIGUE CRACKING ON THK AFTER ASPHALT OVERLAY

INDEX = C - M * AGE ^ B

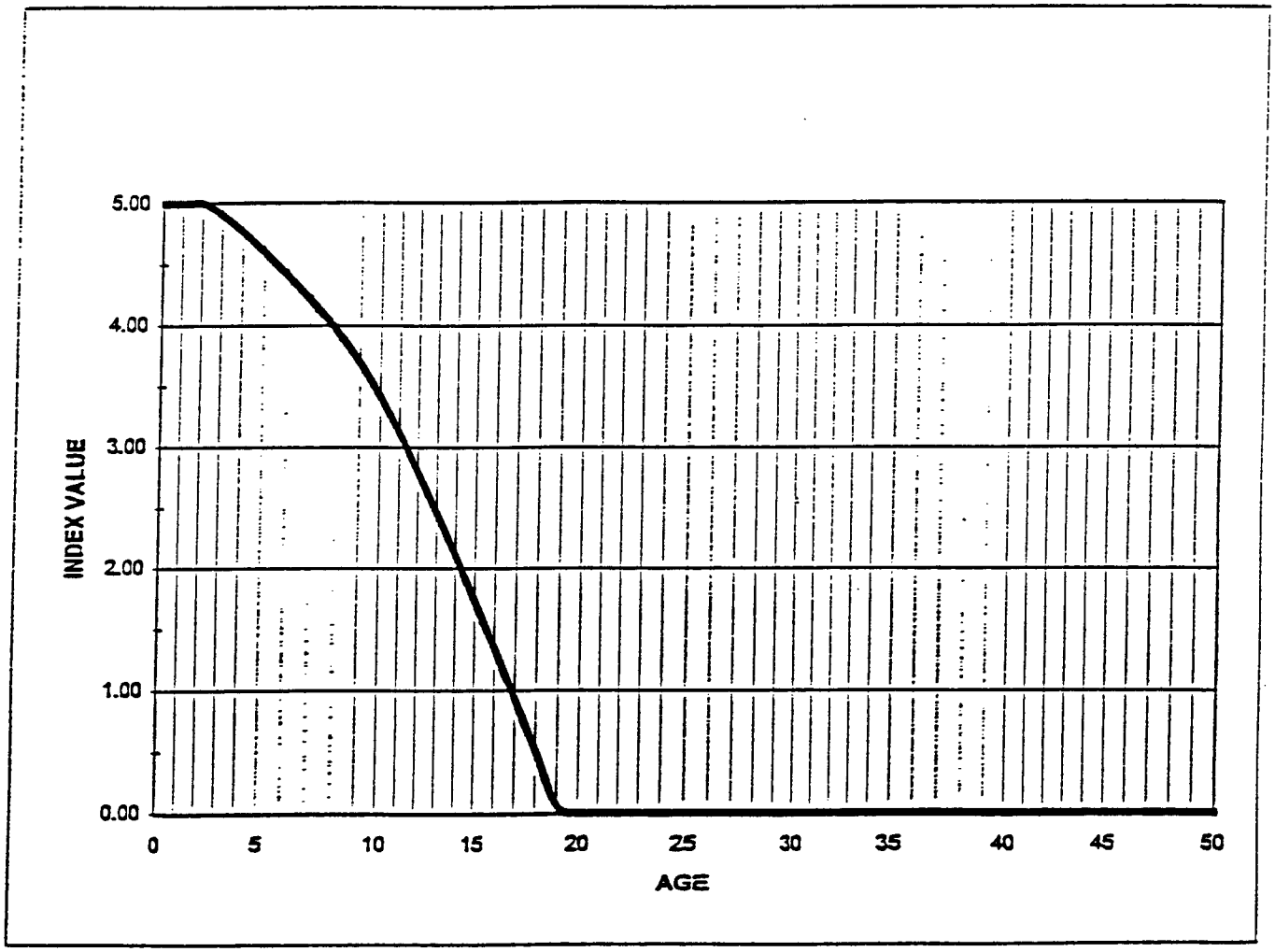
C Value: 5.13
M Value: 0.03612957
B Value: 1.68

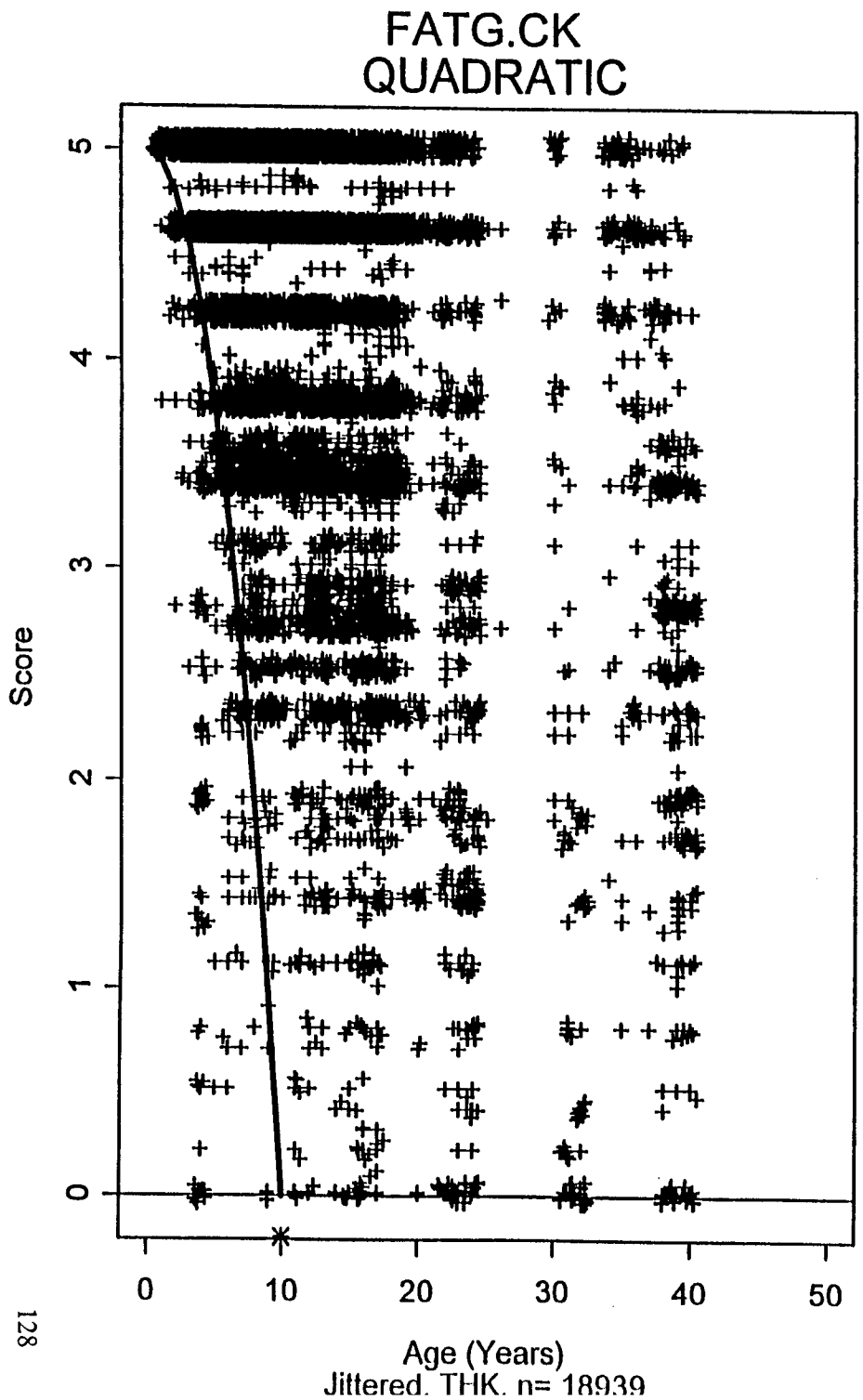
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	4.90	4.76	4.59	4.40	4.18	3.94	3.68	3.40

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.10	2.78	2.44	2.09	1.71	1.32	0.91	0.49	0.05	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:41:06 1998
Family: THK
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.712	0.317	2.249	0.051

R-Squared = 0.36

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.794	0.342	2.322	0.045

R-Squared = 0.375

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.937	0.361	2.593	0.029

R-Squared = 0.428

PATCH DETERIORATION ON THK AFTER ASPHALT OVERLAY

INDEX = C - M * AGE ^ B

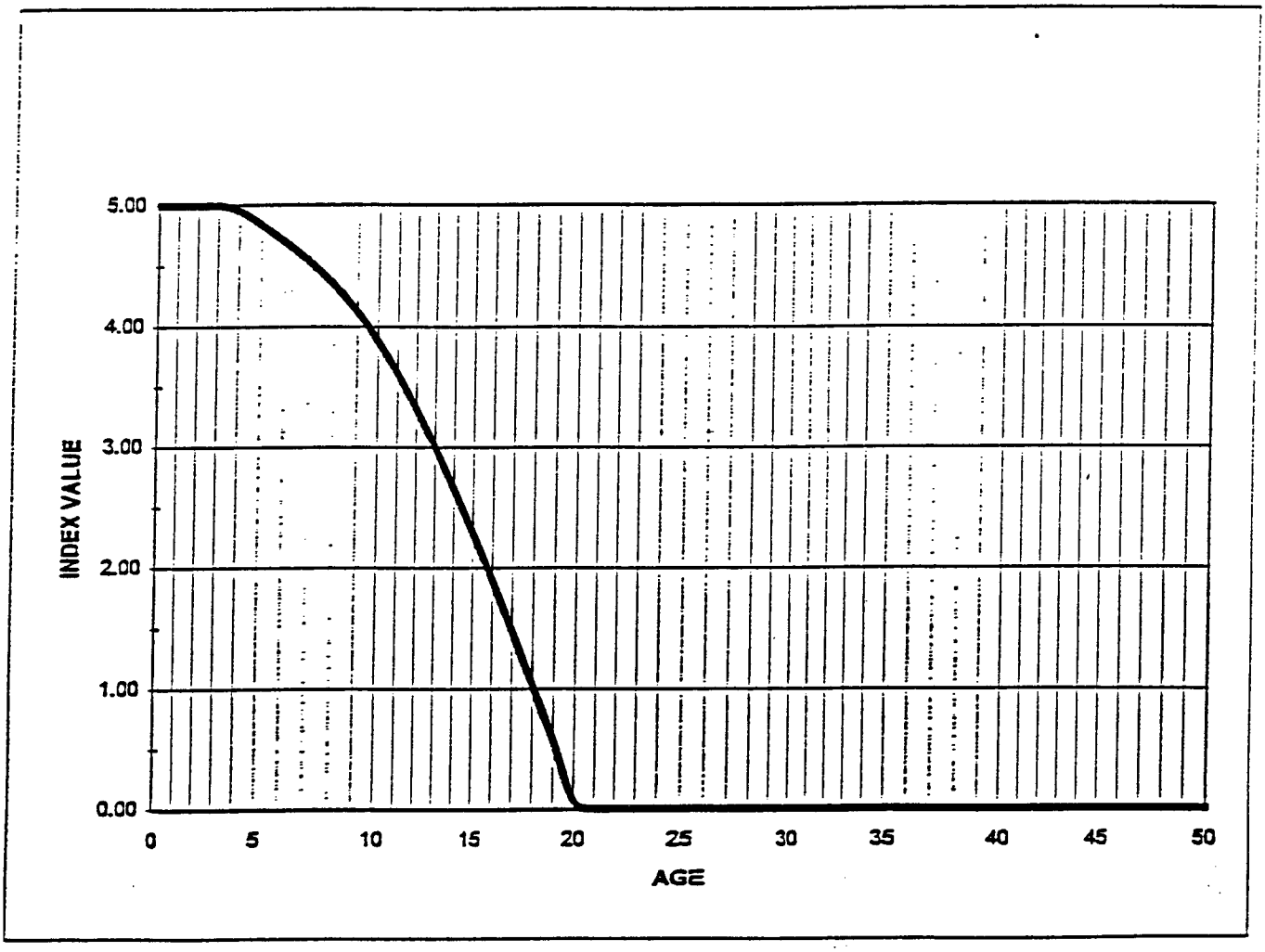
C Value: 5.16
M Value: 0.01356819
B Value: 1.98

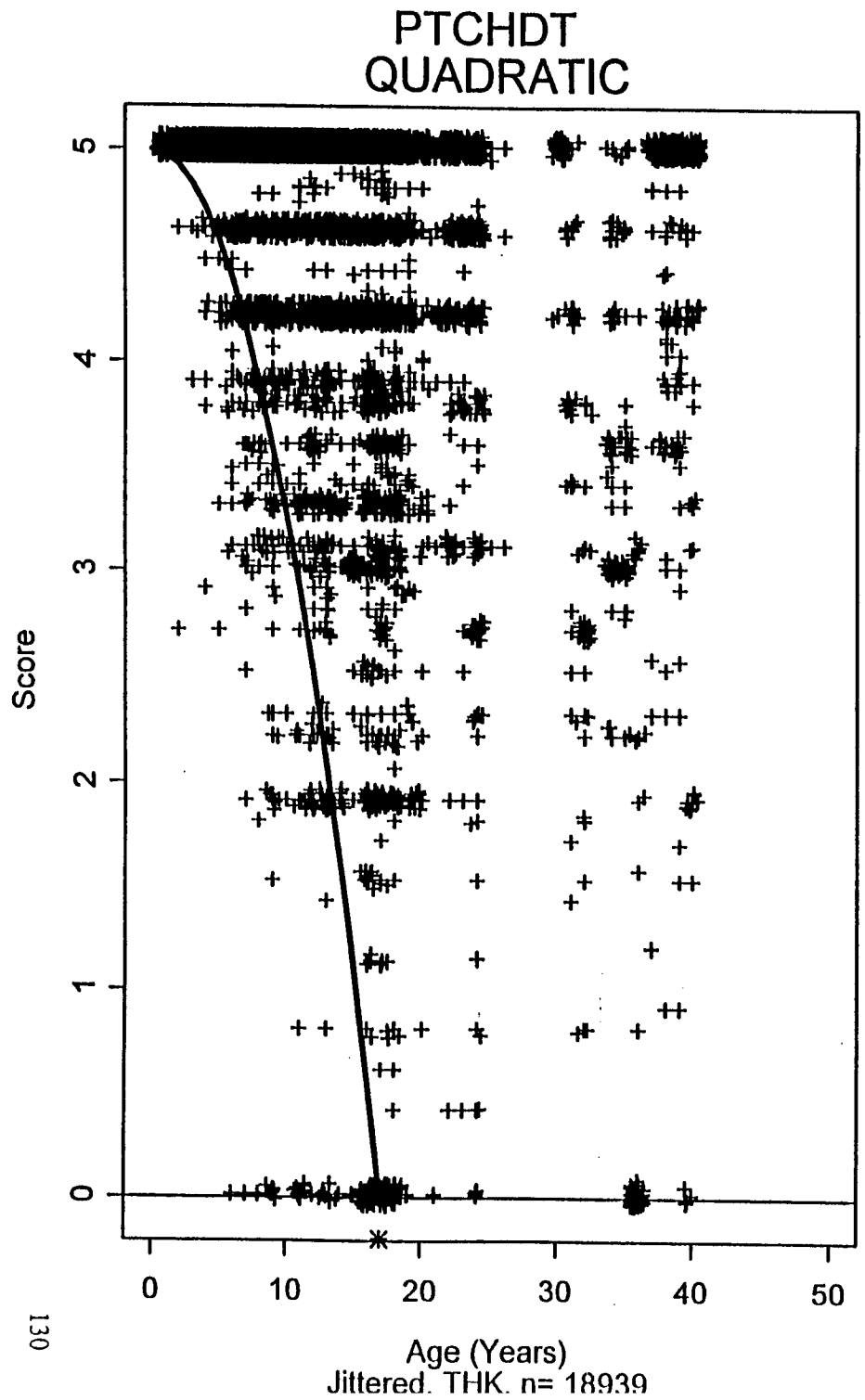
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	4.95	4.83	4.69	4.52	4.33	4.11	3.86

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.60	3.30	2.98	2.64	2.27	1.87	1.45	1.01	0.54	0.05	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 16:46:50 1998
Family: THK
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 17

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.4	0.113	3.527	0.003

R-Squared = 0.437

50TH PERCENTILE
Coefficient Estimates:

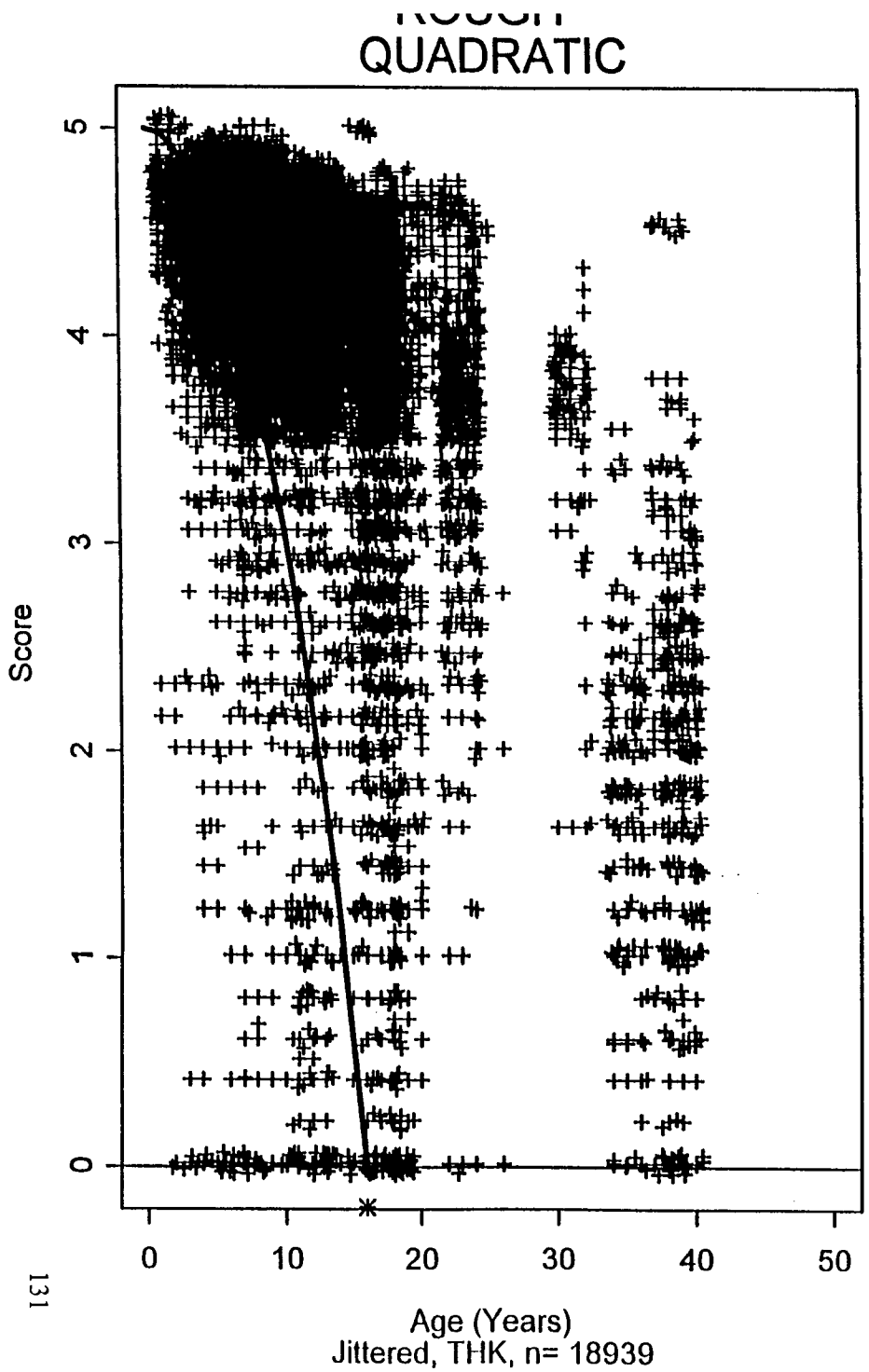
	Value	Std. Error	t value	Pr(>|t|)
1	0.403	0.129	3.118	0.007

R-Squared = 0.378

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.403	0.129	3.118	0.007

R-Squared = 0.378



Date of Analysis: Thu May 7 16:52:28 1998
Family: THK
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.219	0.11	1.996	0.064

R-Squared = 0.21

50TH PERCENTILE
Coefficient Estimates:

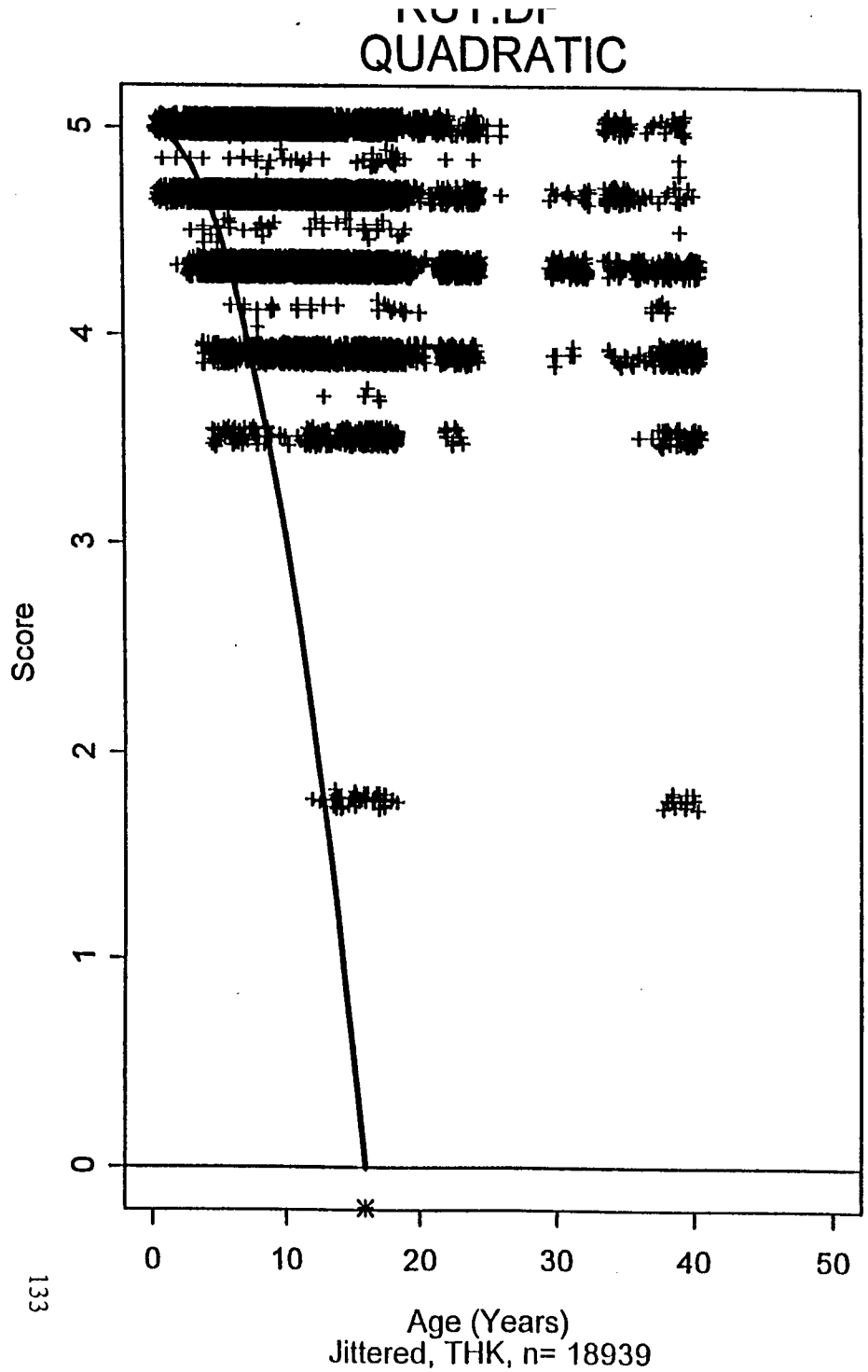
	Value	Std. Error	t value	Pr(>|t|)
1	0.301	0.12	2.508	0.024

R-Squared = 0.295

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.336	0.126	2.675	0.017

R-Squared = 0.323



Date of Analysis: Thu May 7 16:58:21 1998
Family: THK
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.32	0.12	2.663	0.018

R-Squared = 0.321

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.38	0.129	2.932	0.01

R-Squared = 0.364

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.446	0.135	3.312	0.005

R-Squared = 0.422

TRANSVERSE CRACKING ON THK AFTER ASPHALT OVERLAY

INDEX = C - M * AGE ^ B

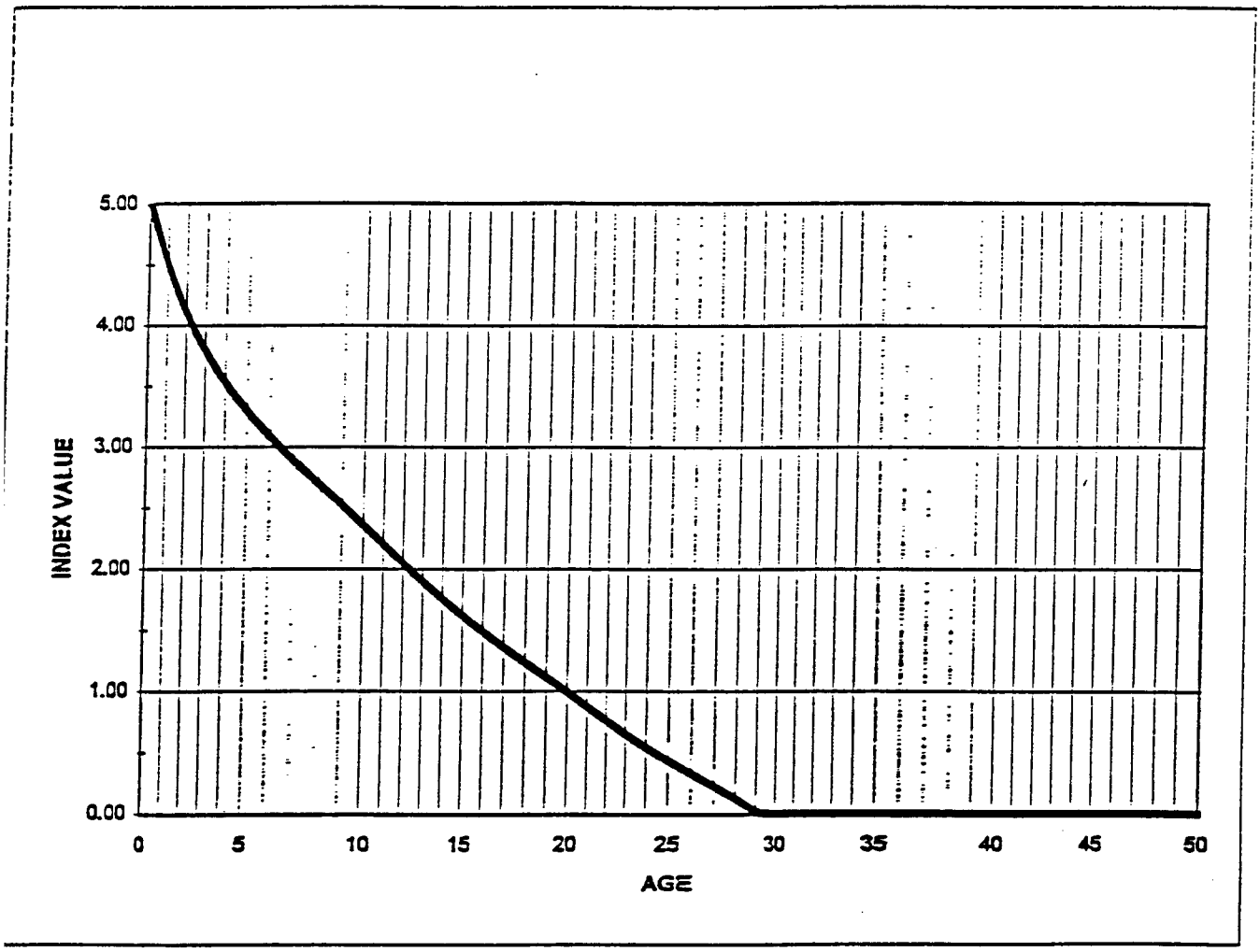
C Value: 5.35
M Value: 0.8660216
B Value: 0.54

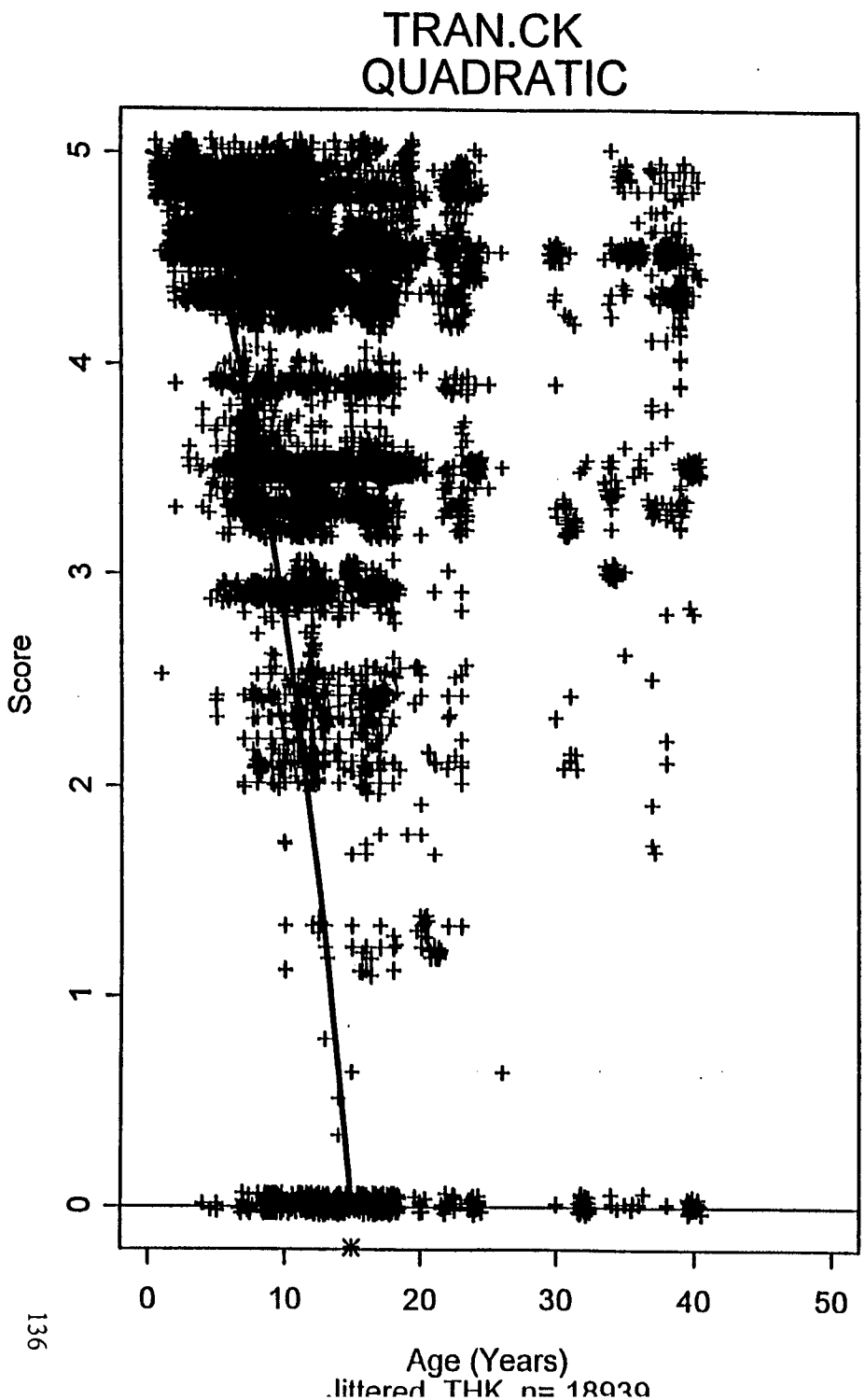
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.48	4.09	3.78	3.52	3.28	3.07	2.87	2.69	2.51	2.35

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.19	2.04	1.89	1.75	1.61	1.48	1.35	1.23	1.10	0.98	0.87

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.75	0.64	0.53	0.42	0.32	0.22	0.11	0.01	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:02:12 1998
Family: THK
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.167	0.098	1.697	0.112

R-Squared = 0.171

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.326	0.122	2.68	0.018

R-Squared = 0.339

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.393	0.137	2.879	0.012

R-Squared = 0.372

APPENDIX E3.3

PERFORMANCE MODELS FOR THK - M PAVEMENT FAMILY

PAVEMENT FAMILY: THK – M [Mill & AC OL on Original]

Number of data points available for regression of performance curves : 2610

Range of years of data available for the given family : 03 to 09 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 23 years
   Historical data forced to end at 23 years has a R^2 value of : 0.789 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.001
   Optimum forced end point is obtained at 13 years with a R^2 value of : 0.55
   Adjusting from the expert curve of the Original Family use endpoint of 10 years
   Historical data forced to end at 10 years has a R^2 value of : 0.444 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.768
   Regression analysis provides inconclusive results so use the existing expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 17 years
   Historical data forced to end at 17 years has a R^2 value of : 0.735 ✓

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.075 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.720 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 30 years
   Historical data forced to end at 30 years has a R^2 value of : 0.849 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

BLOCK CRACKING ON THK AFTER MILL & AC OVERLAY

INDEX = C - M * AGE ^ B

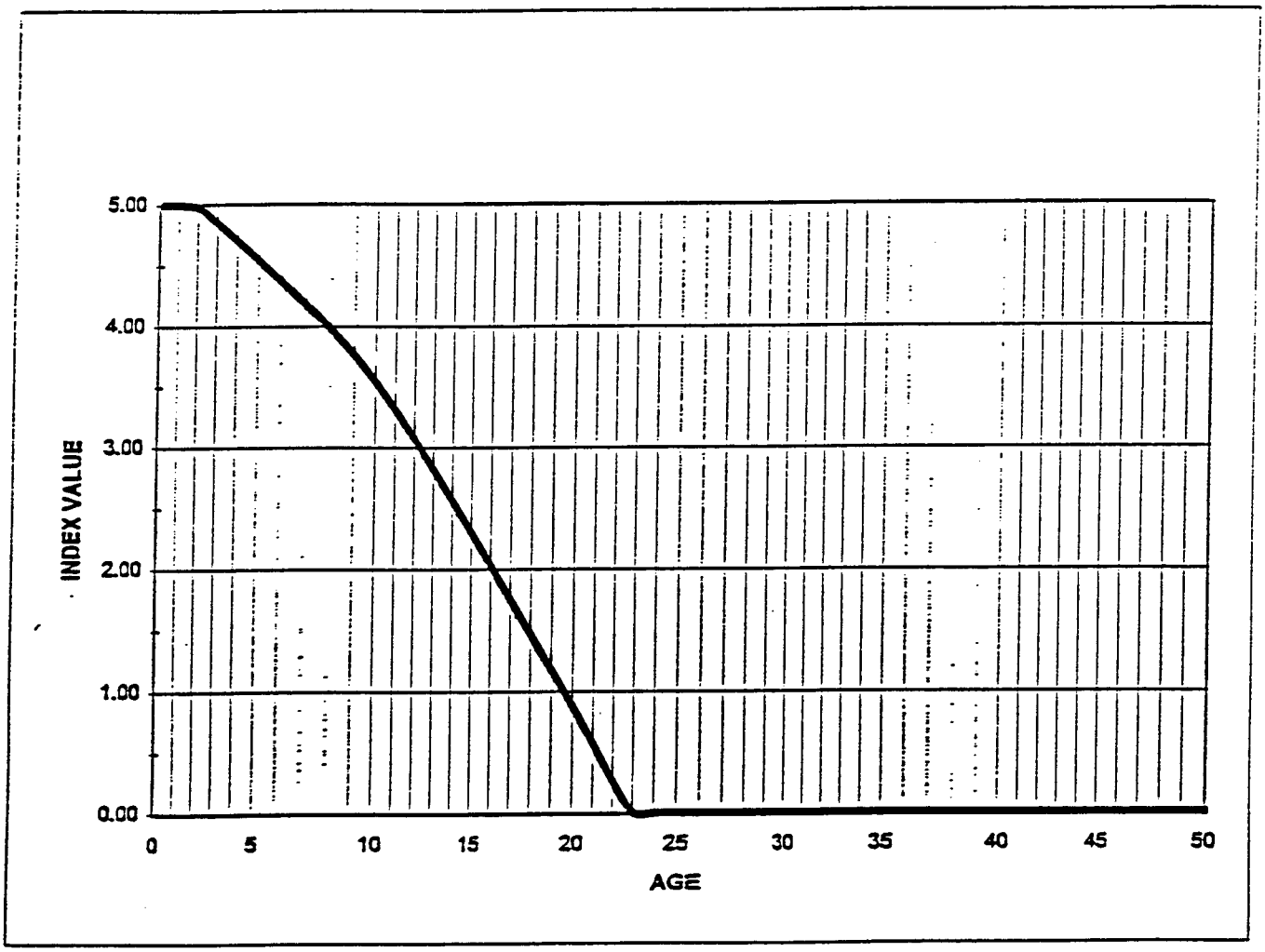
C Value: 5.14
M Value: 0.06261244
B Value: 1.41

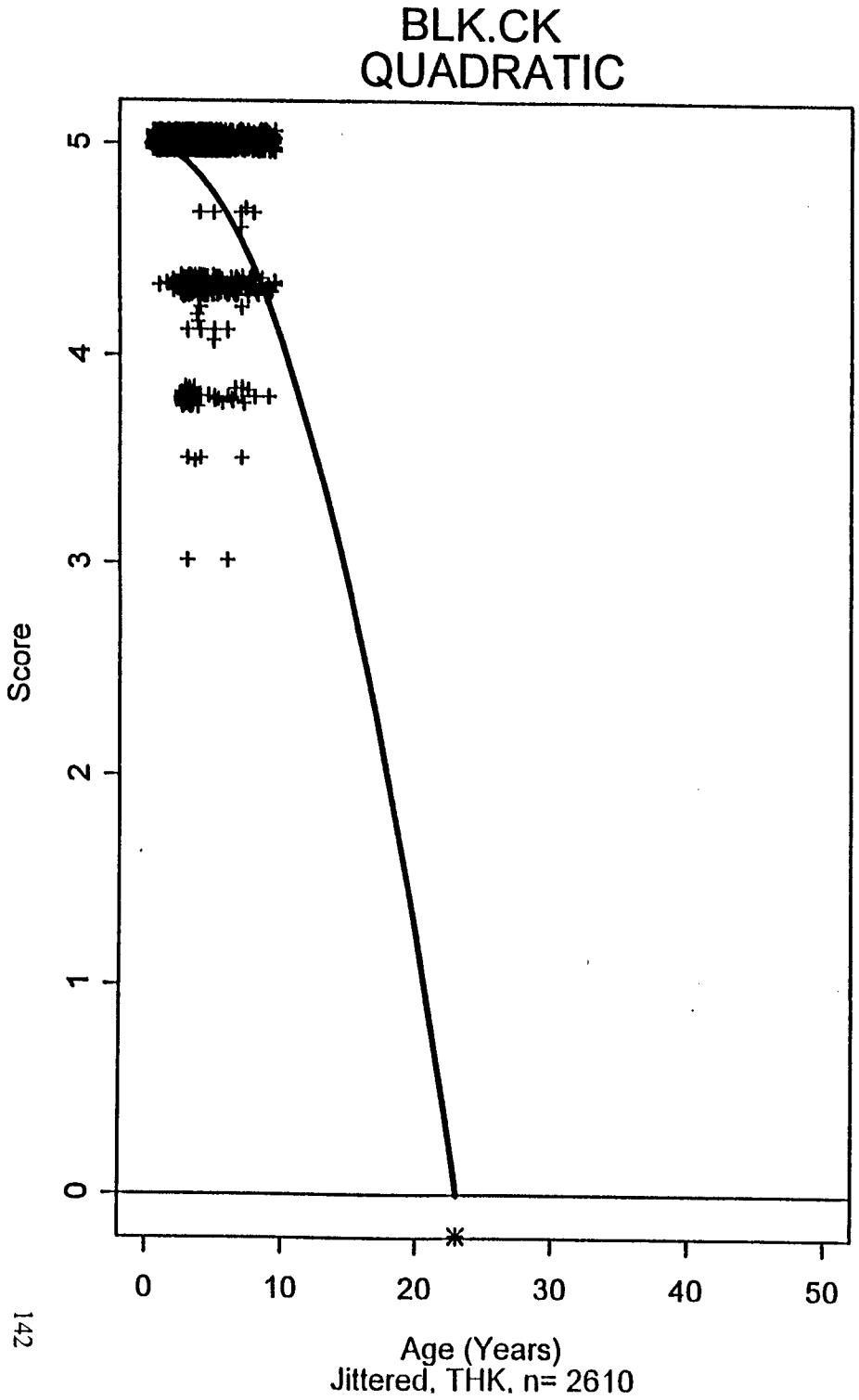
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.97	4.85	4.70	4.53	4.36	4.17	3.97	3.75	3.53

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.30	3.06	2.81	2.55	2.29	2.02	1.74	1.45	1.16	0.86	0.56

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:15:35 1998
Family: THK
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 23

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.041	0.021	1.999	0.081

R-Squared = 0.333

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.067	0.012	5.464	0.001

R-Squared = 0.789

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.067	0.012	5.464	0.001

R-Squared = 0.789

FATIGUE CRACKING ON THK AFTER MILL & AC OVERLAY

INDEX = C - M * AGE ^ B

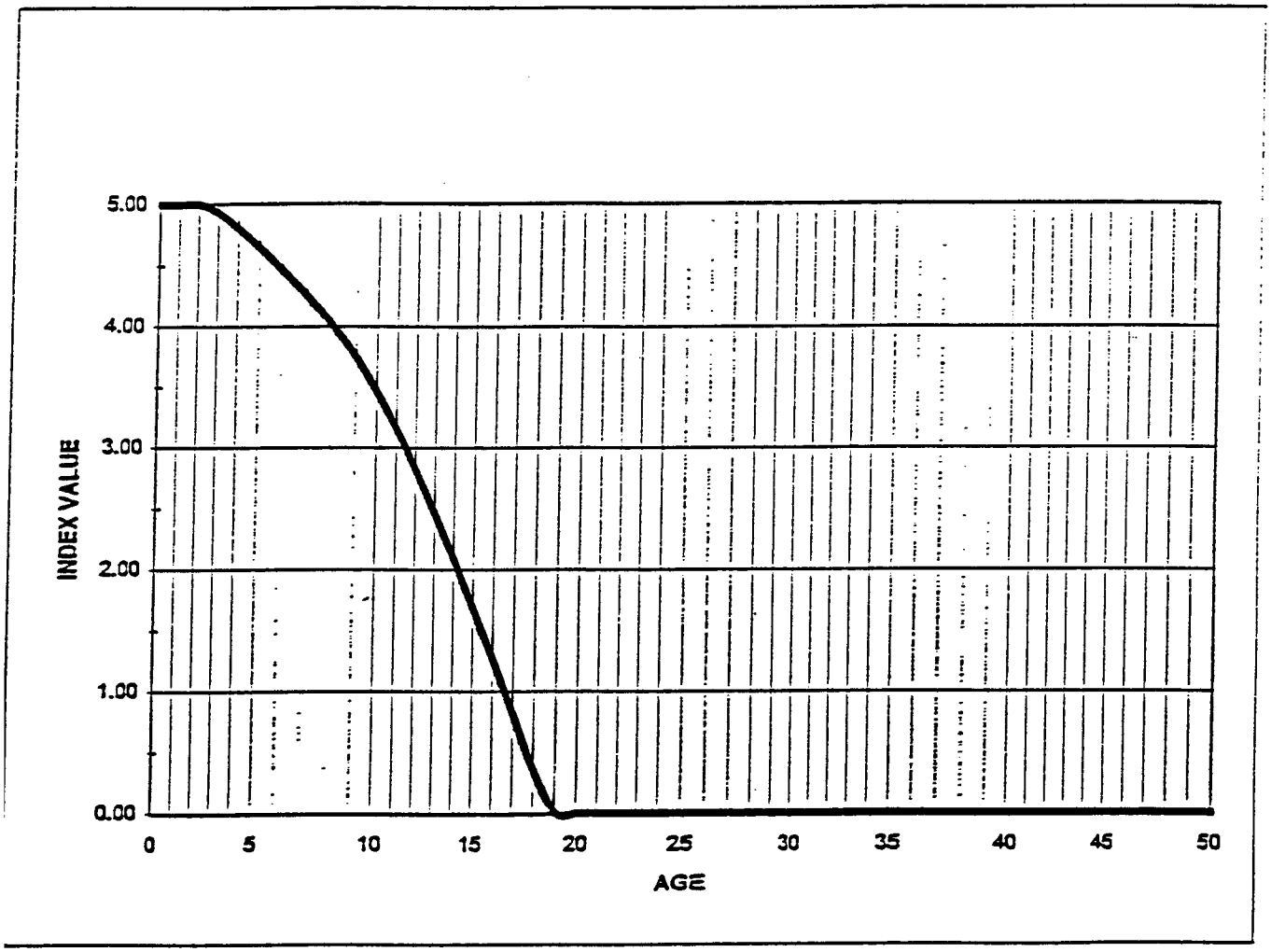
C Value: 5.12
M Value: 0.02711254
B Value: 1.79

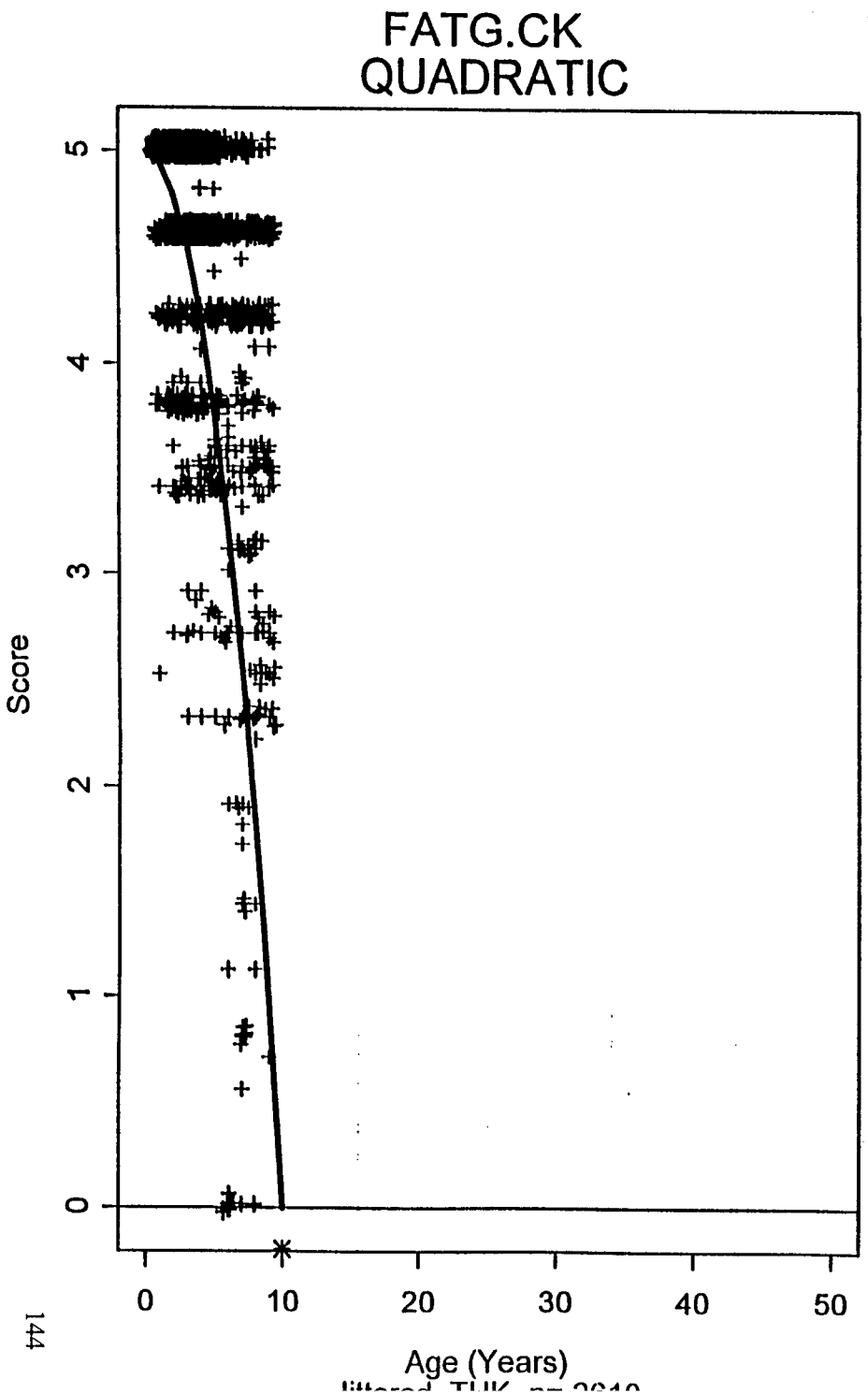
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	4.93	4.80	4.64	4.45	4.24	4.00	3.74	3.45

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.14	2.80	2.45	2.07	1.67	1.24	0.80	0.33	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:18:04 1998
Family: THK
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.168	0.096	1.749	0.118

R-Squared = 0.277

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.311	0.123	2.528	0.035

R-Squared = 0.444

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.407	0.14	2.917	0.019

R-Squared = 0.515

PATCH DETERIORATION ON THK AFTER MILL & AC OVERLAY

INDEX = C - M * AGE ^ B

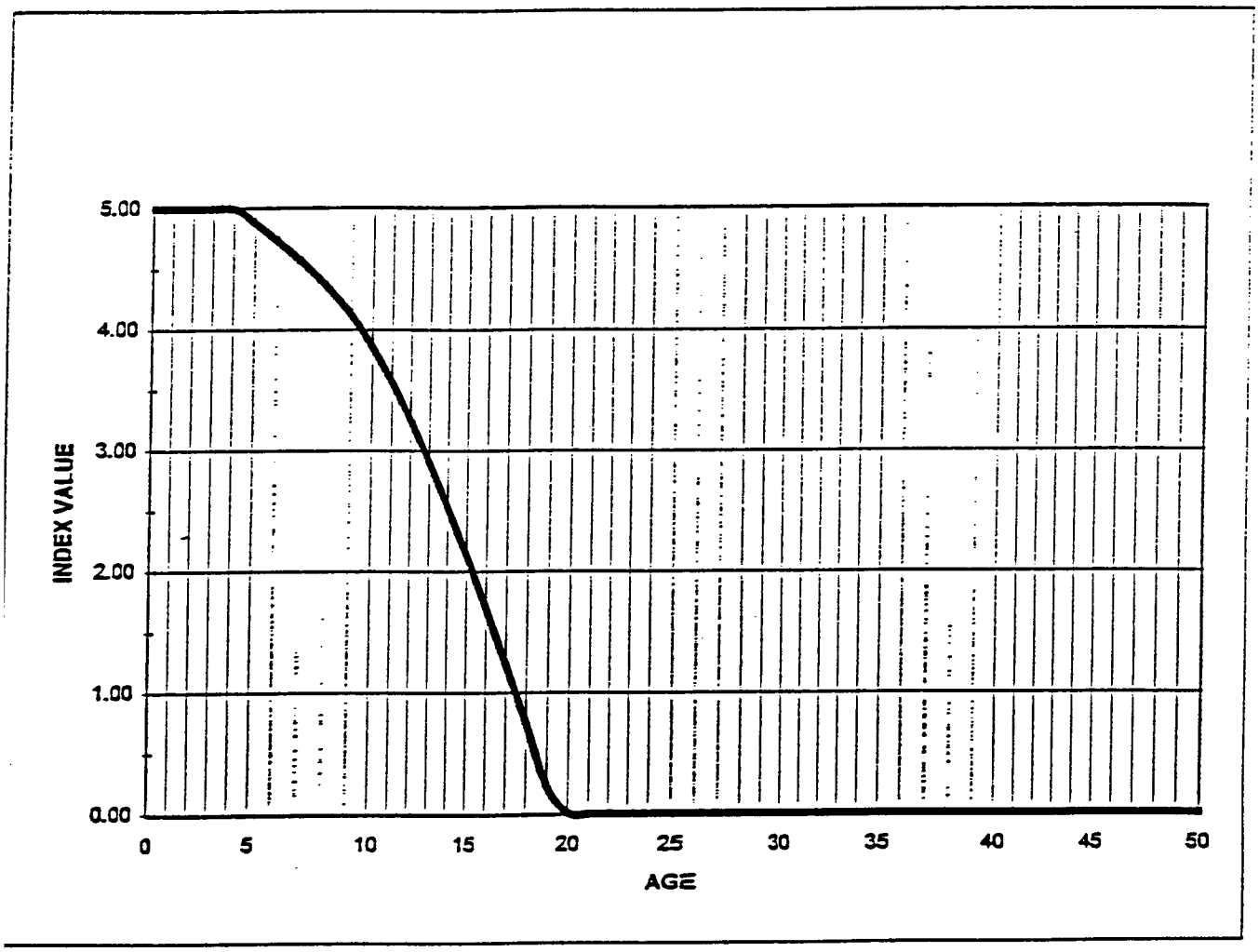
C Value: 5.21
M Value: 0.01306766
B Value: 2.02

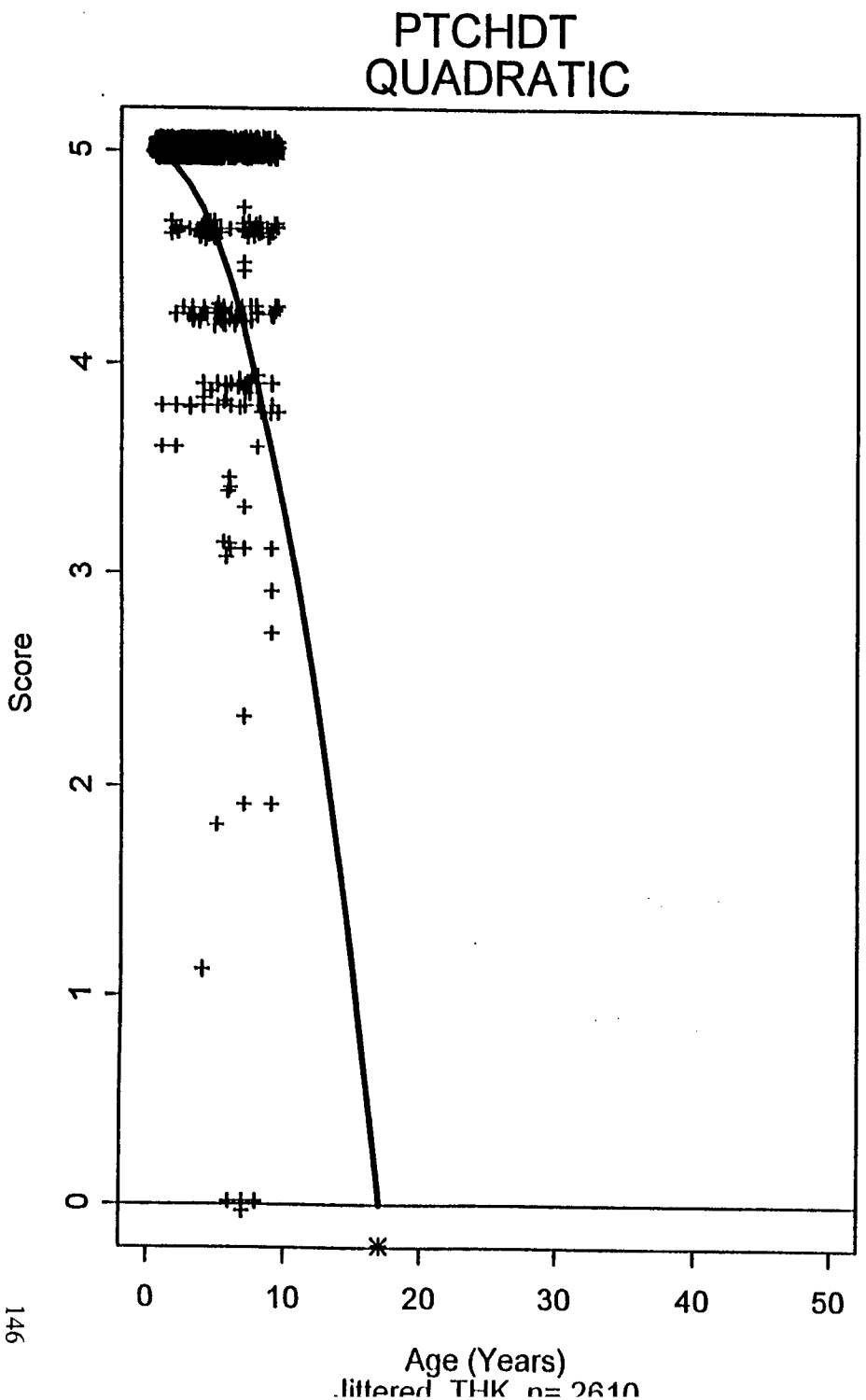
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	5.00	4.87	4.72	4.54	4.34	4.10	3.84

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.55	3.23	2.89	2.51	2.11	1.67	1.21	0.72	0.21	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:19:14 1998
Family: THK
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 17

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.118	0.022	5.35	0.001

R-Squared = 0.782

50TH PERCENTILE
Coefficient Estimates:

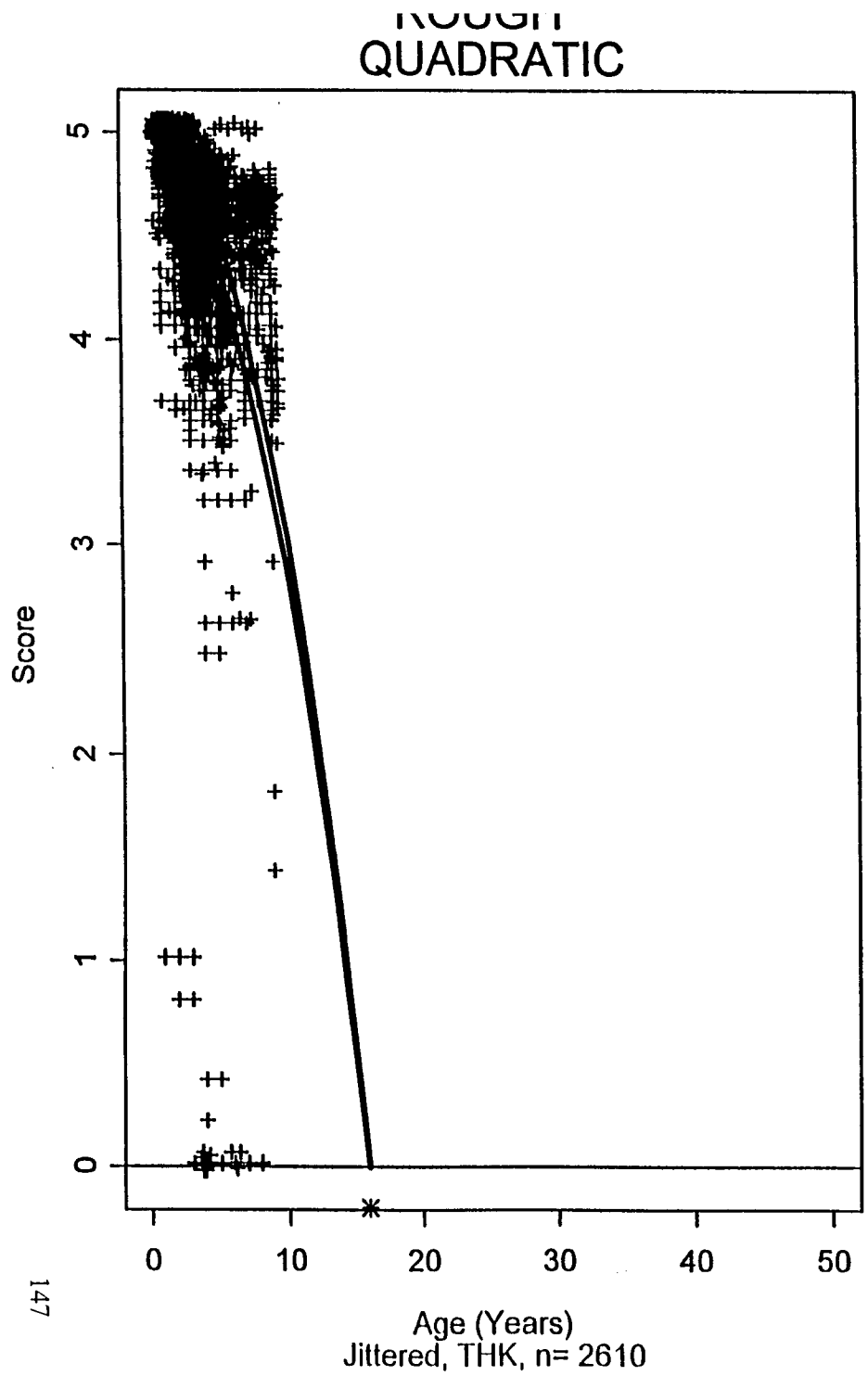
	Value	Std. Error	t value	Pr(>|t|)
1	0.133	0.028	4.711	0.002

R-Squared = 0.735

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.133	0.028	4.711	0.002

R-Squared = 0.735



Date of Analysis: Thu May 7 17:20:24 1998
Family: THK
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.047	0.032	-1.47	0.18

R-Squared = 0.213

50TH PERCENTILE
Coefficient Estimates:

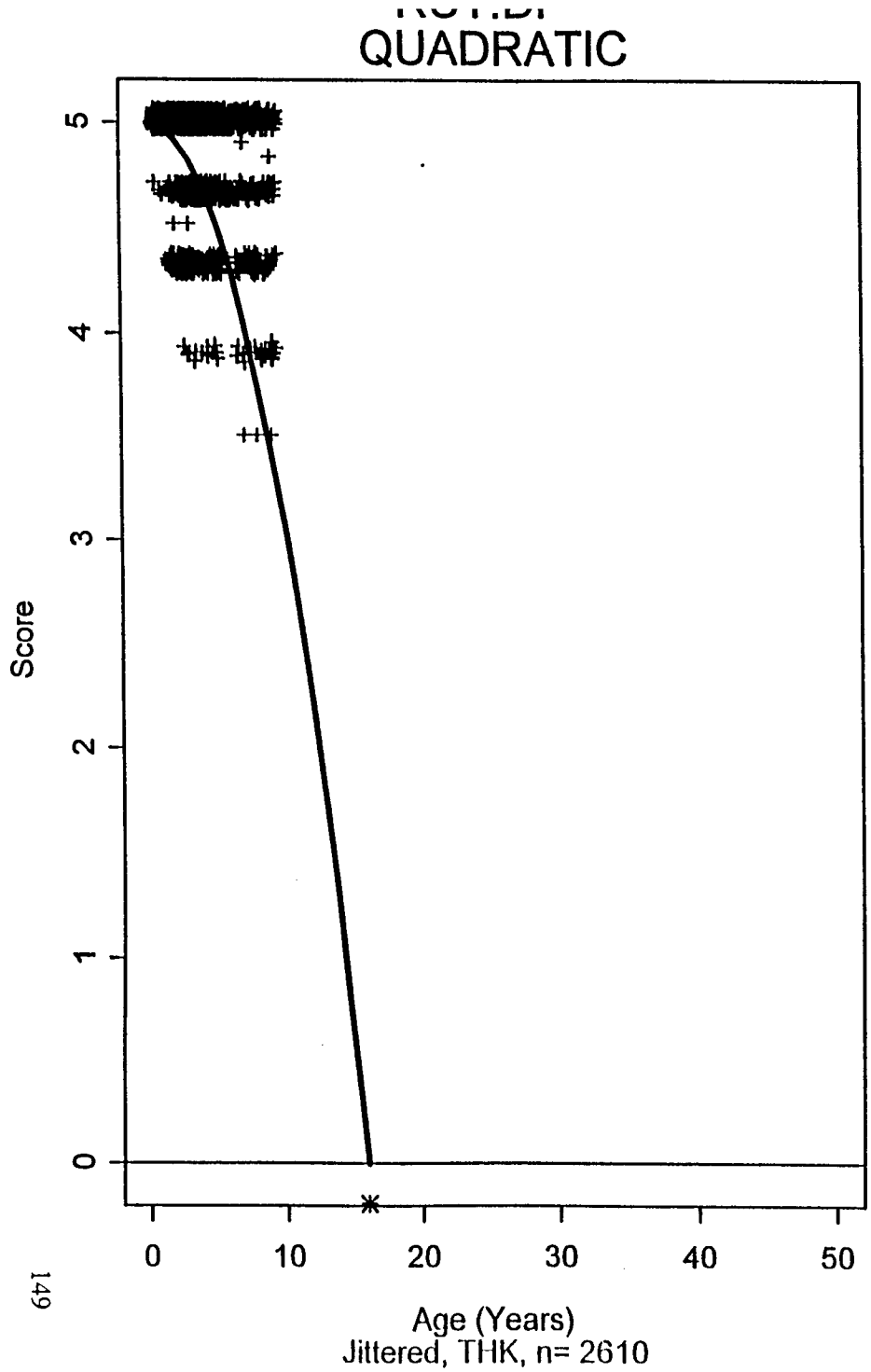
	Value	Std. Error	t value	Pr(>|t|)
1	0.026	0.032	0.804	0.445

R-Squared = 0.075

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.078	0.029	2.636	0.03

R-Squared = 0.465



Date of Analysis: Thu May 7 17:21:30 1998
Family: THK
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.048	0.034	1.405	0.198

R-Squared = 0.198

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.152	0.034	4.53	0.002

R-Squared = 0.72

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.152	0.034	4.53	0.002

R-Squared = 0.72

TRANSVERSE CRACKING ON THK AFTER MILL & AC OVERLAY

INDEX = C - M * AGE ^ B

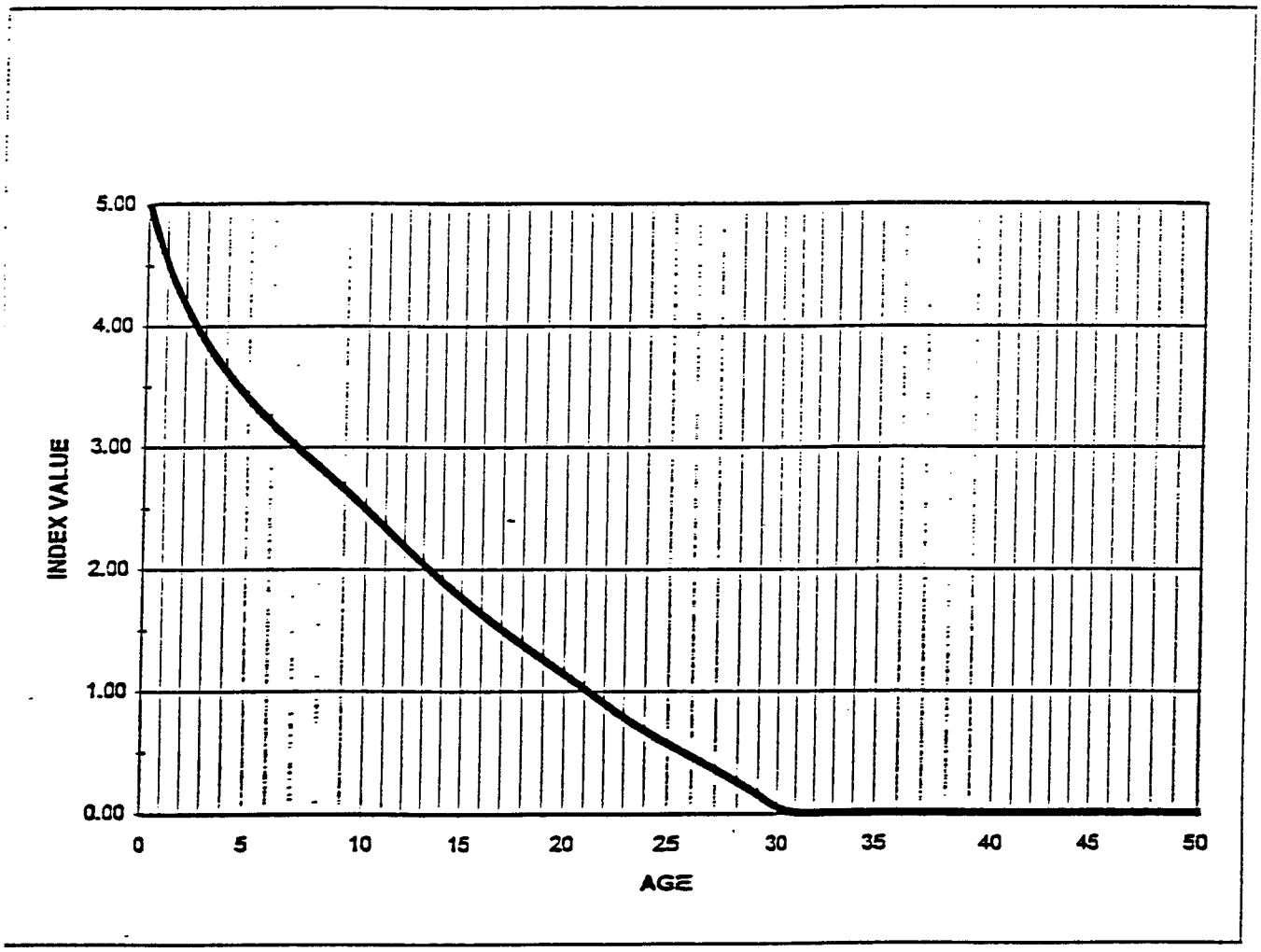
C Value: 5.23
M Value: 0.7219313
B Value: 0.58

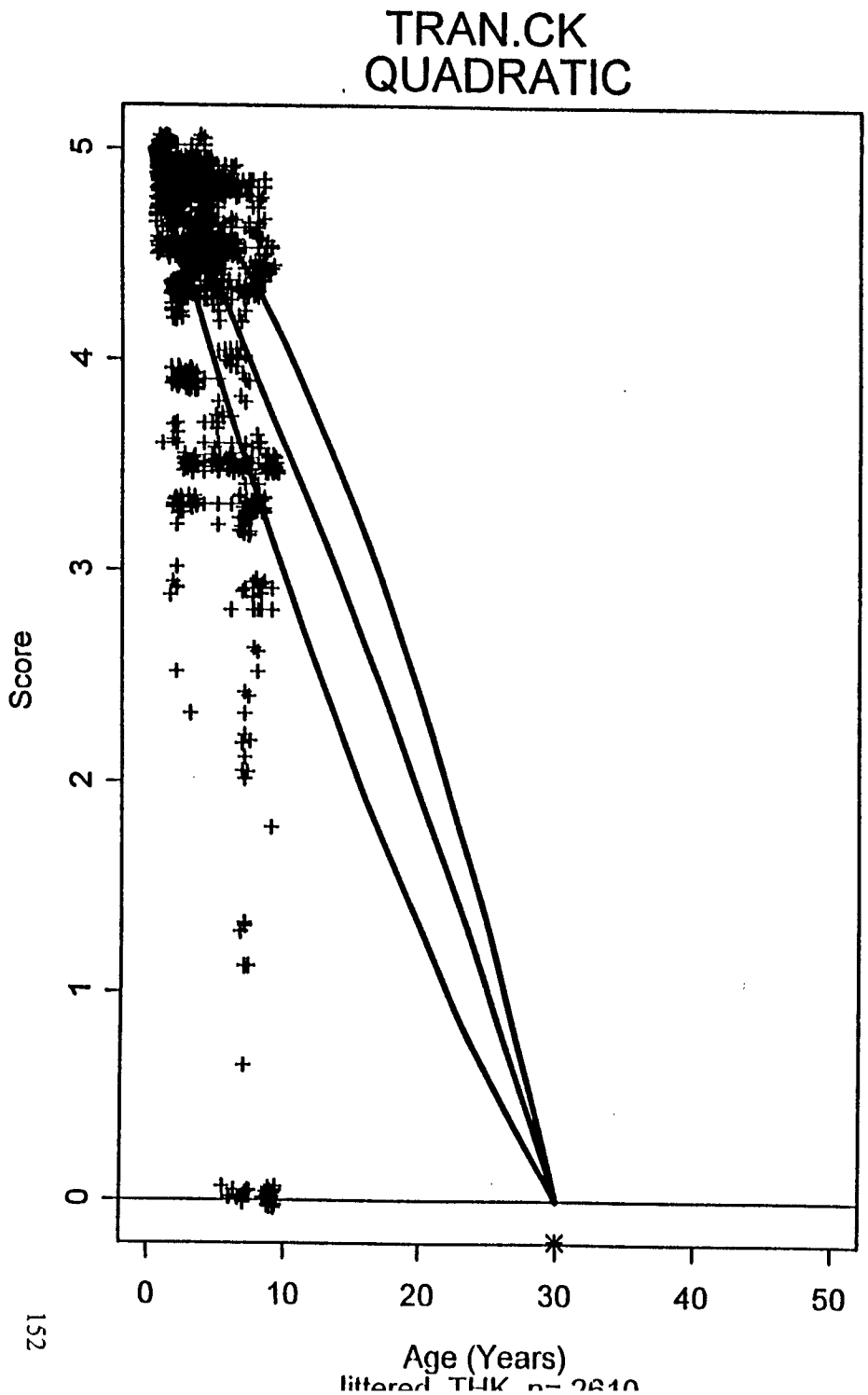
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.51	4.15	3.86	3.62	3.39	3.19	3.00	2.82	2.65	2.49

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.33	2.18	2.03	1.89	1.76	1.63	1.50	1.37	1.25	1.13	1.01

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.89	0.78	0.67	0.56	0.45	0.35	0.24	0.14	0.04	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:22:34 1998
Family: THK
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 30

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.222	0.063	-3.501	0.008

R-Squared = 0.605

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.127	0.019	-6.718	0

R-Squared = 0.849

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.057	0.015	-3.767	0.005

R-Squared = 0.64

APPENDIX E4

PERFORMANCE MODELS FOR TONS PAVEMENT FAMILY

APPENDIX E4.1

PERFORMANCE MODELS FOR TONS - O PAVEMENT FAMILY

PAVEMENT FAMILY: TONS – Original

Number of data points available for regression of performance curves : 5646

Range of years of data available for the given family : 03 to 43 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 26 years
   Historical data forced to end at 26 years has a R^2 value of : 0.447
   Optimum forced end point is obtained at 35 years with a R^2 value of : 0.548 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.182
   Optimum forced end point is obtained at 20 years with a R^2 value of : 0.295 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.489
   Optimum forced end point is obtained at 20 years with a R^2 value of : 0.548 ✓

4. Roughness [ROUGH]
   Existing Expert Model ends at @ 21 years
   Historical data forced to end at 21 years has a R^2 value of : 0.017 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

5. Rut Depth [RUT_DP]
   Existing Expert Model ends at @ 15 years
   Historical data forced to end at 15 years has a R^2 value of : 0.351
   Optimum forced end point is obtained at 20 years with a R^2 value of : 0.433 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 38 years
   Historical data forced to end at 38 years has a R^2 value of : 0.004
   Optimum forced end point is obtained at 20 years with a R^2 value of : 0.251 ✓

BLOCK CRACKING ON TONS

IDEX = C - M * AGE ^ B

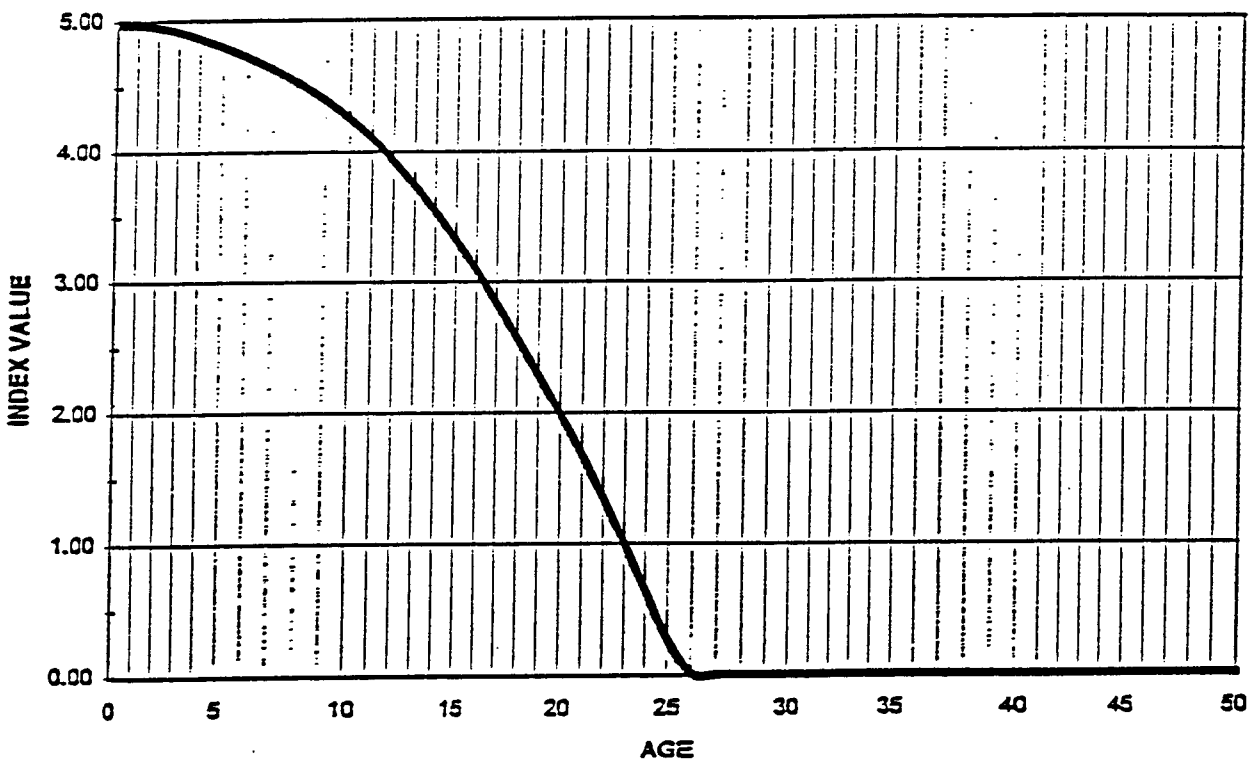
: Value: 4.98
I Value: 0.006873
: Value: 2.03

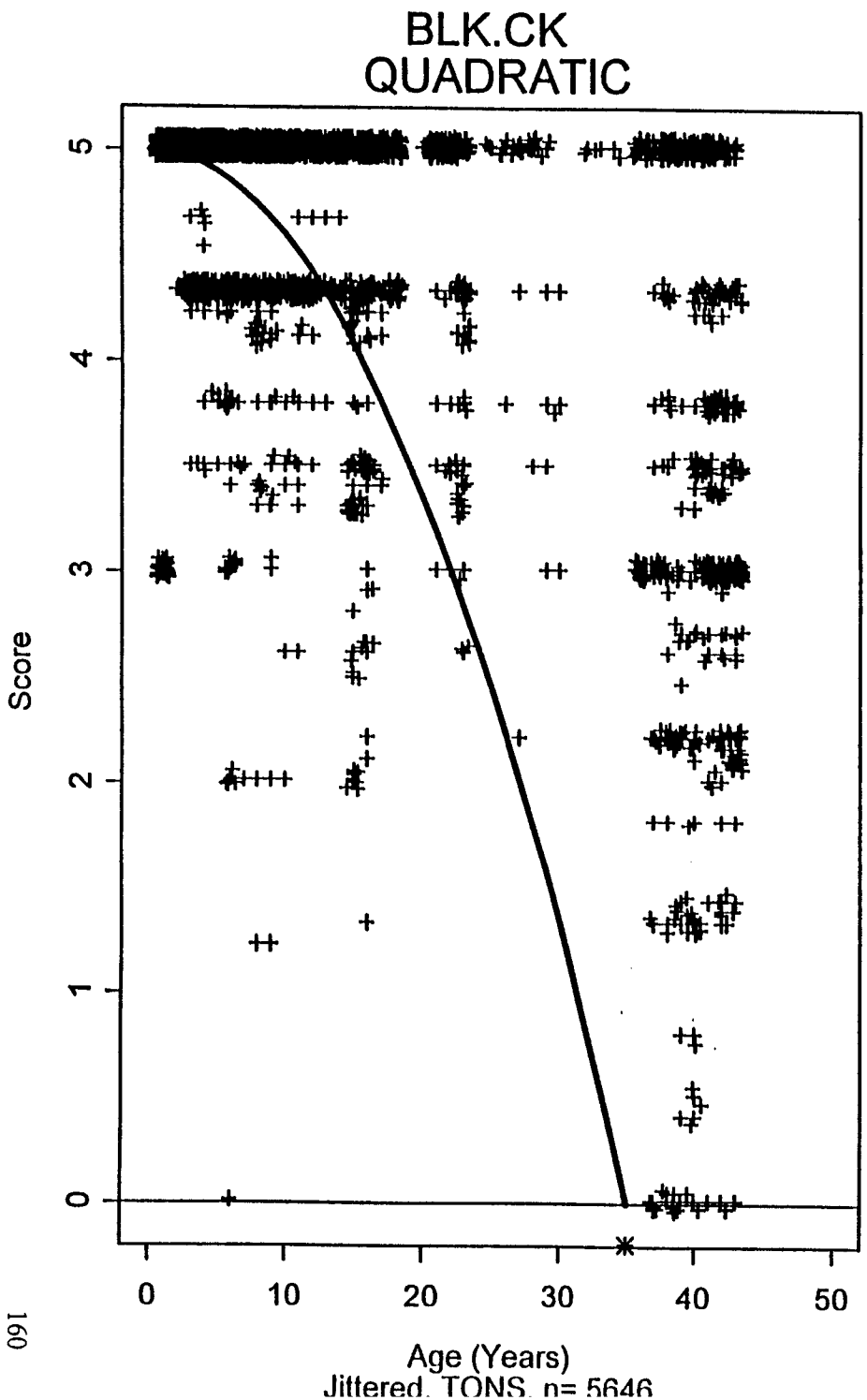
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.98	4.97	4.95	4.92	4.87	4.80	4.72	4.62	4.51	4.39	4.24

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.09	3.91	3.73	3.52	3.30	3.07	2.82	2.55	2.27	1.97	1.66

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.33	0.99	0.63	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:25:23 1998
Family: TONS
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 35

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.049	0.017	2.97	0.006

R-Squared = 0.227

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.083	0.014	6.03	0

R-Squared = 0.548

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.09	0.015	6.174	0

R-Squared = 0.56

FATIGUE CRACKING ON TONS

IDEX = C - M * AGE ^ B

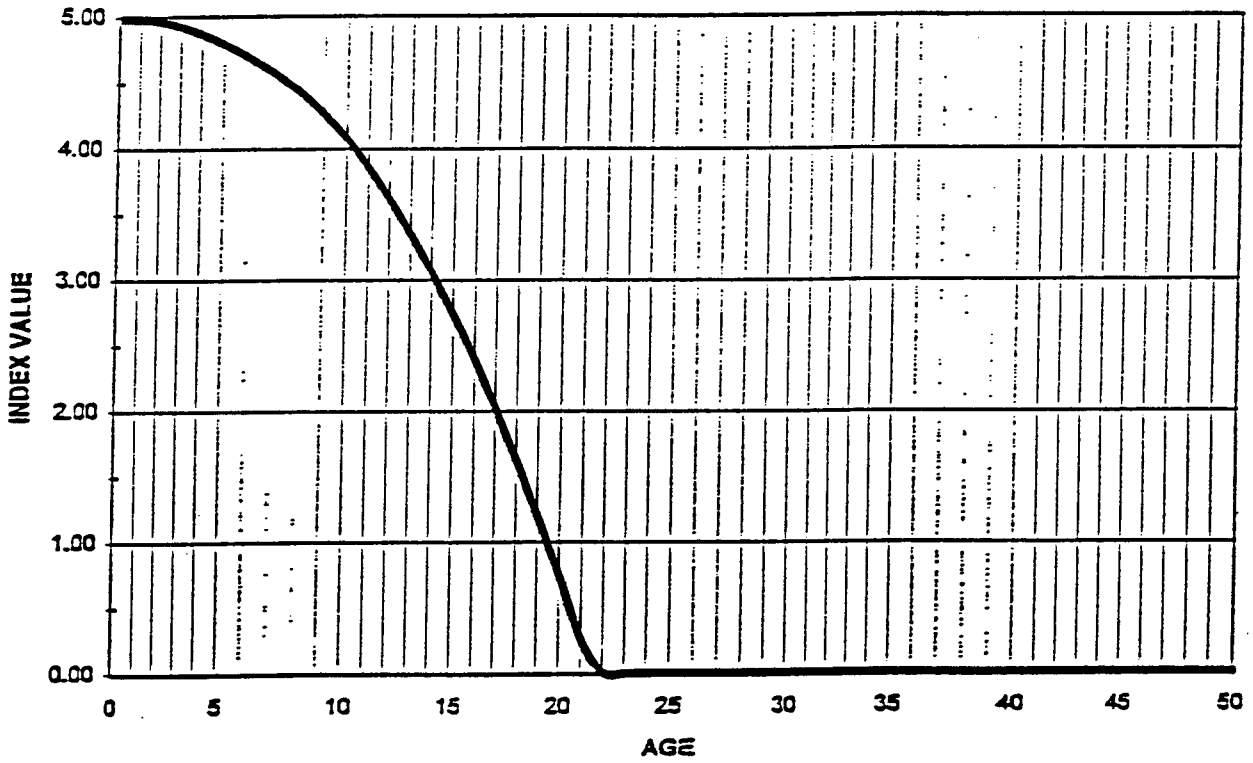
: Value: 4.99
I Value: 0.00586
Value: 2.20

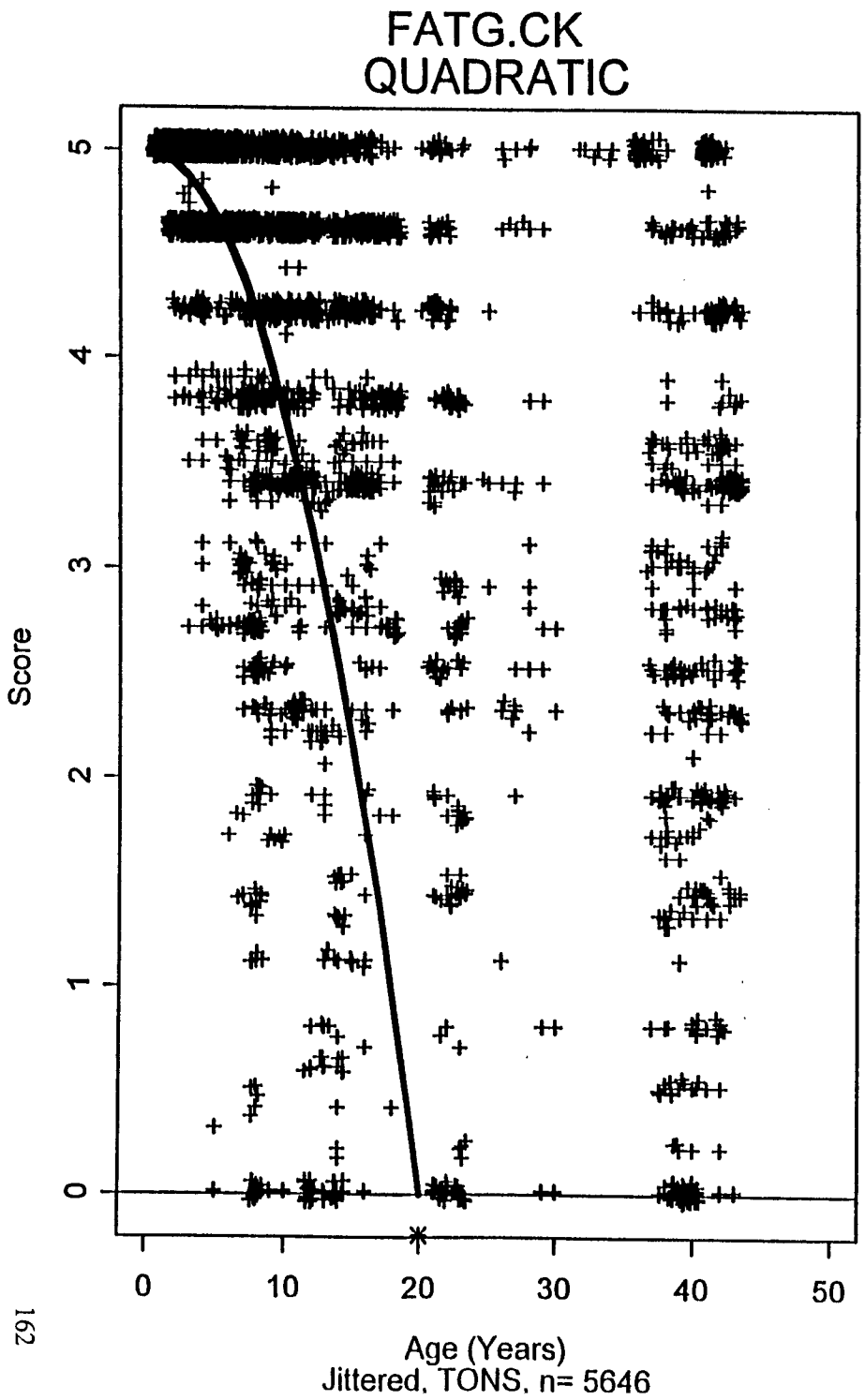
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.99	4.98	4.96	4.92	4.87	4.79	4.69	4.57	4.42	4.25	4.06

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.84	3.60	3.34	3.04	2.72	2.38	2.01	1.61	1.18	0.72	0.24

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:26:44 1998
Family: TONS
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.009	0.048	-0.189	0.852

R-Squared = 0.002

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.14	0.051	2.744	0.013

R-Squared = 0.295

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.201	0.054	3.701	0.002

R-Squared = 0.432

PATCH DETERIORATION ON TONS

NDEX = C - M * AGE ^ B

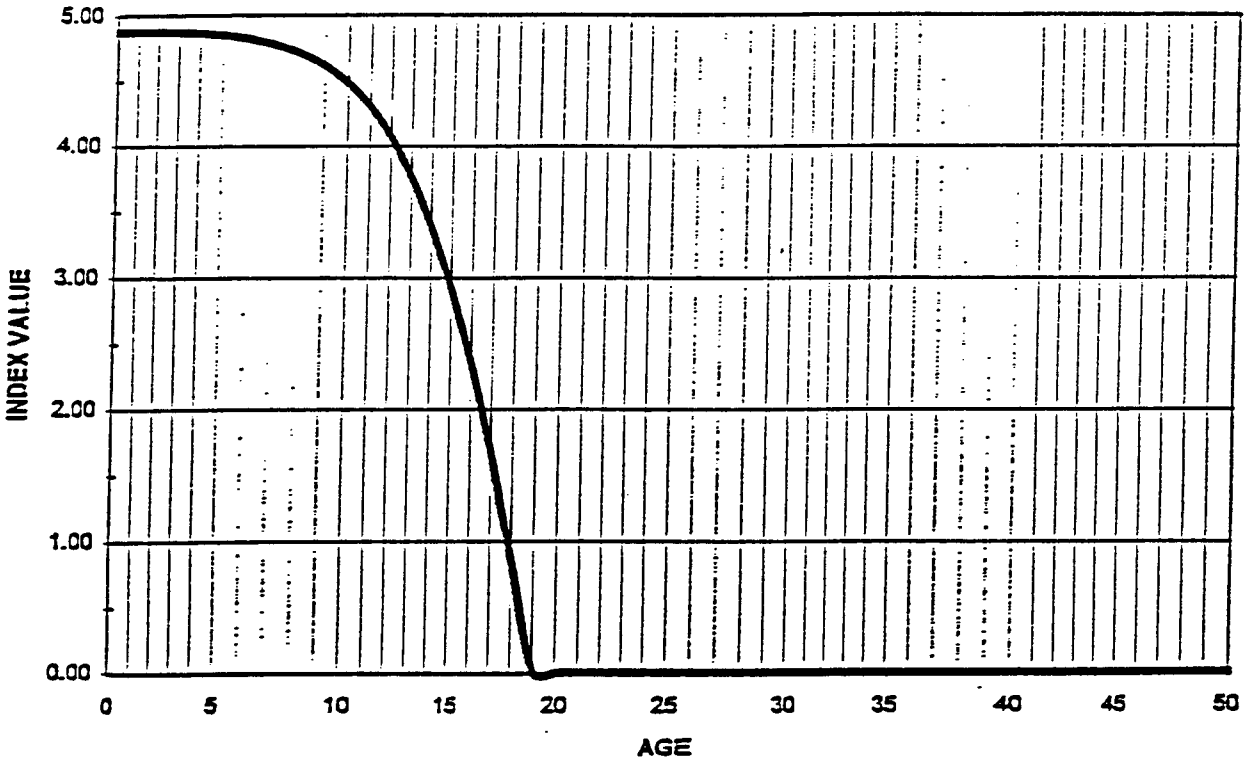
: Value: 4.88
I Value: 0.0000488
I Value: 3.92

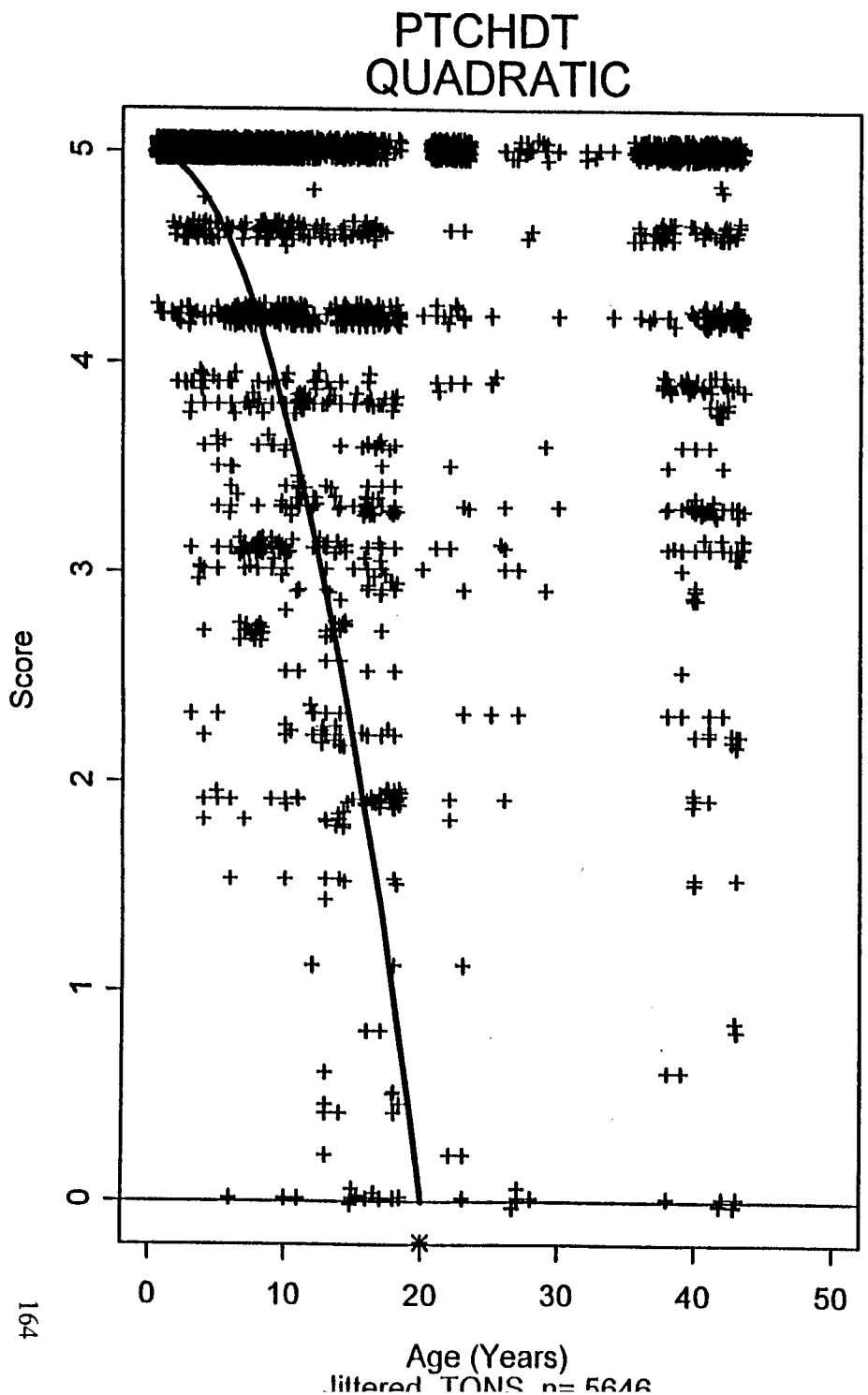
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.88	4.88	4.88	4.88	4.87	4.85	4.83	4.78	4.71	4.61	4.47

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.29	4.05	3.74	3.36	2.89	2.32	1.63	0.81	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:27:50 1998
Family: TONS
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.168	0.043	3.89	0.001

R-Squared = 0.457

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.234	0.05	4.669	0

R-Squared = 0.548

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.247	0.058	4.252	0

R-Squared = 0.501

ROUGHNESS ON TONS

DEX = C - M * AGE ^ B

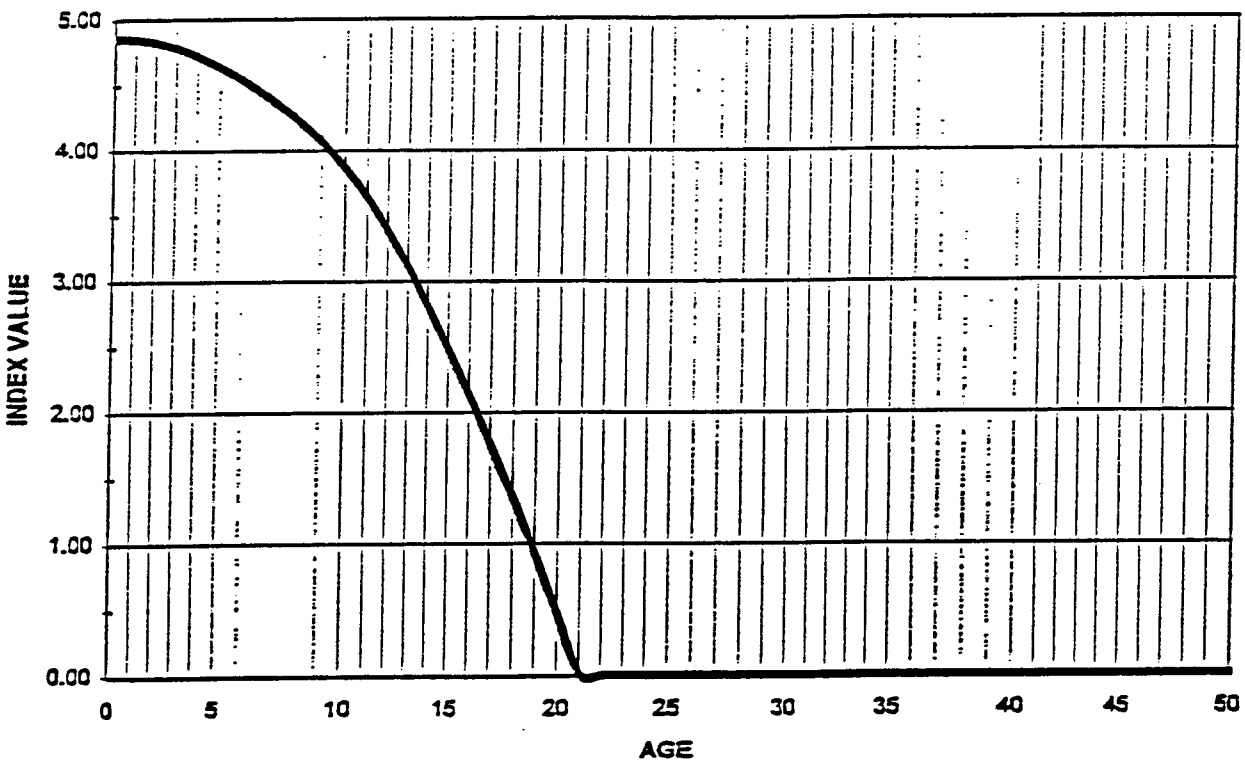
Value: 4.86
Value: 0.007471023
Value: 2.13

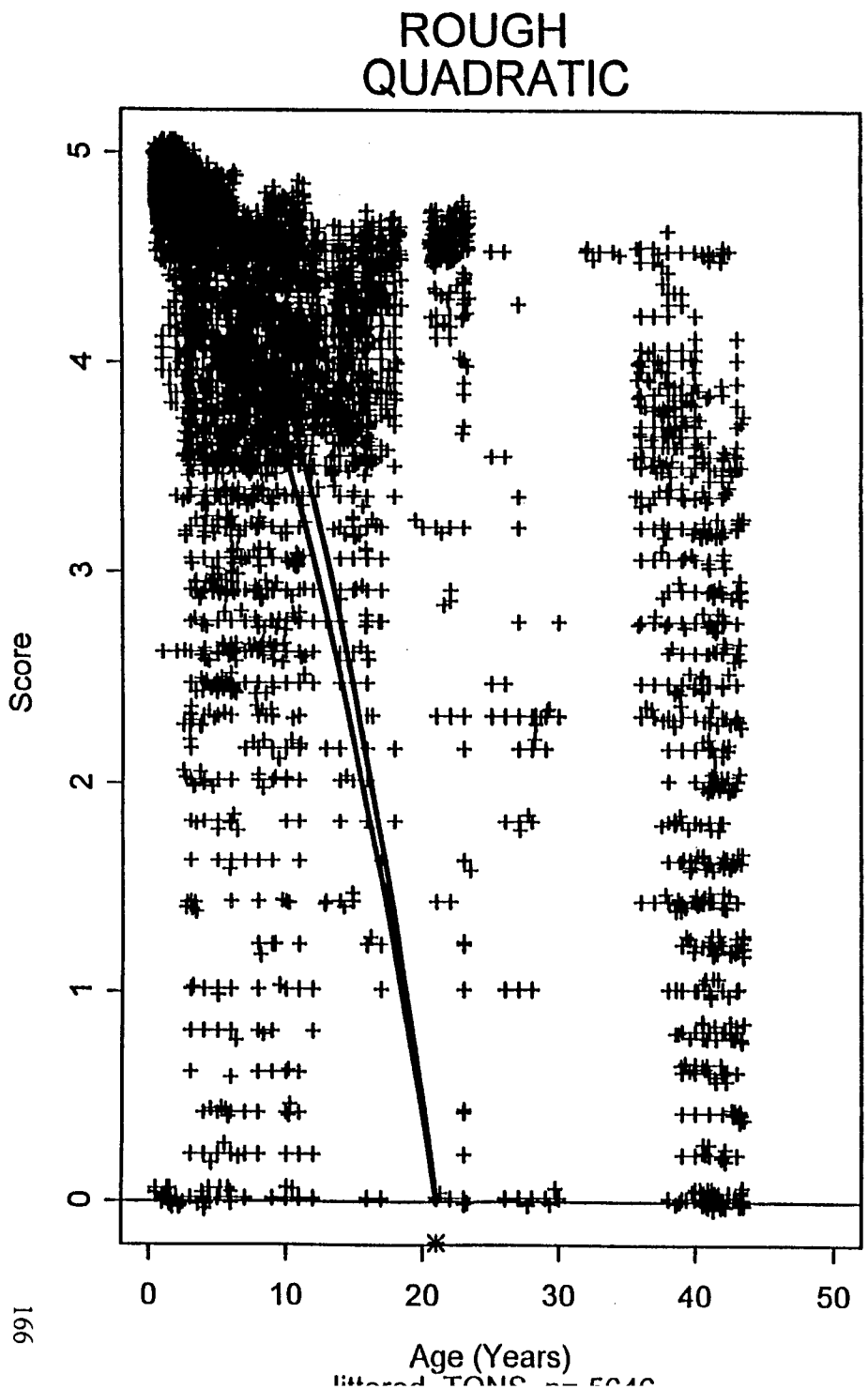
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.86	4.85	4.83	4.78	4.72	4.63	4.52	4.39	4.23	4.05	3.85

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.63	3.37	3.10	2.80	2.47	2.12	1.74	1.34	0.91	0.45	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:28:43 1998
Family: TONS
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 21

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.057	0.059	-0.969	0.345

R-Squared = 0.047

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.033	0.058	0.57	0.575

R-Squared = 0.017

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.106	0.057	1.853	0.079

R-Squared = 0.153

RUT DEPTH ON TONS

DEX = C - M * AGE ^ B

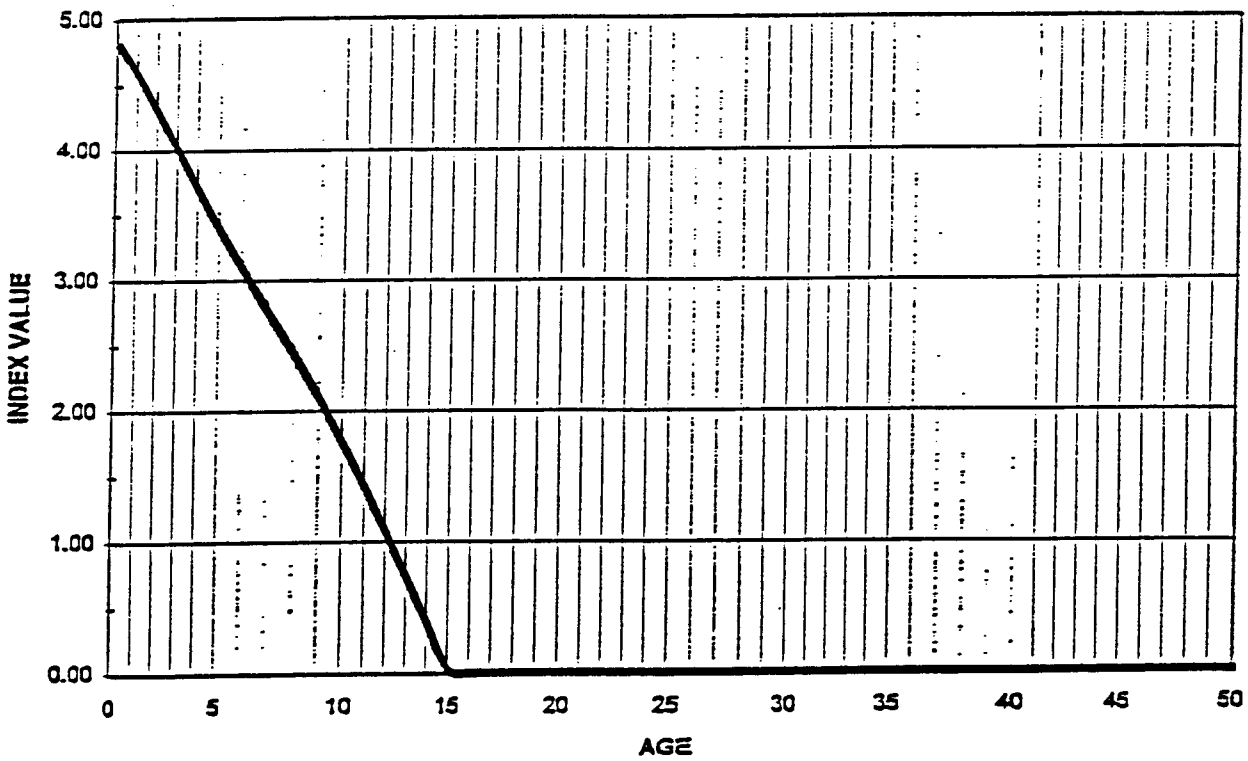
Value: 4.82
Value: 0.2440305
Value: 1.10

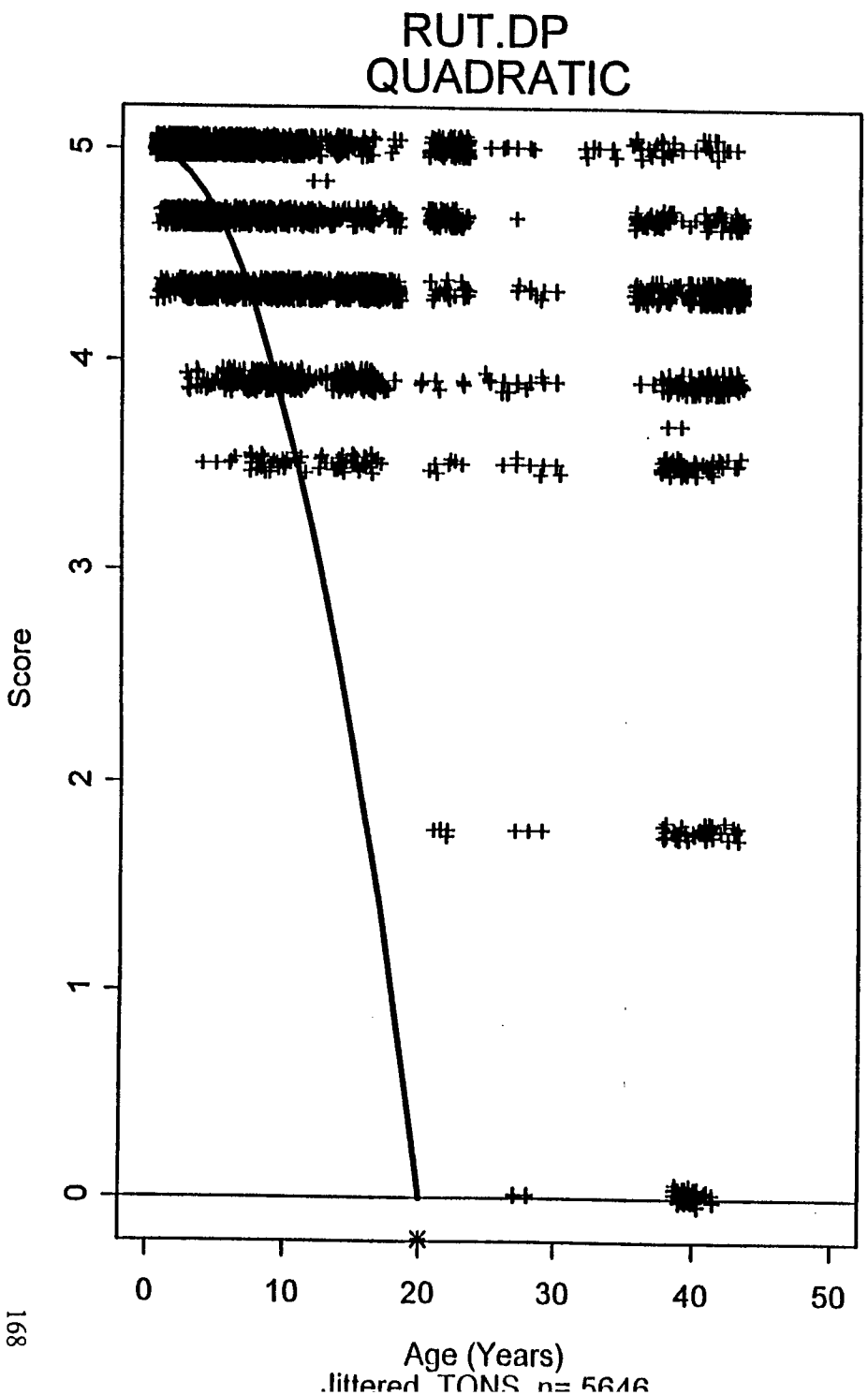
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.82	4.58	4.30	4.00	3.70	3.39	3.07	2.74	2.42	2.08	1.75

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.41	1.07	0.72	0.37	0.02	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:34:12 1998
Family: TONS
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.104	0.049	2.118	0.048

R-Squared = 0.2

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.174	0.047	3.71	0.002

R-Squared = 0.433

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.225	0.053	4.272	0

R-Squared = 0.504

TRANSVERSE CRACKING ON TONS

NDEX = C - M * AGE ^ B

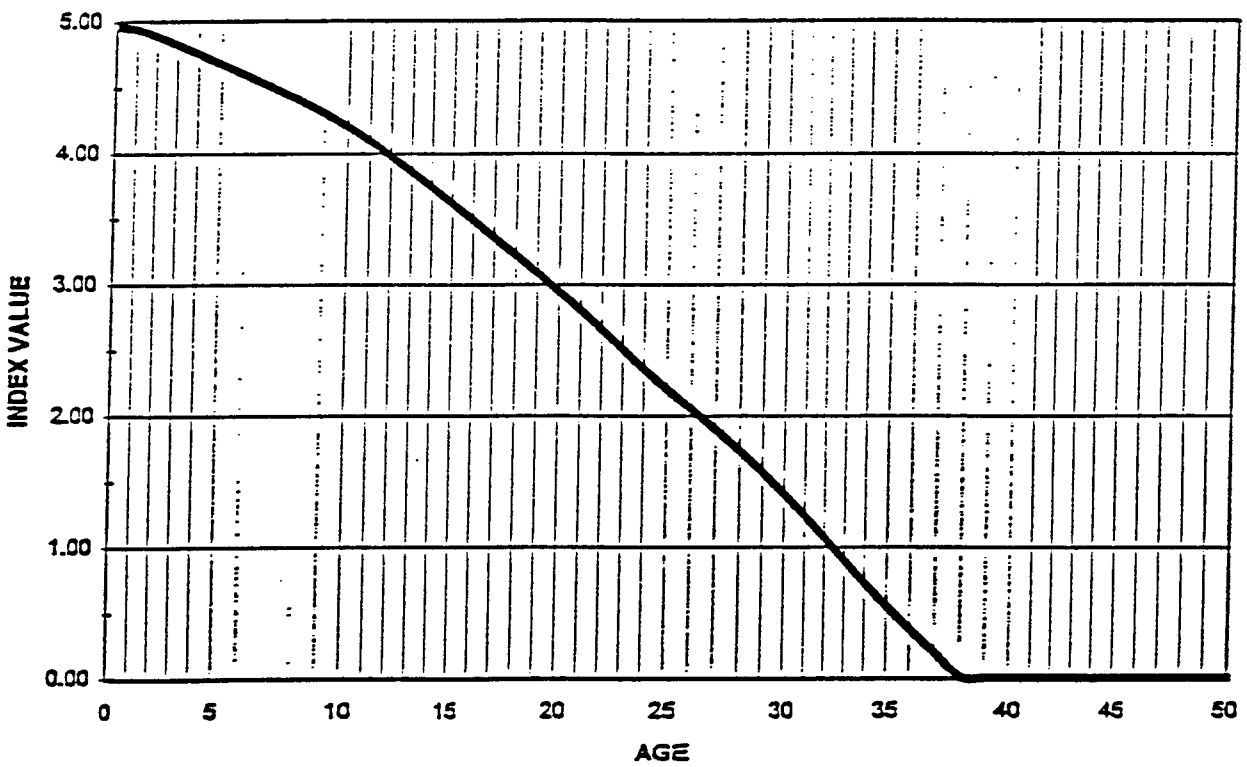
C Value: 4.97
M Value: 0.03163676
B Value: 1.39

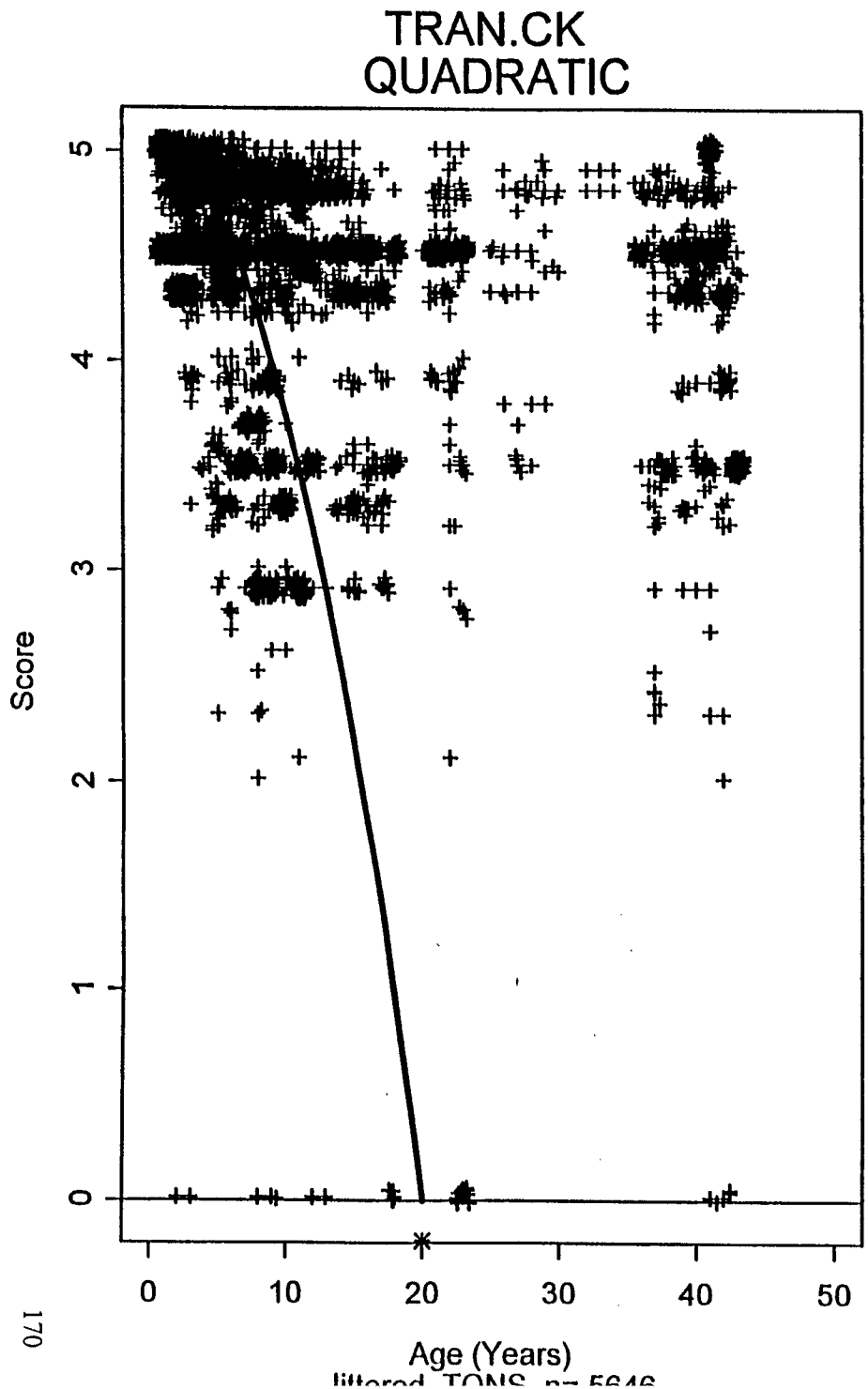
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.97	4.94	4.89	4.82	4.75	4.67	4.59	4.50	4.40	4.30	4.19

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.08	3.97	3.85	3.73	3.61	3.48	3.35	3.21	3.07	2.93	2.79

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	2.65	2.50	2.35	2.19	2.04	1.88	1.72	1.56	1.39	1.23	1.06

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.89	0.71	0.54	0.36	0.18	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:35:45 1998
Family: TONS
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.002	0.06	0.025	0.98

R-Squared = 0

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.139	0.057	2.457	0.024

R-Squared = 0.251

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.192	0.055	3.478	0.003

R-Squared = 0.402

APPENDIX E4.2

PERFORMANCE MODELS FOR TONS - A PAVEMENT FAMILY

PAVEMENT FAMILY: TONS – A [AC Overlay on Original]

Number of data points available for regression of performance curves : 14412

Range of years of data available for the given family : 04 to 29 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.491 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 18 years
   Historical data forced to end at 18 years has a R^2 value of : 0.396
   Optimum forced end point is obtained at 23 years with a R^2 value of : 0.451
   Adjusting from the expert curve of the Original Family use endpoint of 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.417 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.453 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 21 years with a R^2 value of : 0.356 ✓

5. Rut Depth [RUT_DP]
   Existing Expert Model ends at @ 13 years
   Historical data forced to end at 13 years has a R^2 value of : 0.368
   Optimum forced end point is obtained at 22 years with a R^2 value of : 0.428
   Adjusting from the expert curve of the Original Family use endpoint of 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.397 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 25 years
   Historical data forced to end at 25 years has a R^2 value of : 0.370
   Optimum forced end point is obtained at 23 years with a R^2 value of : 0.426
   Adjusting from the expert curve of the Original Family use endpoint of 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.349 ✓

BLOCK CRACKING ON TONS AFTER ASPHALT OVERLAY

NDEX = C - M * AGE ^ B

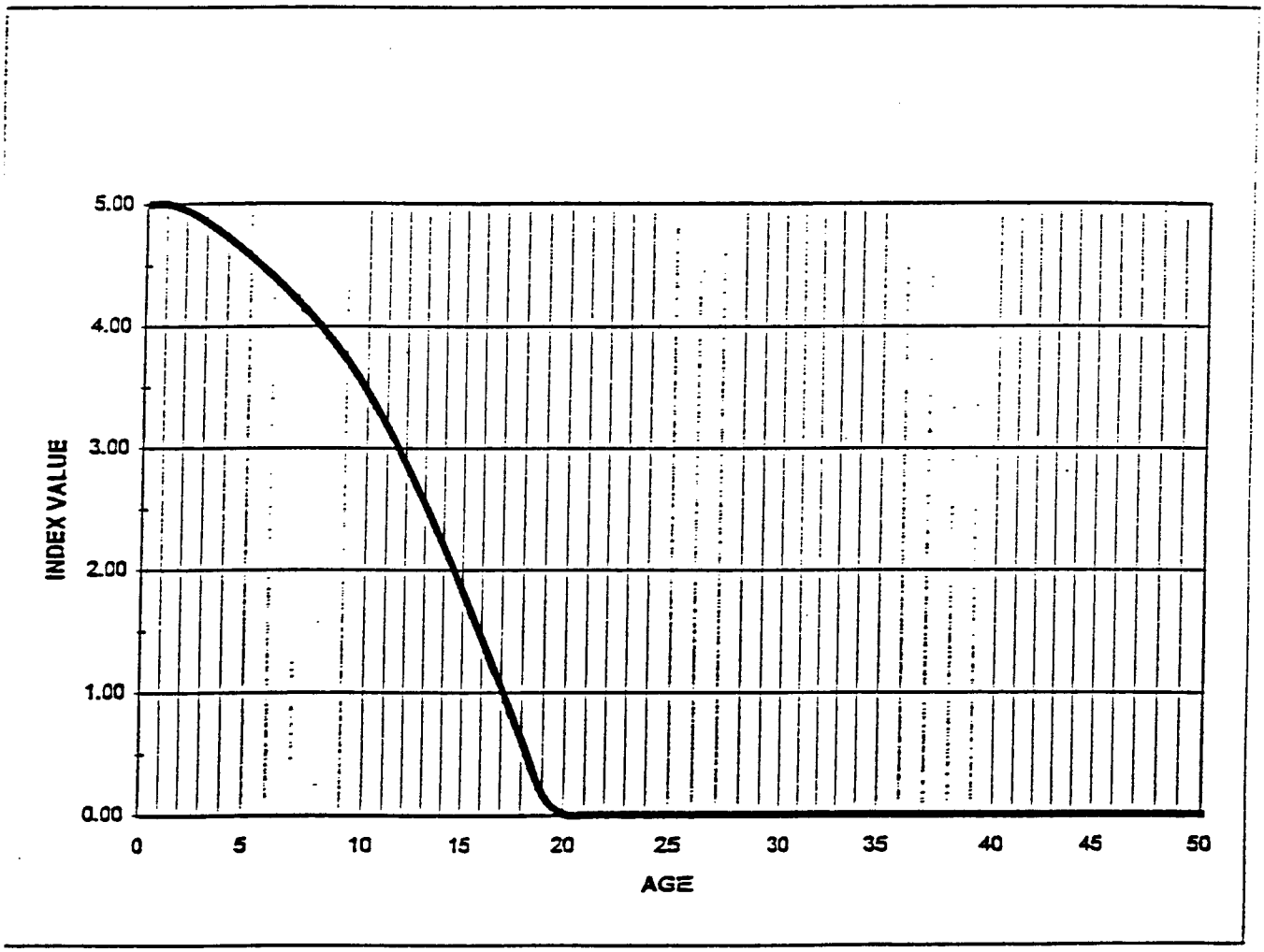
C Value: 5.04
M Value: 0.02826652
B Value: 1.75

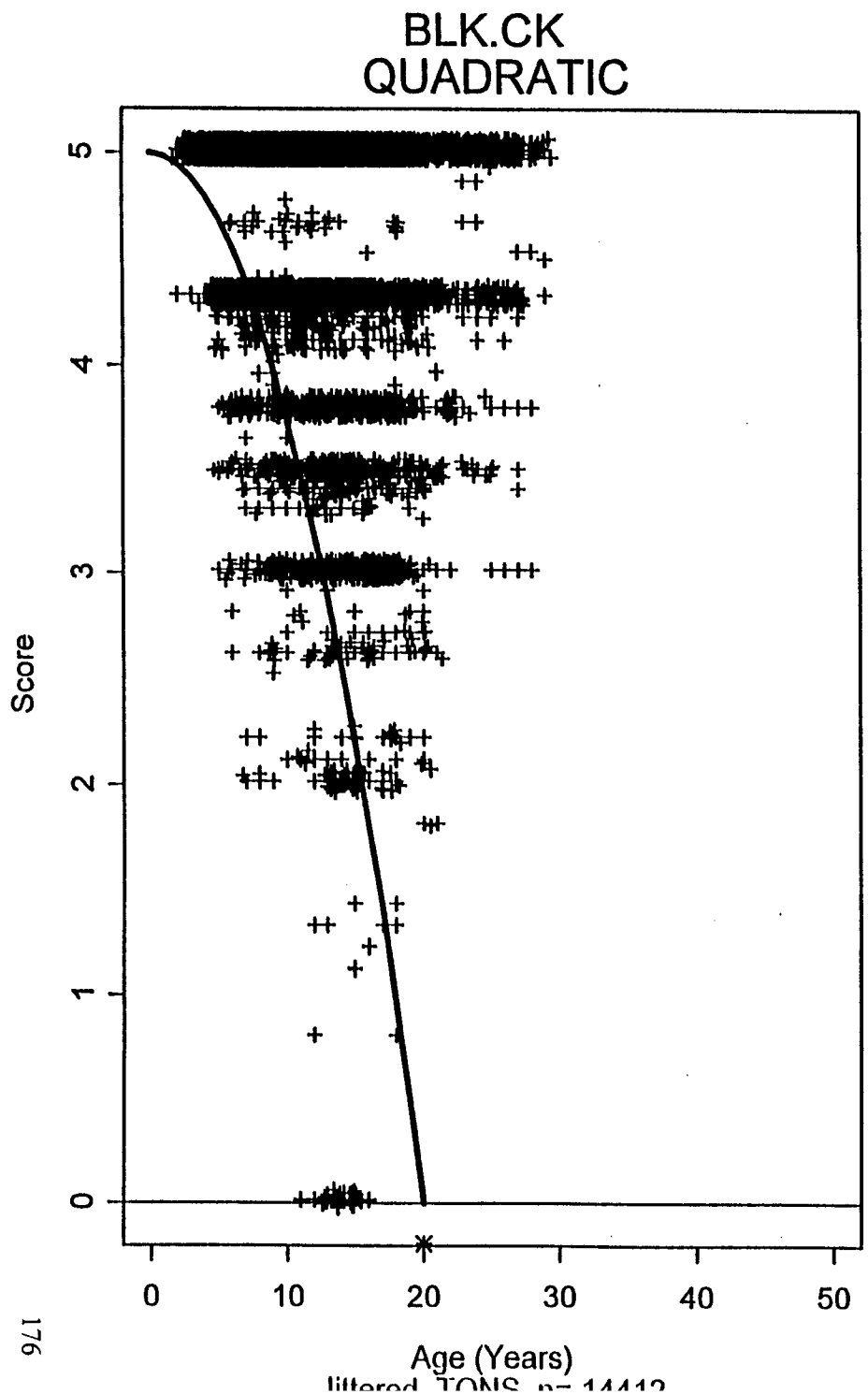
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.94	4.85	4.72	4.57	4.39	4.19	3.96	3.72	3.45

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.16	2.85	2.52	2.18	1.81	1.42	1.02	0.59	0.15	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:39:34 1998
Family: TONS
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.267	0.075	3.546	0.002

R-Squared = 0.411

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.371	0.089	4.17	0.001

R-Squared = 0.491

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.371	0.089	4.17	0.001

R-Squared = 0.491

FATIGUE CRACKING ON TONS AFTER ASPHALT OVERLAY

INDEX = C - M * AGE ^ B

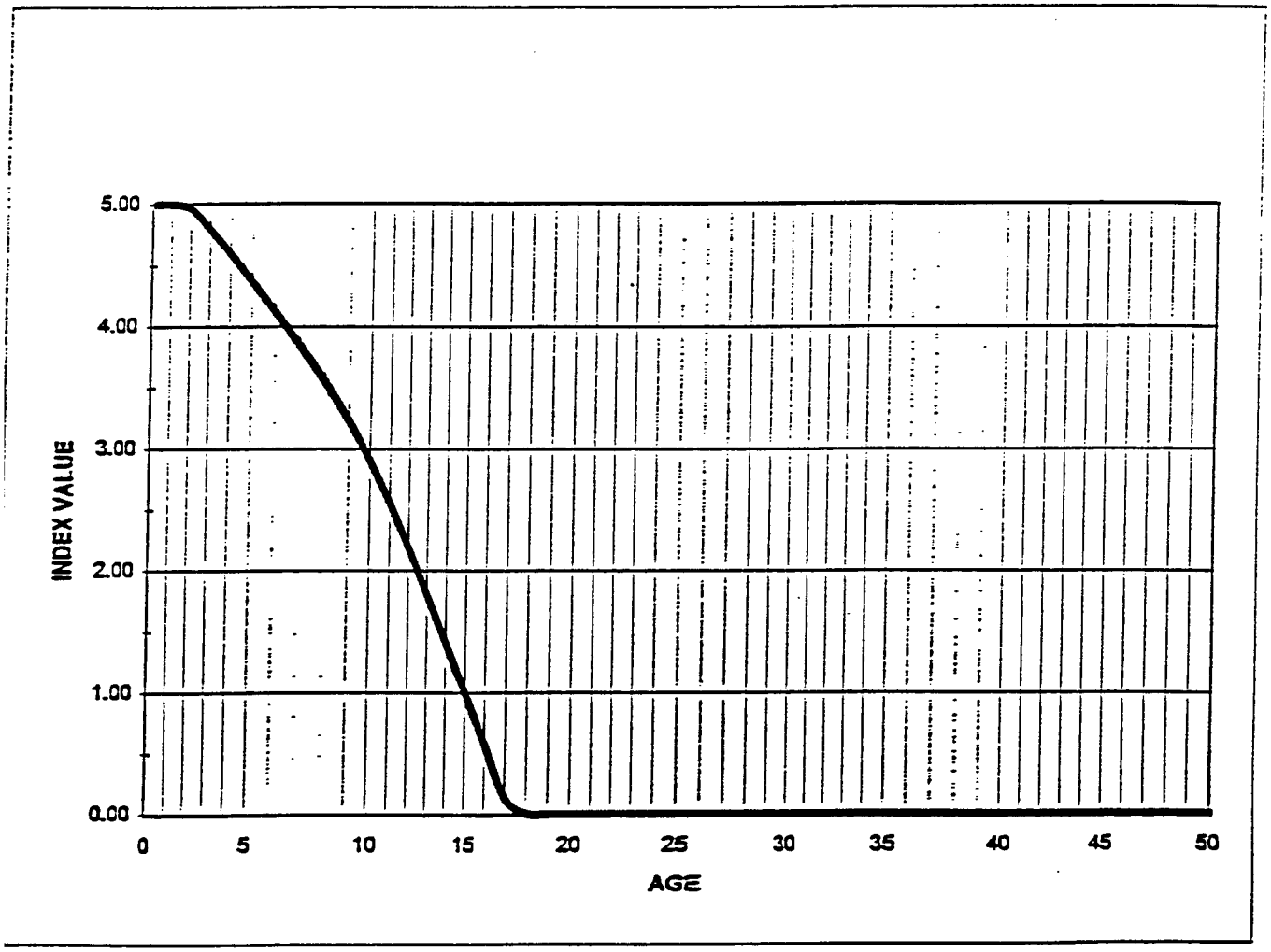
C Value: 5.16
M Value: 0.07192761
B Value: 1.50

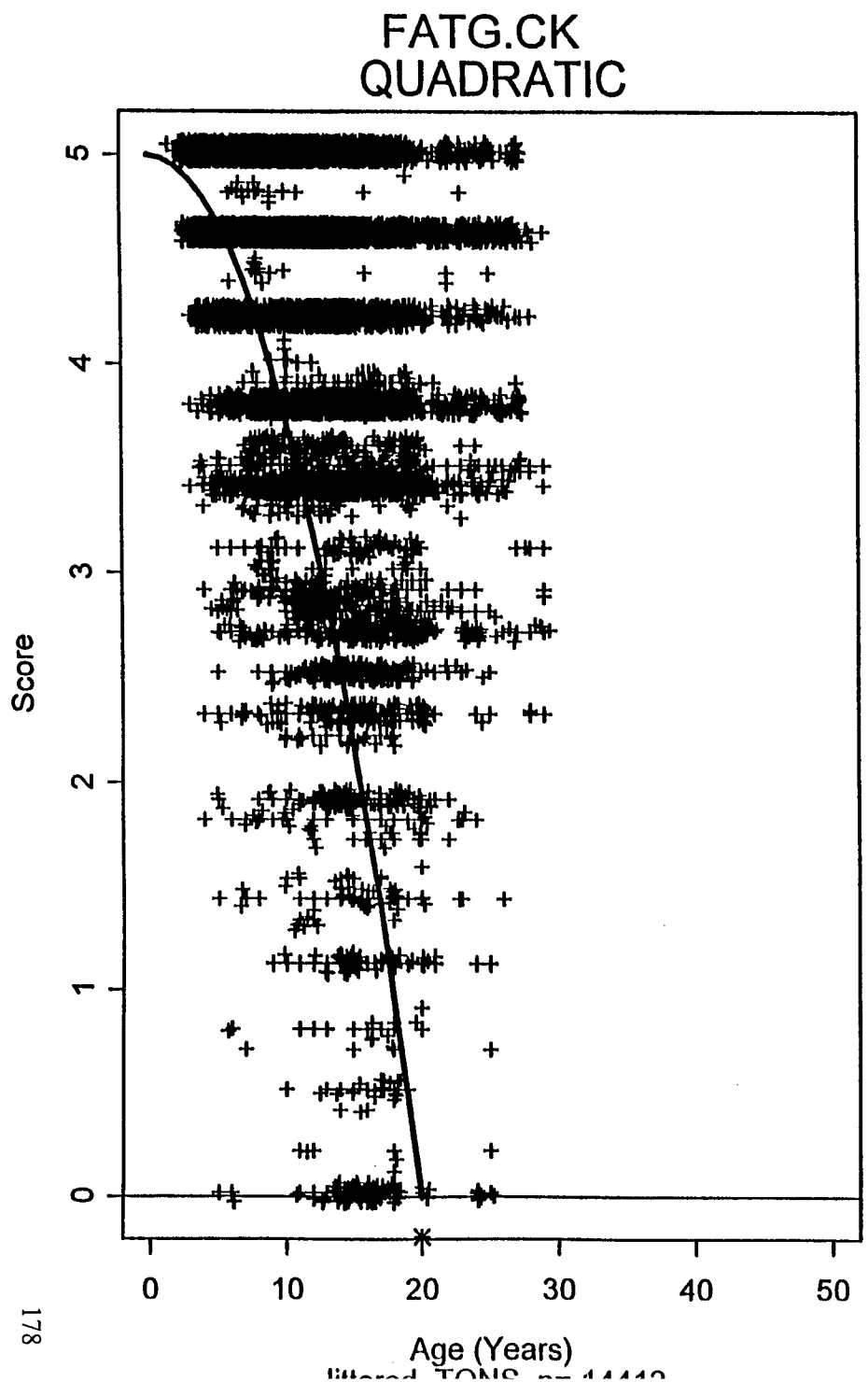
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.96	4.79	4.58	4.36	4.10	3.83	3.53	3.22	2.89

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.54	2.17	1.79	1.39	0.98	0.56	0.12	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:43:24 1998
Family: TONS
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.153	0.052	2.951	0.009

R-Squared = 0.326

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.258	0.072	3.588	0.002

R-Squared = 0.417

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.331	0.077	4.286	0

R-Squared = 0.505

PATCH DETERIORATION ON TONS AFTER ASPHALT OVERLAY

INDEX = C - M * AGE ^ B

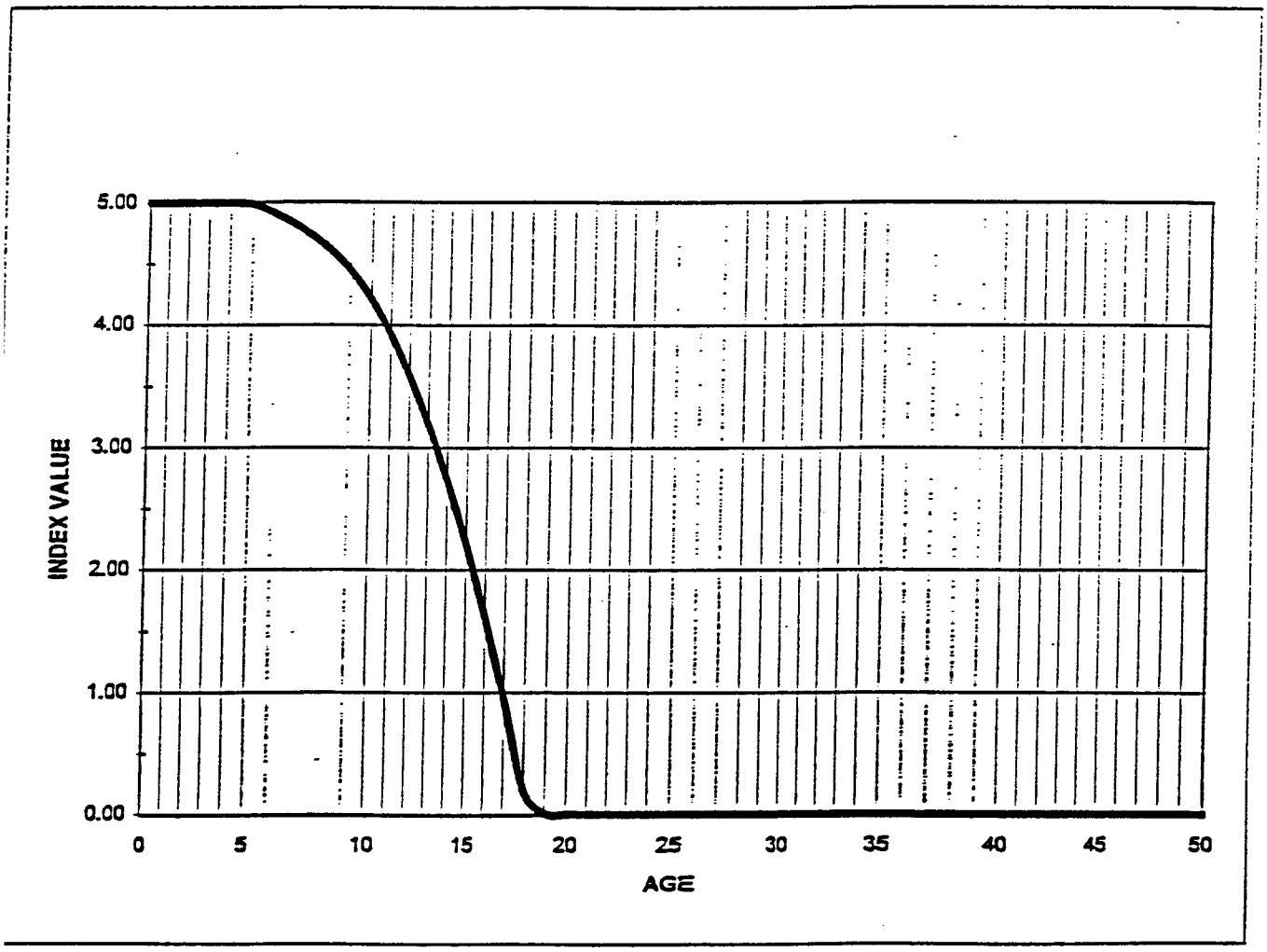
C Value: 5.11
M Value: 0.001232851
B Value: 2.87

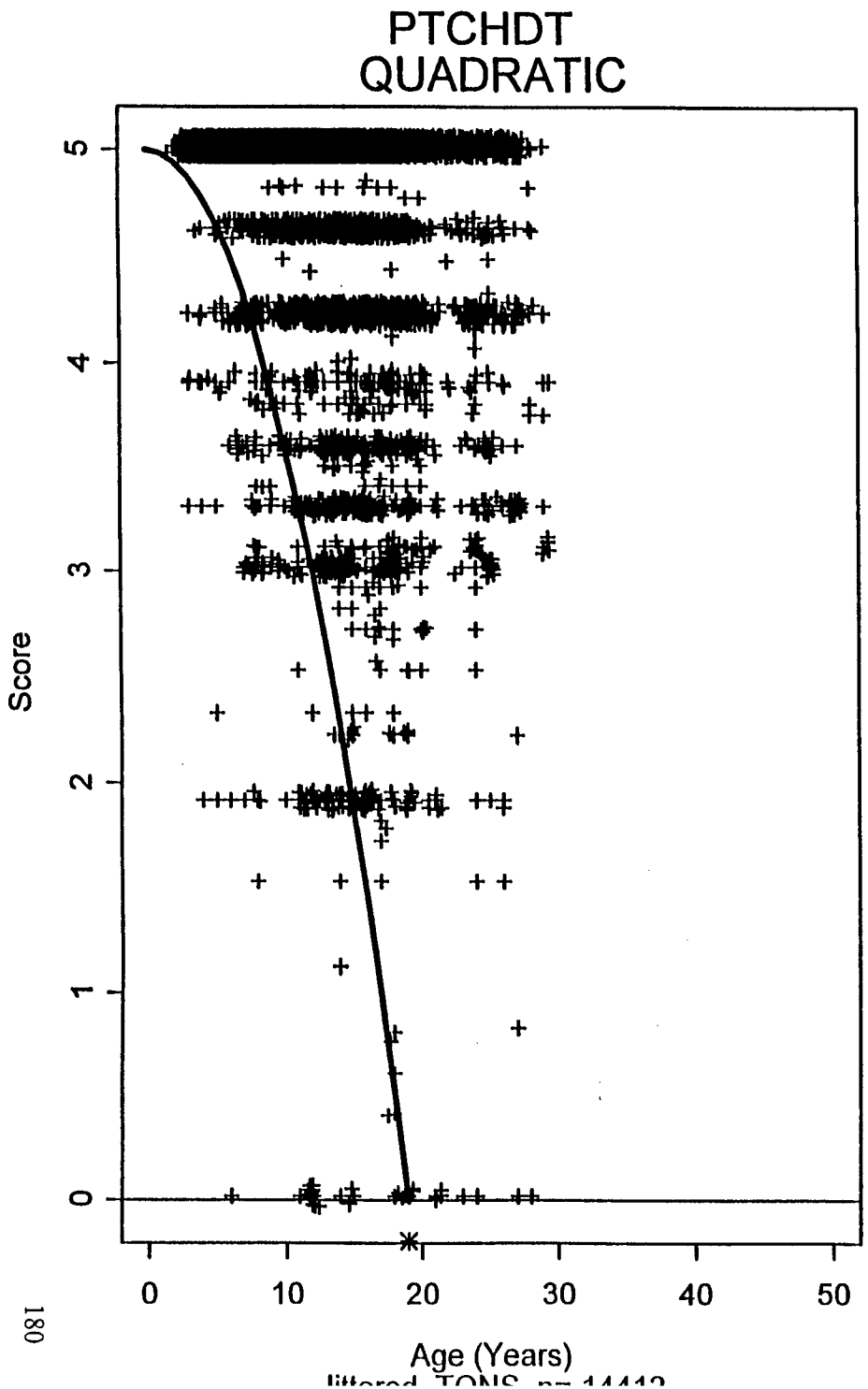
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	5.00	4.98	4.90	4.78	4.63	4.43	4.20

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.91	3.57	3.17	2.71	2.18	1.59	0.92	0.17	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:01:53 1998
Family: TONS
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 19

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.387	0.092	4.224	0.001

R-Squared = 0.512

50TH PERCENTILE
Coefficient Estimates:

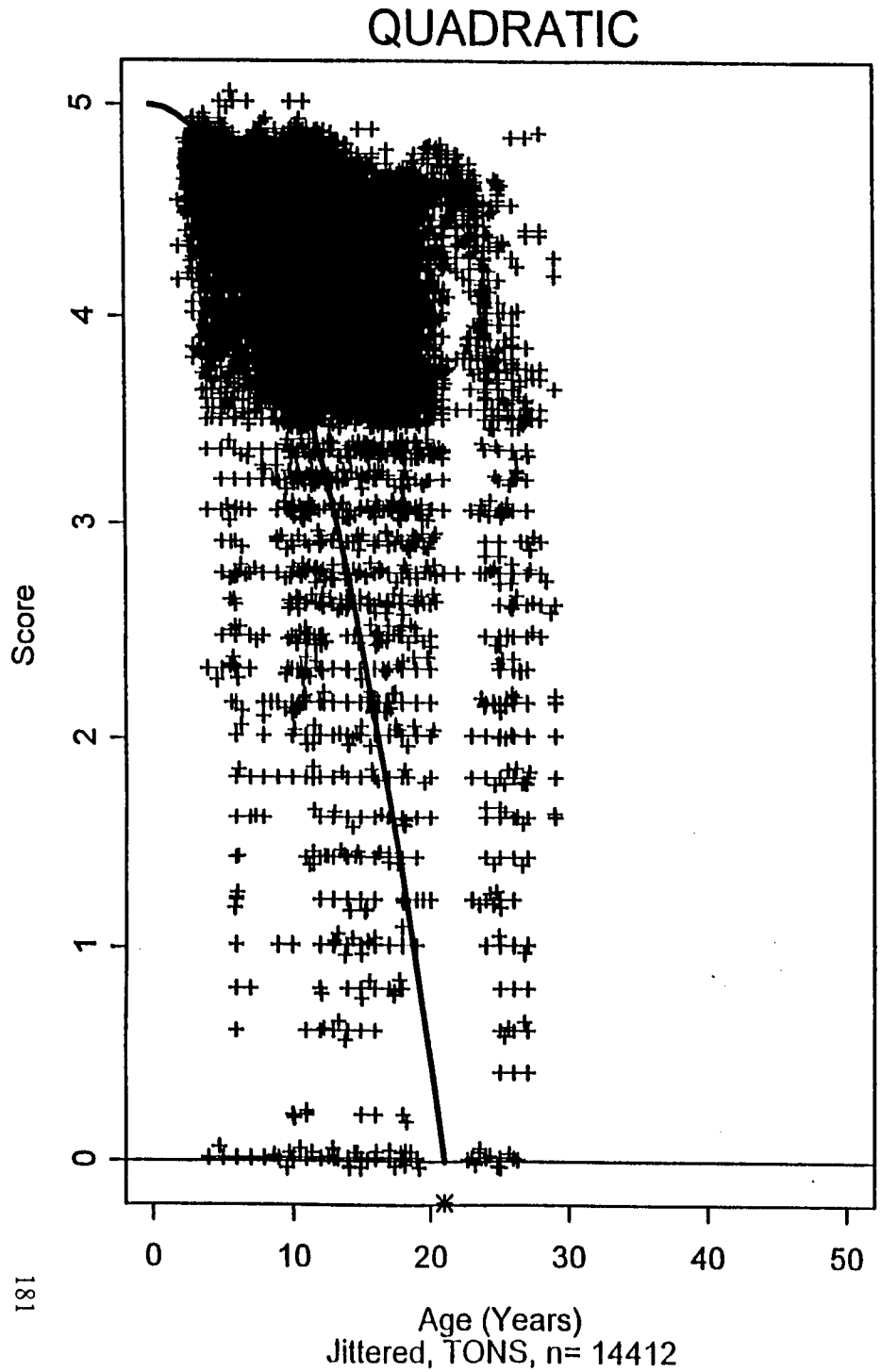
	Value	Std. Error	t value	Pr(>|t|)
1	0.41	0.109	3.749	0.002

R-Squared = 0.453

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.41	0.109	3.749	0.002

R-Squared = 0.453



Date of Analysis: Thu May 7 17:52:19 1998
Family: TONS
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 21

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.125	0.054	2.329	0.031

R-Squared = 0.222

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.187	0.058	3.243	0.004

R-Squared = 0.356

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.229	0.062	3.718	0.001

R-Squared = 0.421

RUT DEPTH ON TONS AFTER ASPHALT OVERLAY

INDEX = C - M * AGE ^ B

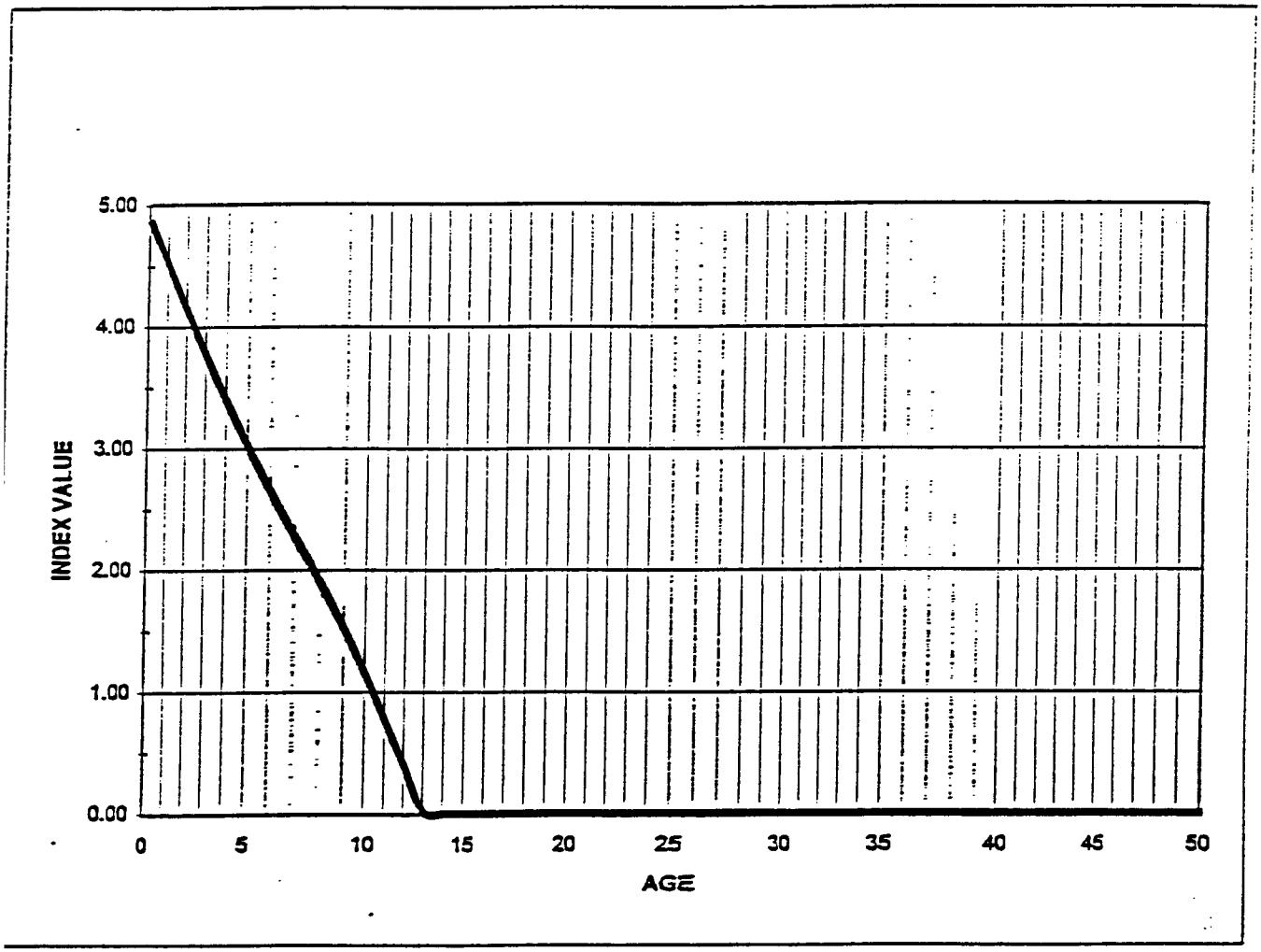
C Value: 4.88
M Value: 0.3742857
B Value: 1.00

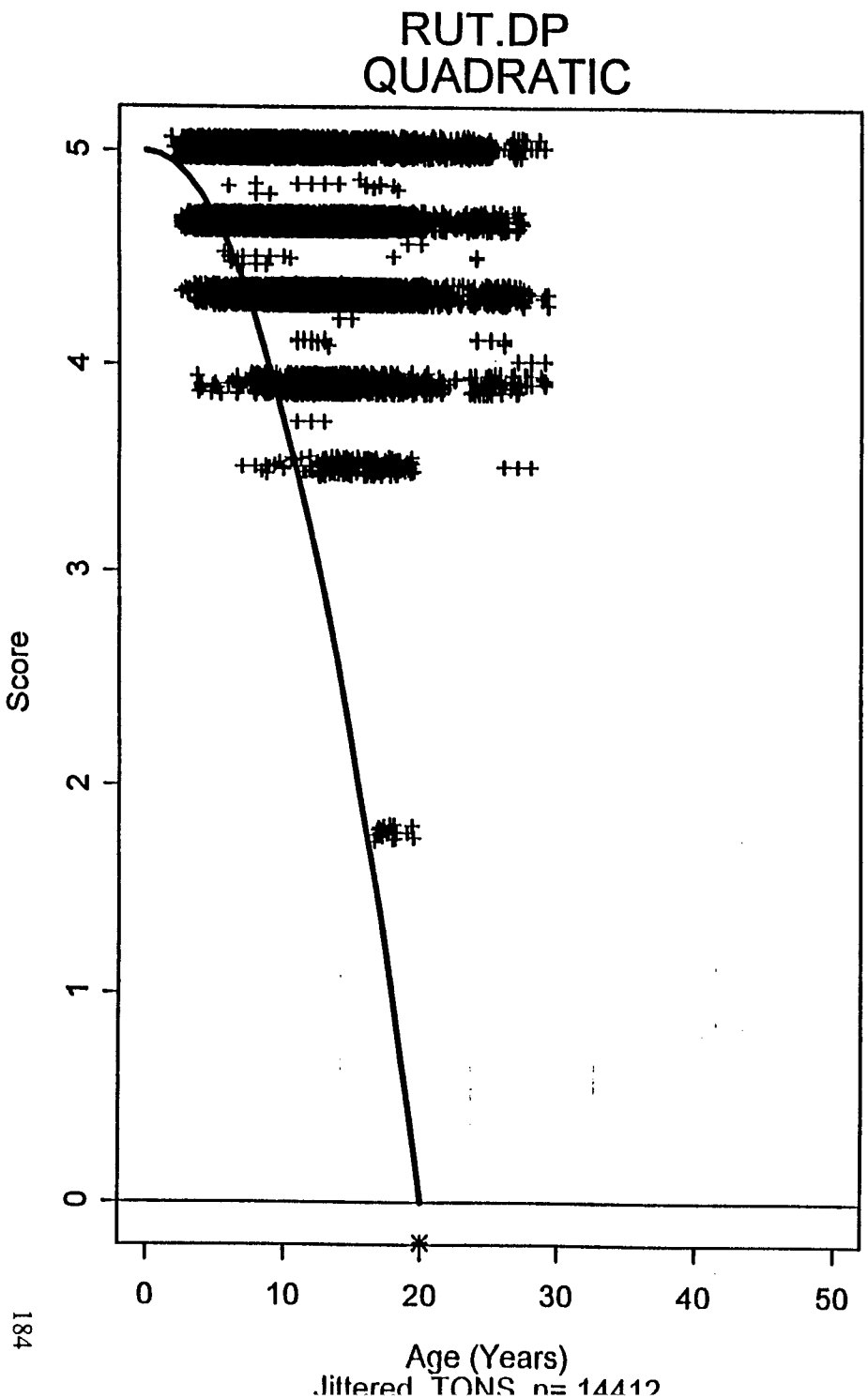
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.88	4.51	4.13	3.76	3.38	3.01	2.63	2.26	1.89	1.51	1.14

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	0.76	0.39	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 17:56:46 1998
Family: TONS
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.231	0.077	3.007	0.008

R-Squared = 0.334

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.261	0.076	3.445	0.003

R-Squared = 0.397

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.337	0.082	4.134	0.001

R-Squared = 0.487

TRANSVERSE CRACKING ON TONS AFTER ASPHALT OVERLAY

NDEX = C - M * AGE ^ B

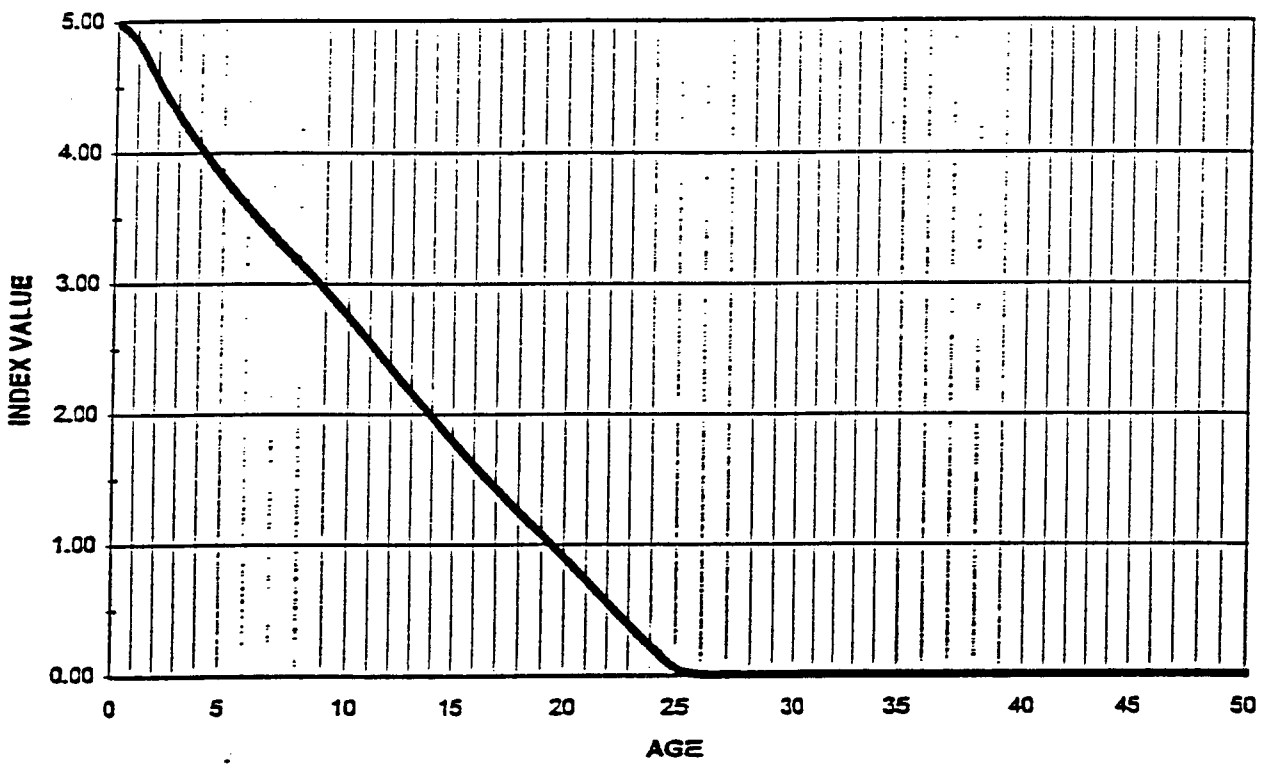
C Value: 5.23
M Value: 0.3951392
B Value: 0.80

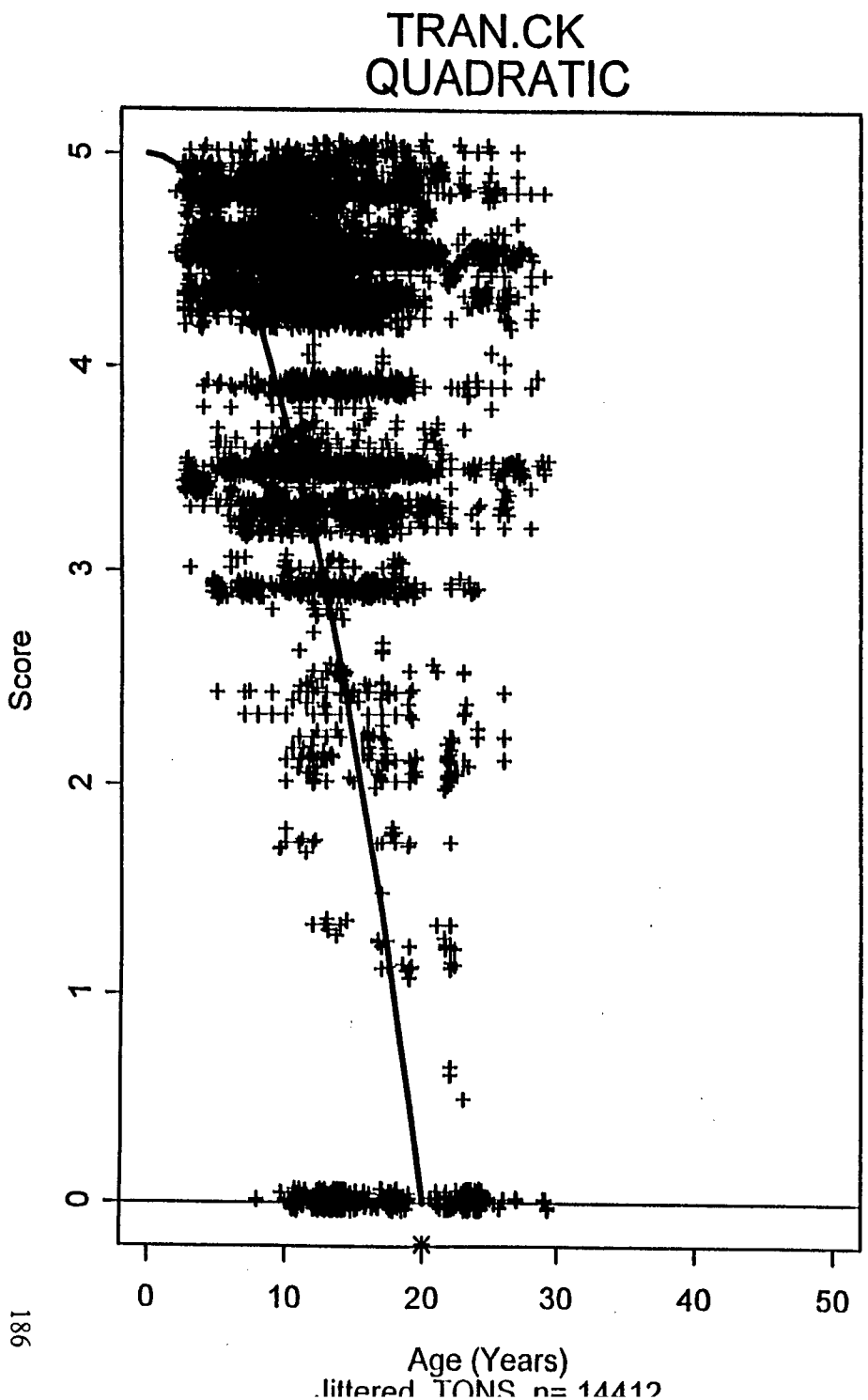
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.83	4.54	4.28	4.03	3.80	3.57	3.36	3.14	2.94	2.74

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.54	2.35	2.15	1.97	1.78	1.60	1.42	1.24	1.06	0.89	0.72

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.55	0.38	0.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:06:32 1998
Family: TONS
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.123	0.061	2.014	0.059

R-Squared = 0.184

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.25	0.081	3.105	0.006

R-Squared = 0.349

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.27	0.081	3.332	0.004

R-Squared = 0.381

APPENDIX E4.3

PERFORMANCE MODELS FOR TONS - M PAVEMENT FAMILY

PAVEMENT FAMILY: TONS – M [Mill & AC OL on Original]

Number of data points available for regression of performance curves : 855

Range of years of data available for the given family : 03 to 07 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.804
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.873 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 17 years
   Historical data forced to end at 17 years has a R^2 value of : 0.041
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.898 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 18 years
   Historical data forced to end at 18 years has a R^2 value of : 0.866 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

4. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 21 years
   Historical data forced to end at 21 years has a R^2 value of : 0.621 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.874 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 25 years
   Historical data forced to end at 25 years has a R^2 value of : 0.844
   Regression analysis provides inconclusive results so use the existing expert model.
   Adjusting from the expert curve of the Original Family use endpoint of 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.728 ✓

BLOCK CRACKING ON TONS AFTER MILL & AC OVERLAY

INDEX = C - M * AGE ^ B

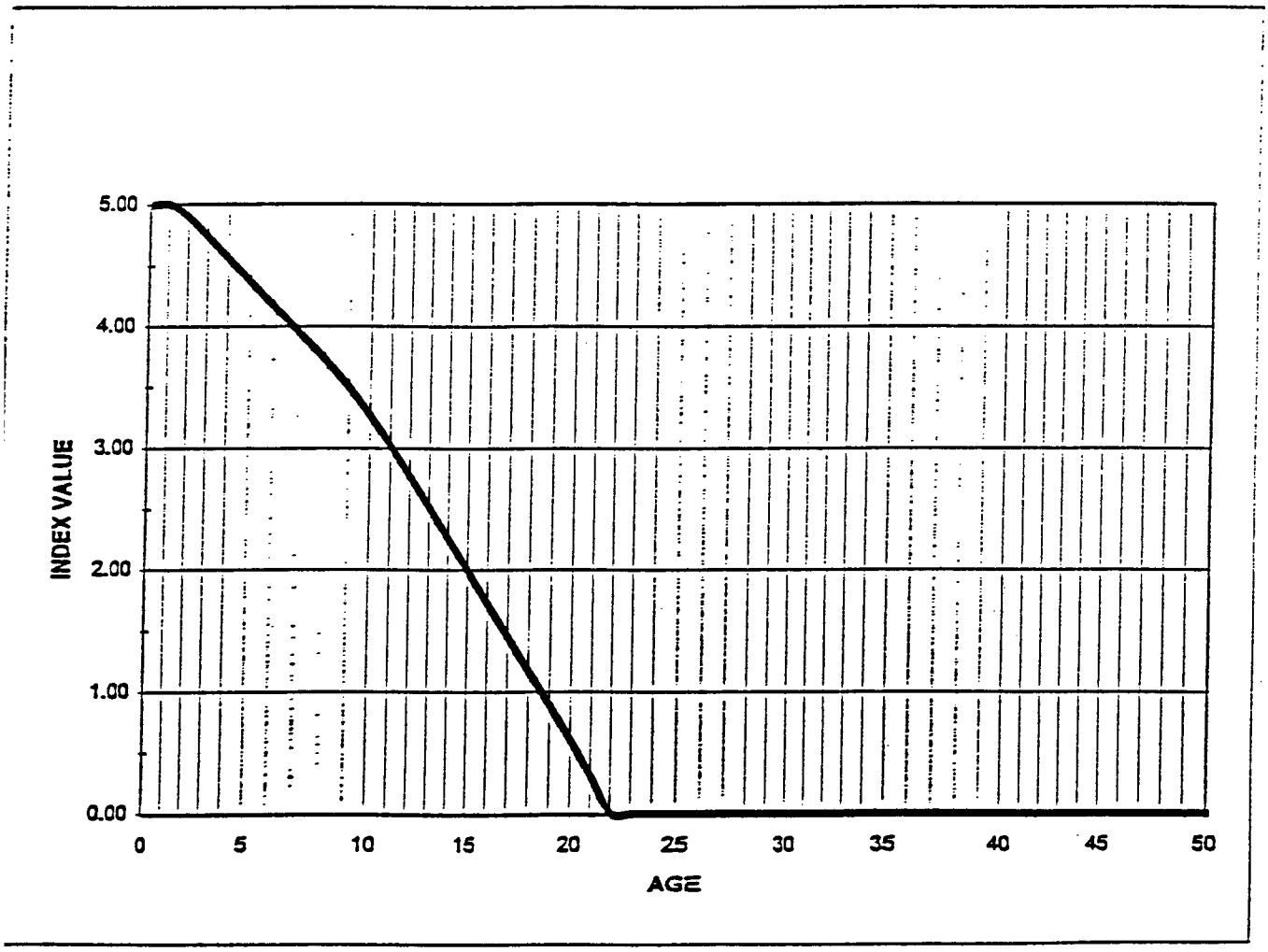
C Value: 5.14
M Value: 0.1013757
B Value: 1.27

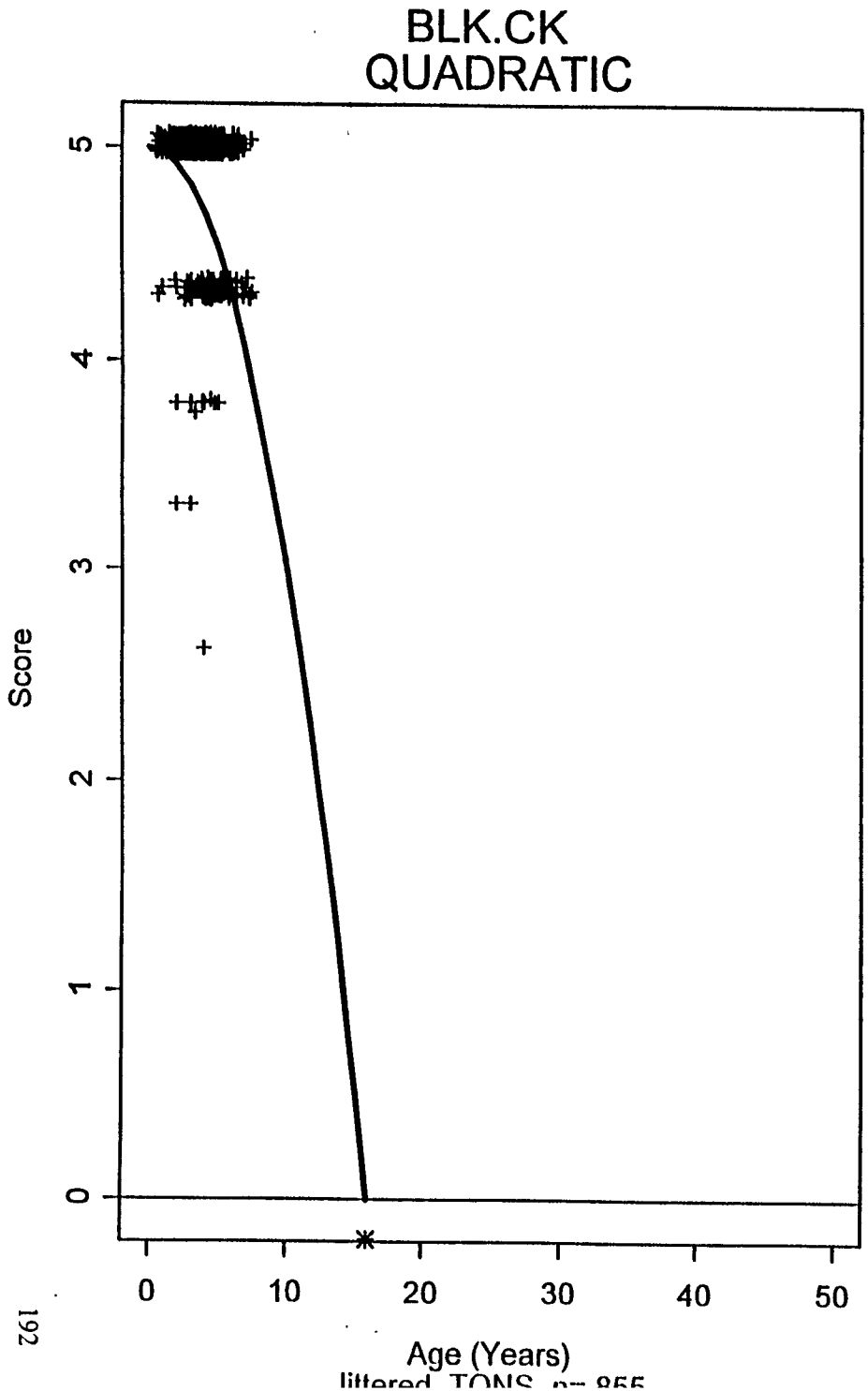
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.90	4.73	4.55	4.36	4.15	3.94	3.72	3.49	3.25

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.01	2.76	2.51	2.25	1.98	1.71	1.44	1.16	0.87	0.59	0.30

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:16:00 1998
Family: TONS
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.087	0.017	5.139	0.002

R-Squared = 0.815

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.106	0.016	6.425	0.001

R-Squared = 0.873

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.108	0.017	6.548	0.001

R-Squared = 0.877

FATIGUE CRACKING ON TONS AFTER MILL & AC OVERLAY

INDEX = C - M * AGE ^ B

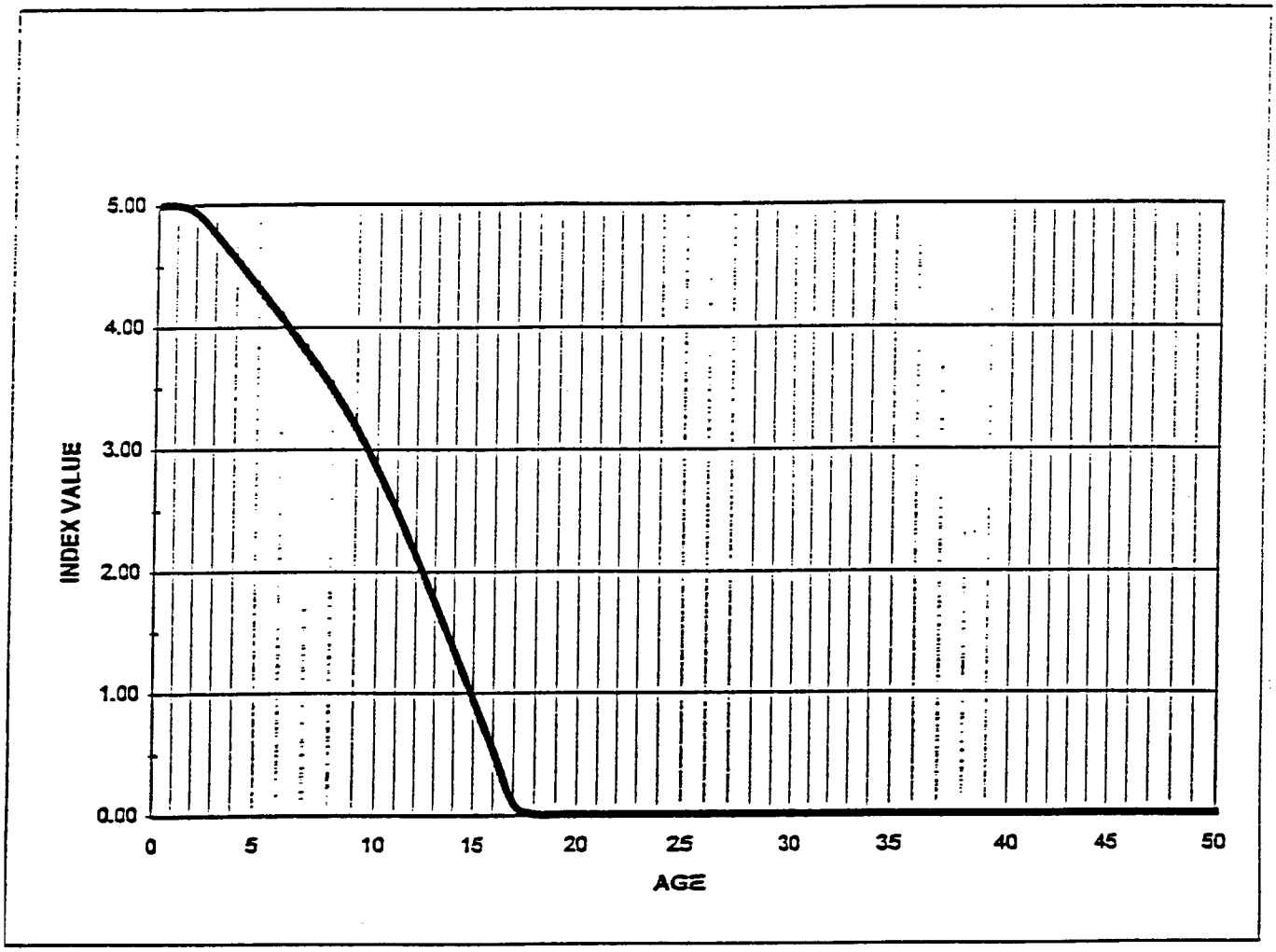
C Value: 5.15
M Value: 0.0787983
B Value: 1.47

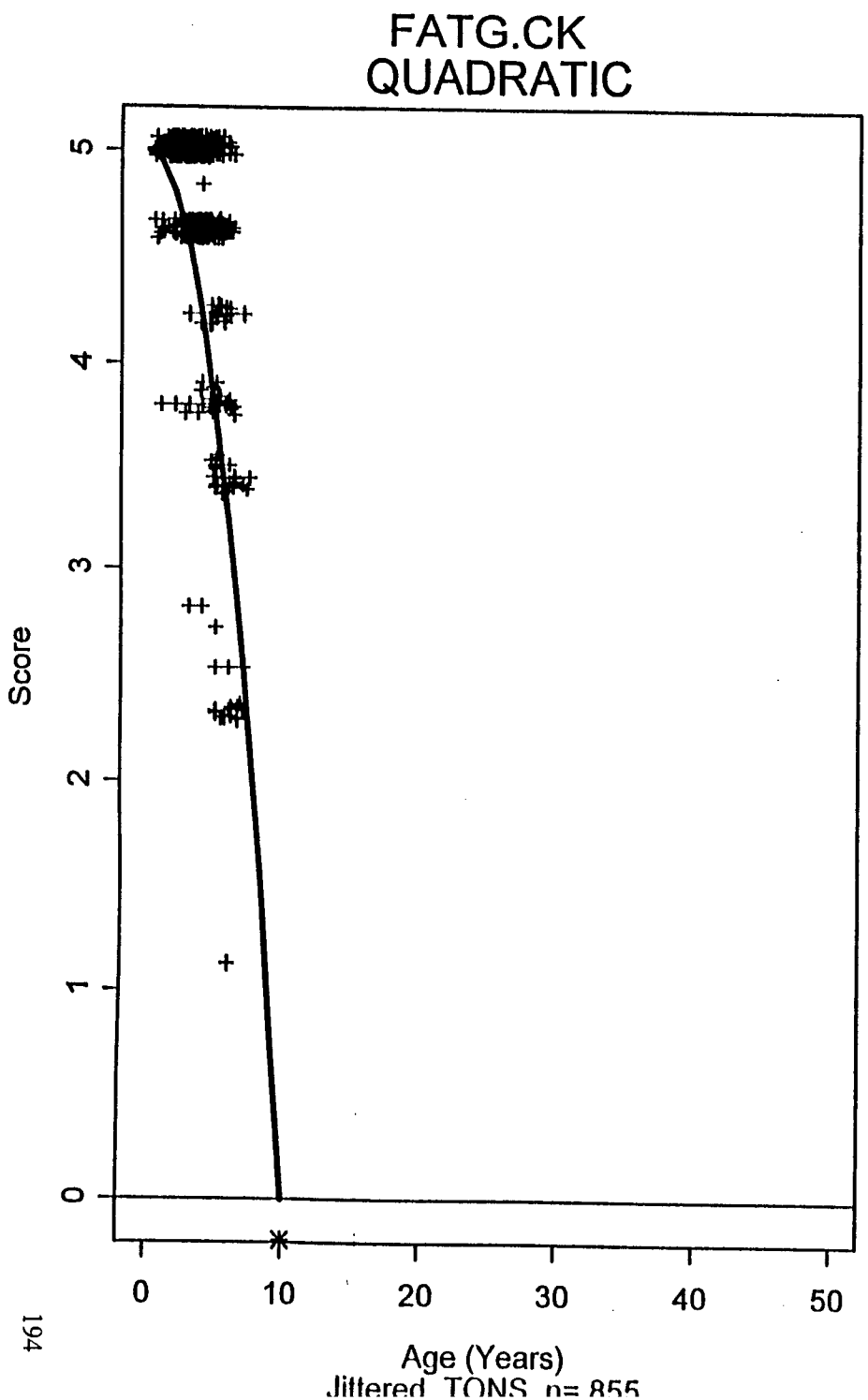
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.93	4.75	4.55	4.31	4.05	3.77	3.47	3.16	2.82

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.47	2.11	1.73	1.34	0.93	0.51	0.08	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:16:52 1998
Family: TONS
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.09	0.028	3.261	0.017

R-Squared = 0.639

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.263	0.036	7.283	0

R-Squared = 0.898

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.319	0.055	5.767	0.001

R-Squared = 0.847

PATCH DETERIORATION ON TONS AFTER MILL & AC OVERLAY

NDEX = C - M * AGE ^ B

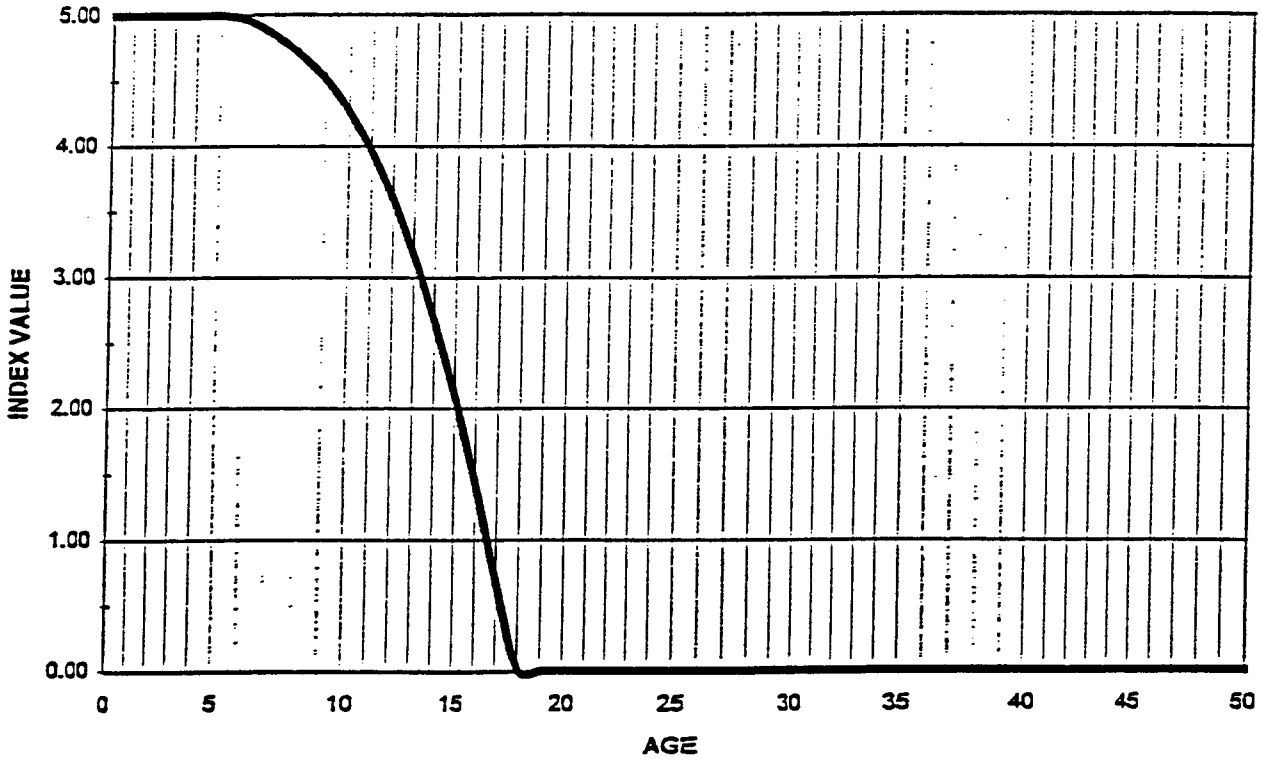
C Value: 5.16
M Value: 0.0008922156
B Value: 3.01

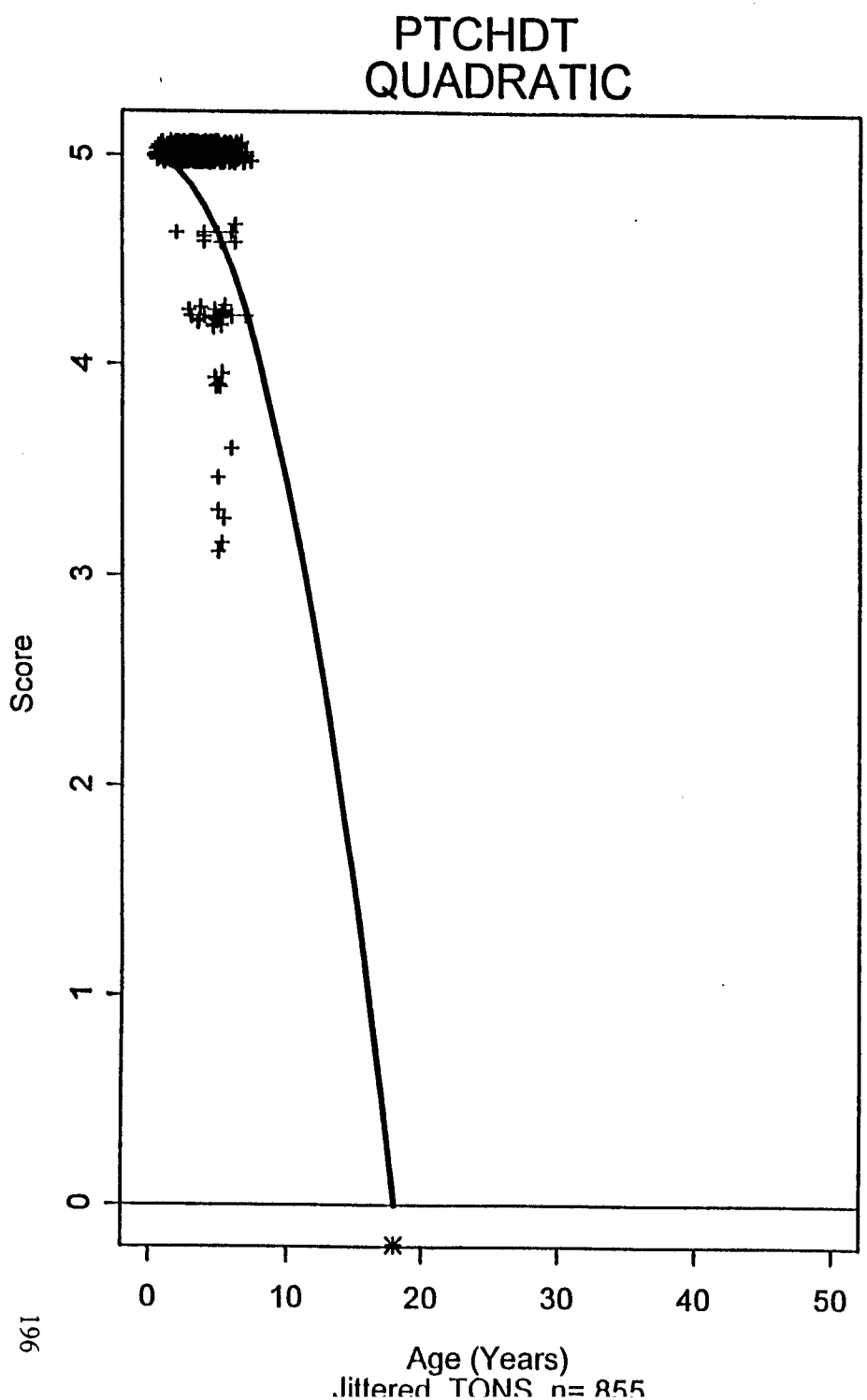
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	5.00	5.00	4.96	4.85	4.69	4.50	4.25

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.94	3.58	3.15	2.65	2.07	1.40	0.65	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:17:43 1998
Family: TONS
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 18

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.085	0.014	6.223	0.001

R-Squared = 0.866

50TH PERCENTILE
Coefficient Estimates:

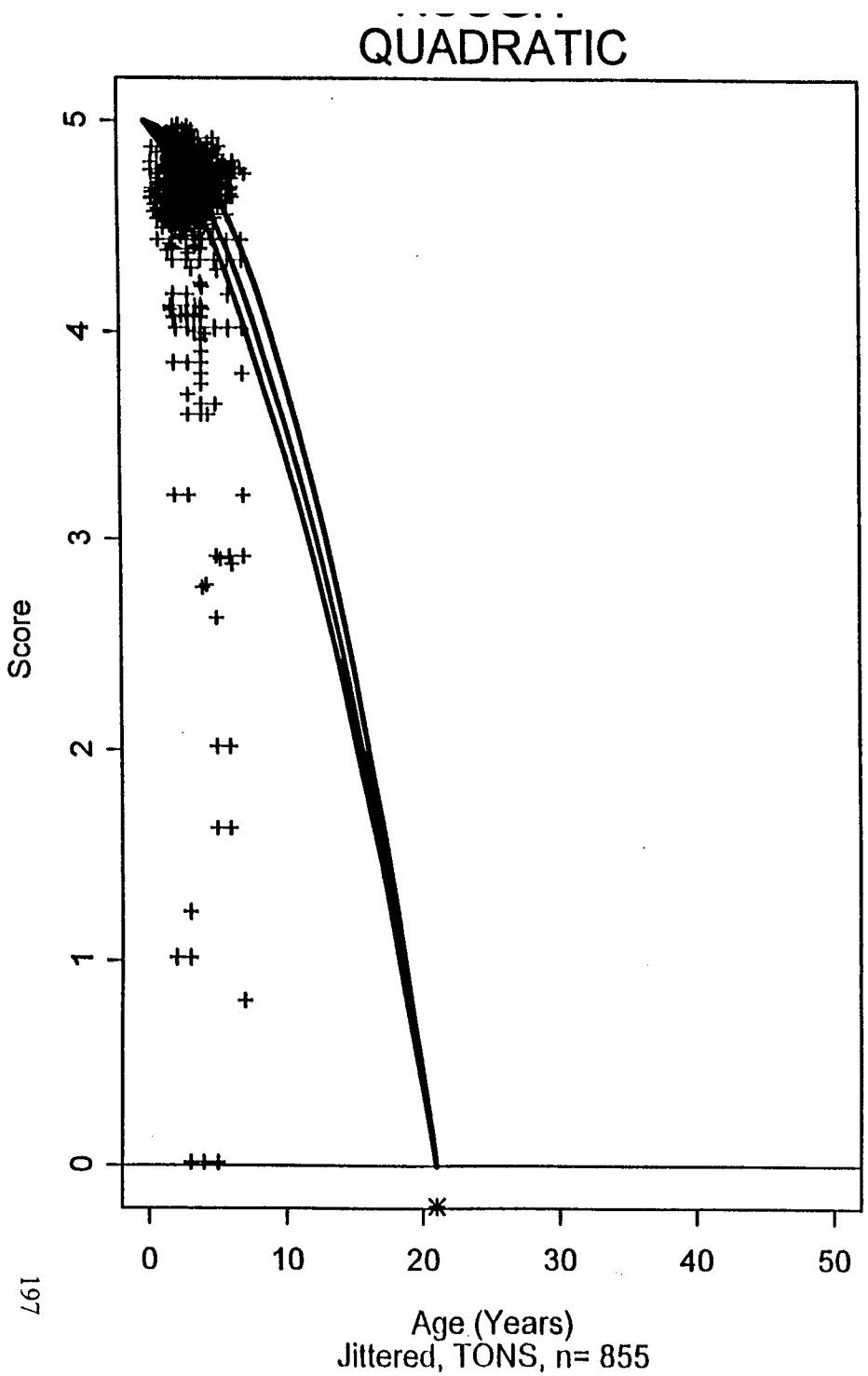
	Value	Std. Error	t value	Pr(>|t|)
1	0.085	0.014	6.223	0.001

R-Squared = 0.866

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.085	0.014	6.223	0.001

R-Squared = 0.866



Date of Analysis: Thu May 7 18:18:39 1998
Family: TONS
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 21

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.083	0.026	-3.25	0.017

R-Squared = 0.638

50TH PERCENTILE
Coefficient Estimates:

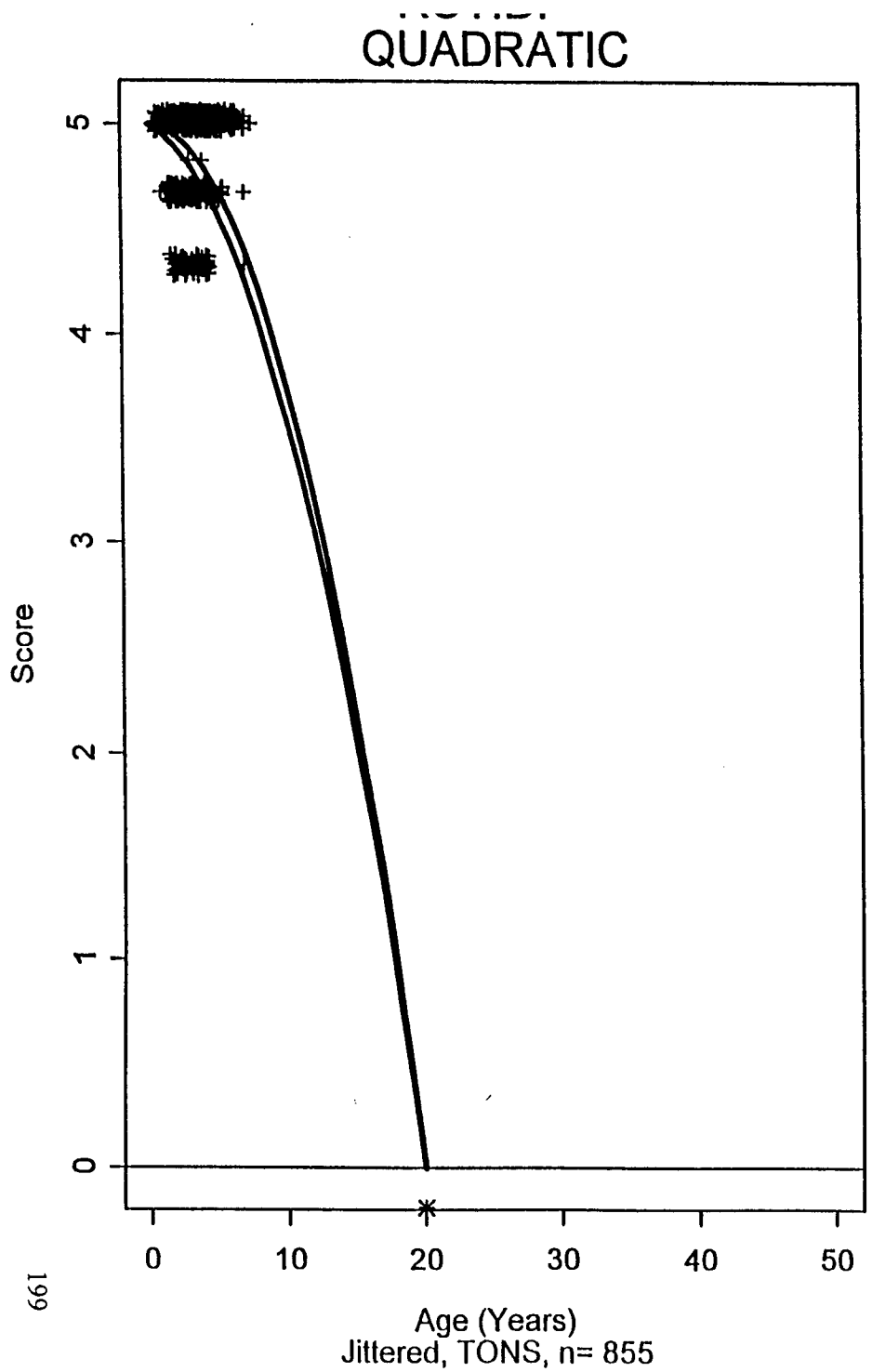
	Value	Std. Error	t value	Pr(>|t|)
1	-0.054	0.017	-3.133	0.02

R-Squared = 0.621

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.015	0.013	-1.103	0.312

R-Squared = 0.169



Date of Analysis: Thu May 7 18:19:35 1998
Family: TONS
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.032	0.031	-1.005	0.354

R-Squared = 0.144

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.067	0.01	6.442	0.001

R-Squared = 0.874

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.067	0.01	6.442	0.001

R-Squared = 0.874

TRANSVERSE CRACKING ON TONS AFTER MILL & AC OVERLAY

NDEX = C - M * AGE ^ B

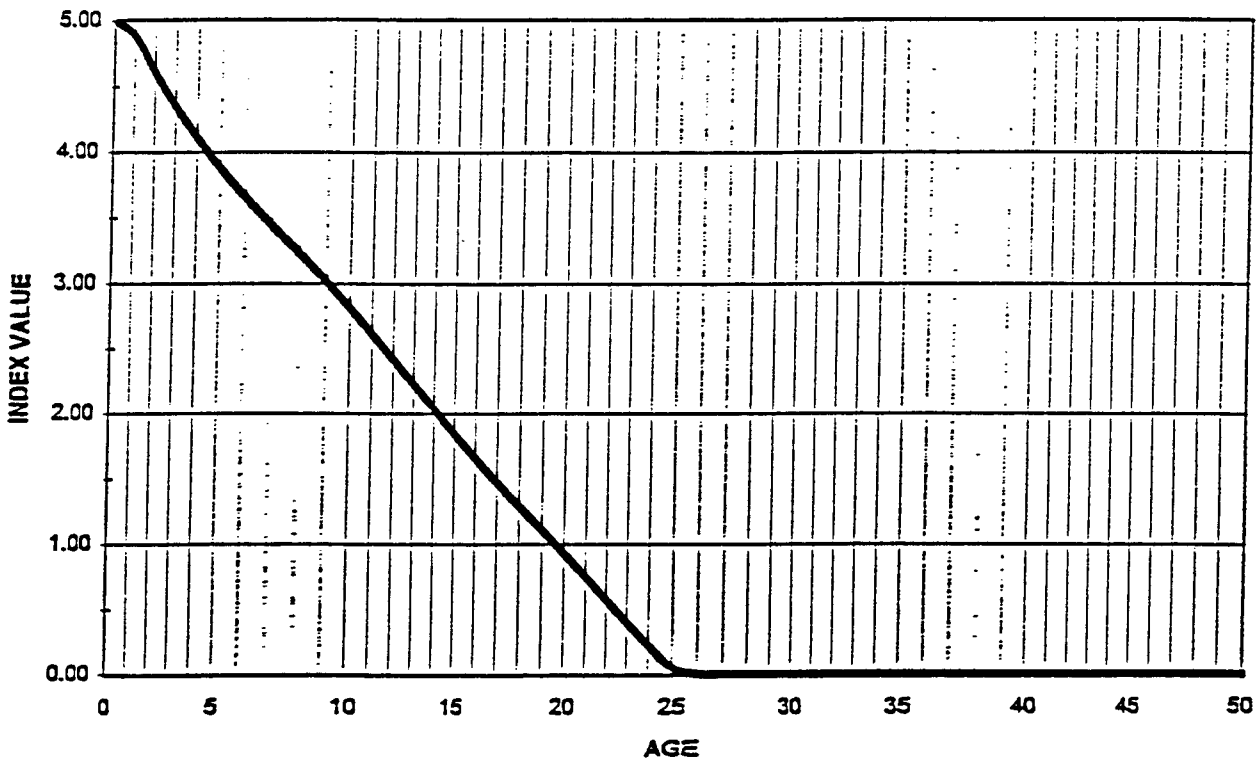
C Value: 5.23
M Value: 0.3588375
B Value: 0.83

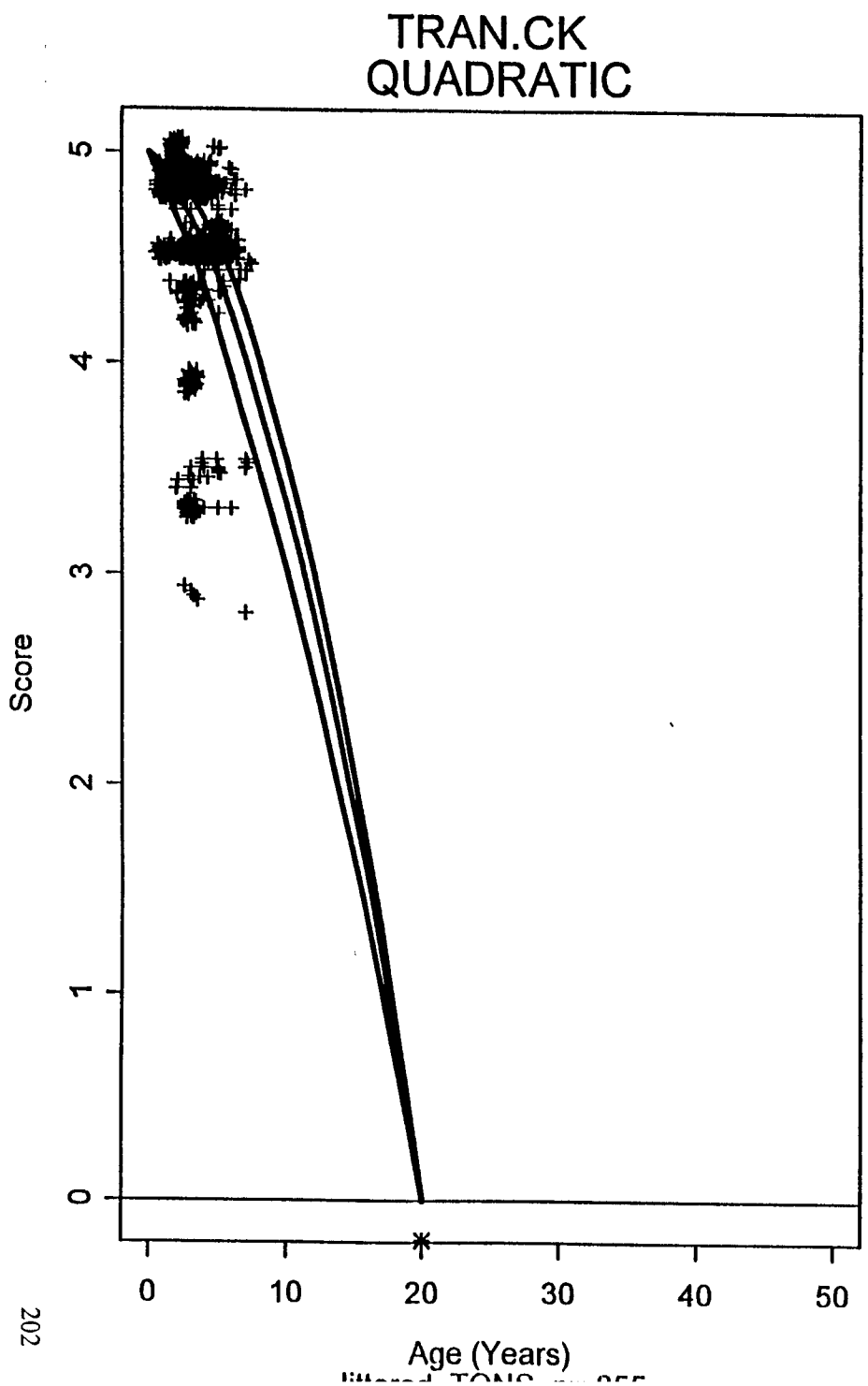
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.87	4.59	4.34	4.10	3.87	3.64	3.43	3.21	3.01	2.80

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.60	2.41	2.21	2.02	1.83	1.65	1.46	1.28	1.10	0.92	0.74

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.56	0.39	0.21	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:20:20 1998
Family: TONS
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.145	0.056	-2.594	0.041

R-Squared = 0.529

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.08	0.02	-4.002	0.007

R-Squared = 0.727

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.038	0.026	-1.472	0.192

R-Squared = 0.265

APPENDIX E5

PERFORMANCE MODELS FOR TONW PAVEMENT FAMILY

APPENDIX E5.1

PERFORMANCE MODELS FOR TONW - O PAVEMENT FAMILY

PAVEMENT FAMILY: TONW – Original

Number of data points available for regression of performance curves : 1704

Range of years of data available for the given family : 03 to 62 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.173
   Optimum forced end point is obtained at 26 years with a R^2 value of : 0.522 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 15 years
   Historical data forced to end at 15 years has a R^2 value of : 0.210
   Optimum forced end point is obtained at 26 years with a R^2 value of : 0.406 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 18 years
   Historical data forced to end at 18 years has a R^2 value of : 0.208
   Optimum forced end point is obtained at 27 years with a R^2 value of : 0.499 ✓

4. Roughness [ROUGH]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.064
   Optimum forced end point is obtained at 27 years with a R^2 value of : 0.289 ✓

5. Rut Depth [RUT_DP]
   Existing Expert Model ends at @ 12 years
   Historical data forced to end at 12 years has a R^2 value of : 0.161
   Optimum forced end point is obtained at 27 years with a R^2 value of : 0.484 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 21 years
   Historical data forced to end at 21 years has a R^2 value of : 0.235
   Optimum forced end point is obtained at 27 years with a R^2 value of : 0.453 ✓

BLOCK CRACKING ON TONW

IDEX = C - M * AGE ^ B

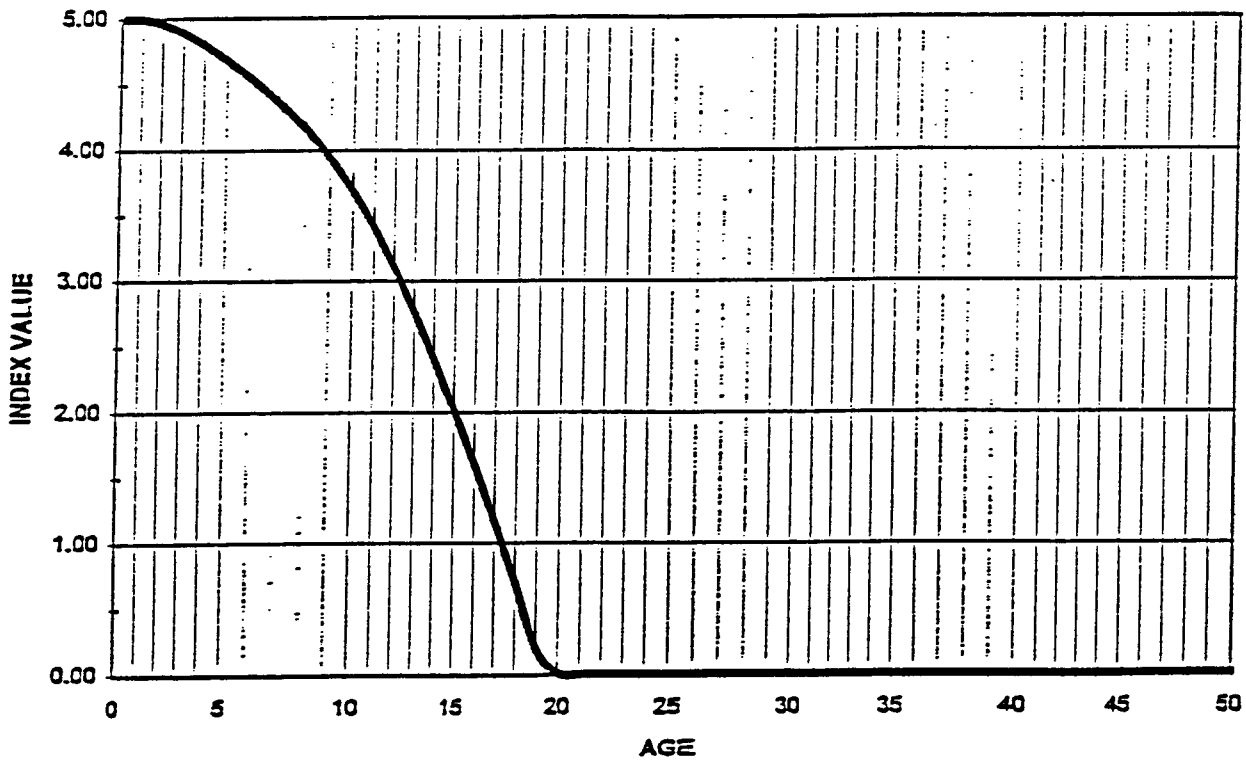
; Value: 5.01
I Value: 0.01339
; Value: 2.00

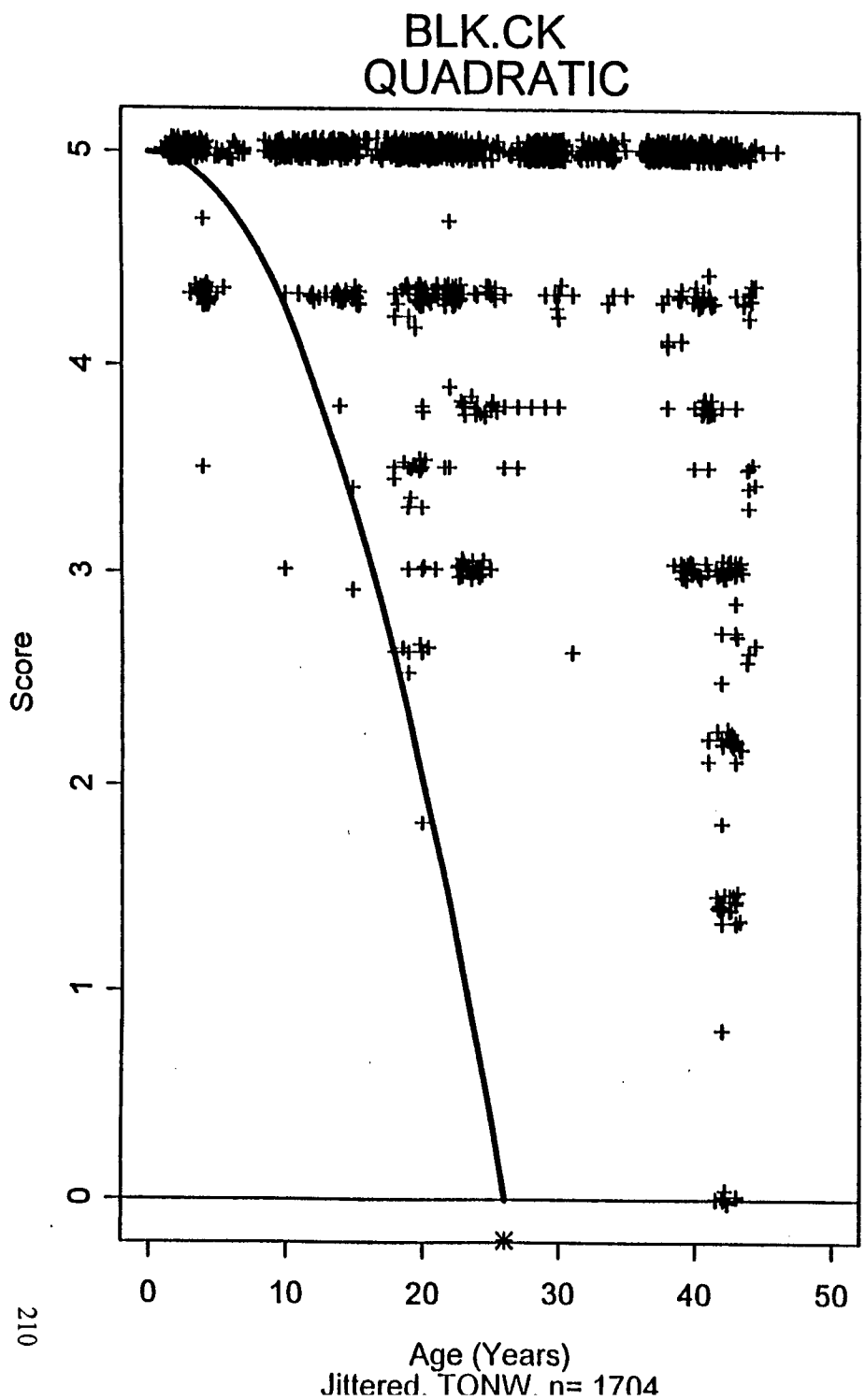
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.96	4.89	4.80	4.68	4.53	4.35	4.15	3.93	3.67

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.39	3.08	2.75	2.39	2.00	1.58	1.14	0.67	0.18	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:21:50 1998
Family: TONW
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 26

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.332	0.064	5.171	0

R-Squared = 0.527

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.404	0.079	5.117	0

R-Squared = 0.522

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.412	0.079	5.204	0

R-Squared = 0.53

FATIGUE CRACKING ON TONW

NDEX = C - M * AGE ^ B

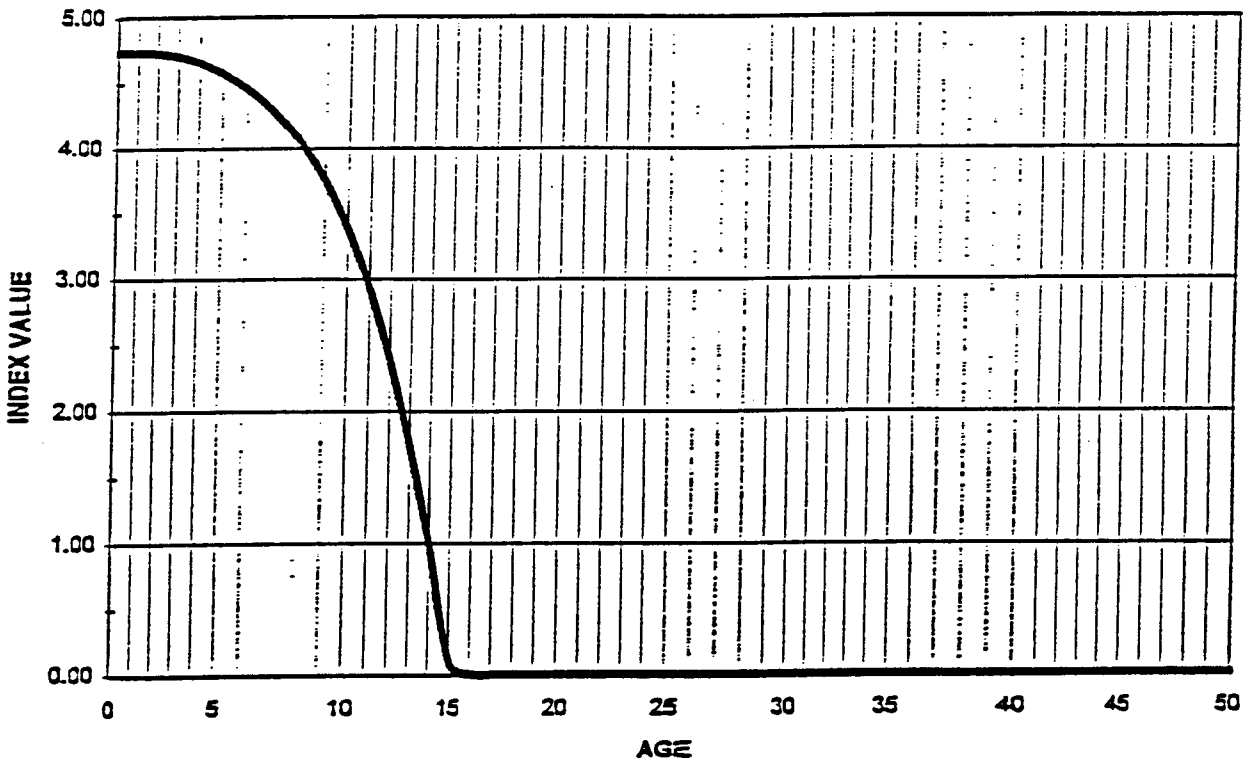
; Value: 4.74
I Value: 0.00138
I Value: 3.00

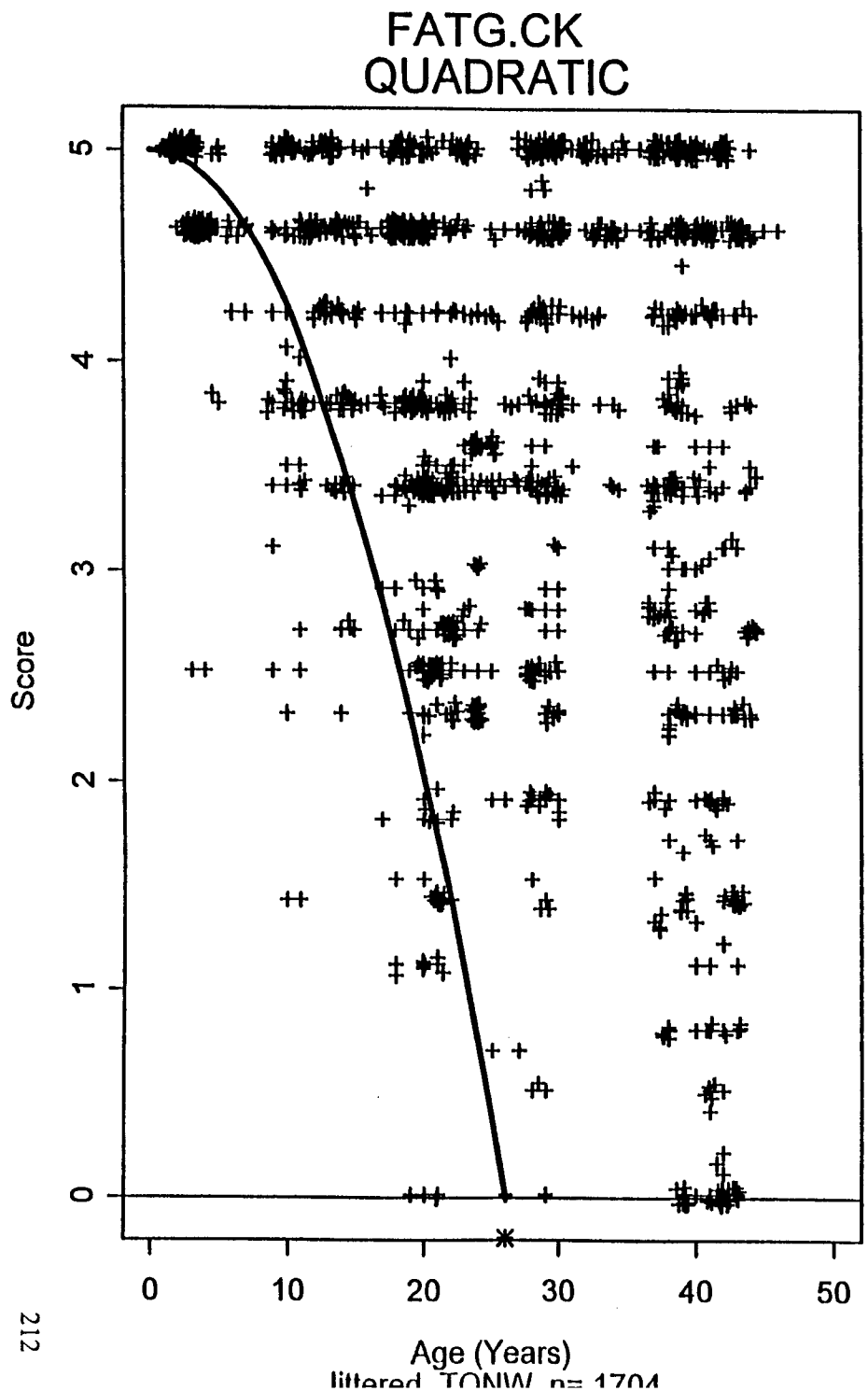
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.74	4.74	4.73	4.70	4.65	4.57	4.44	4.27	4.03	3.73	3.36

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.90	2.36	1.71	0.95	0.08	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:23:14 1998
Family: TONW
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 26

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.118	0.046	2.553	0.017

R-Squared = 0.214

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.224	0.055	4.051	0

R-Squared = 0.406

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.306	0.061	4.99	0

R-Squared = 0.509

PATCH DETERIORATION ON TONW

NDEX = C - M * AGE ^ B

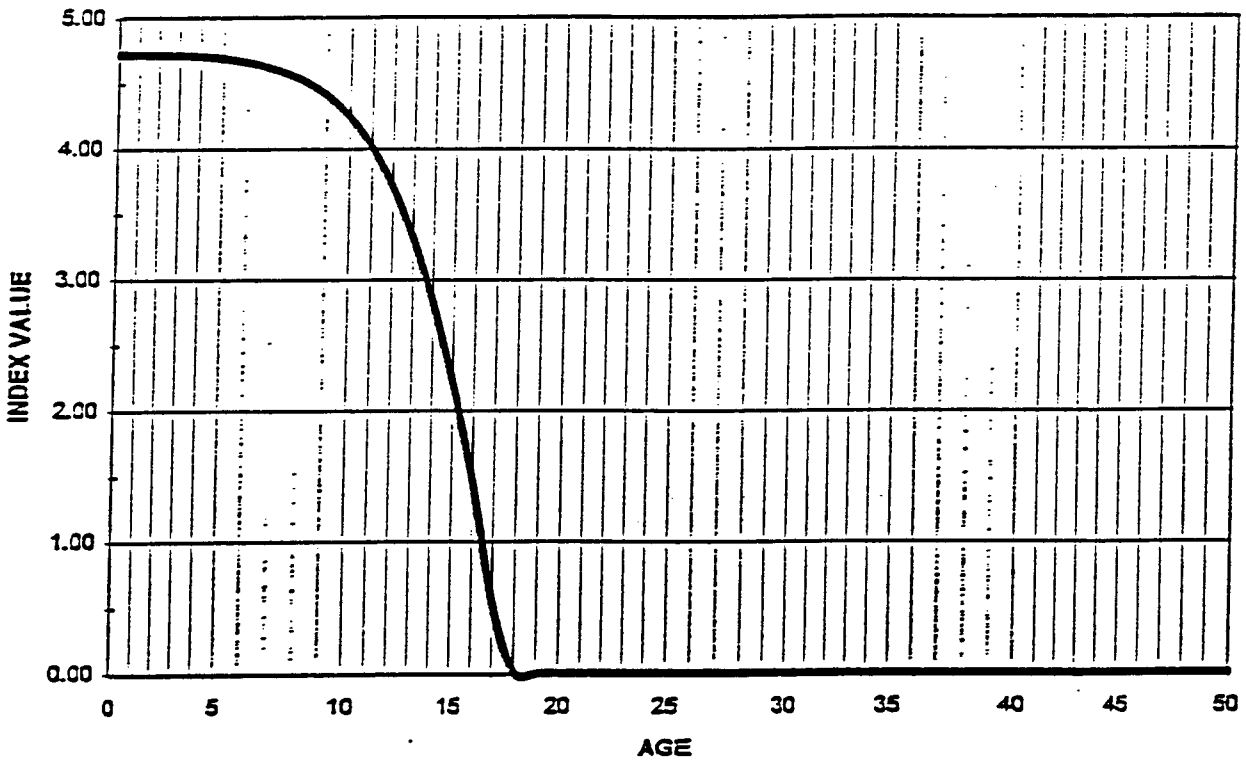
C Value: 4.72
M Value: 0.0000439
B Value: 4.05

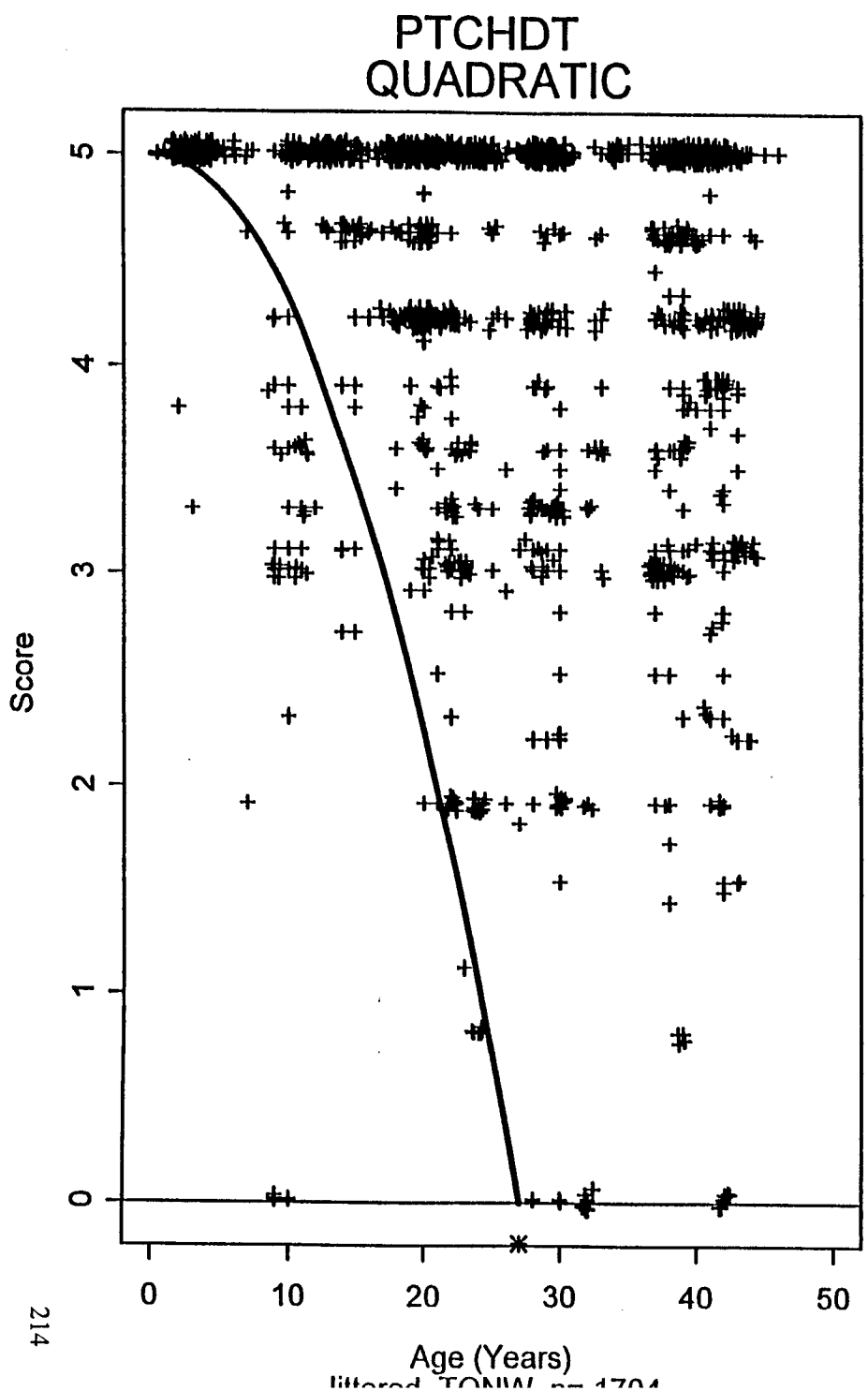
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.72	4.72	4.72	4.72	4.71	4.69	4.66	4.60	4.52	4.40	4.23

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.00	3.69	3.29	2.80	2.18	1.42	0.50	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:24:20 1998
Family: TONW
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 27

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.231	0.046	5.024	0

R-Squared = 0.502

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.32	0.064	4.994	0

R-Squared = 0.499

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.37	0.065	5.663	0

R-Squared = 0.562

ROUGHNESS ON TONW

NDEX = C - M * AGE ^ B

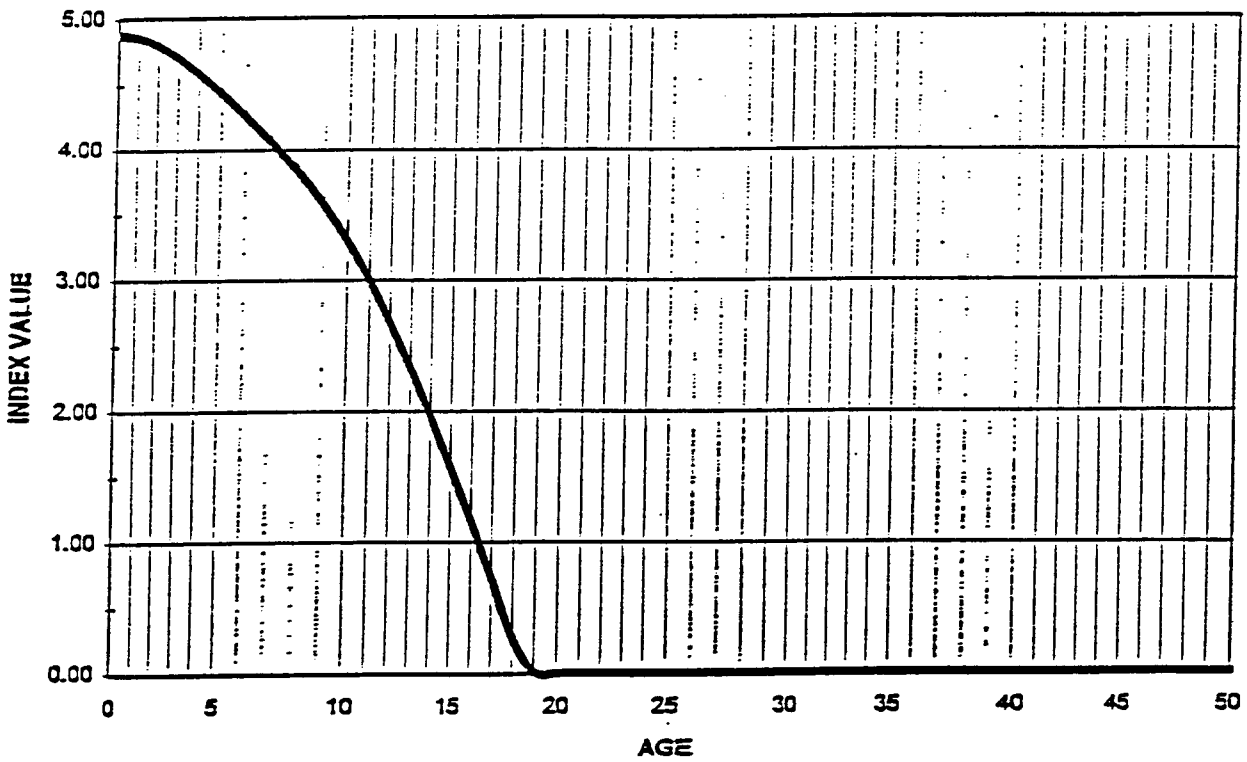
C Value: 4.88
M Value: 0.0247679
B Value: 1.81

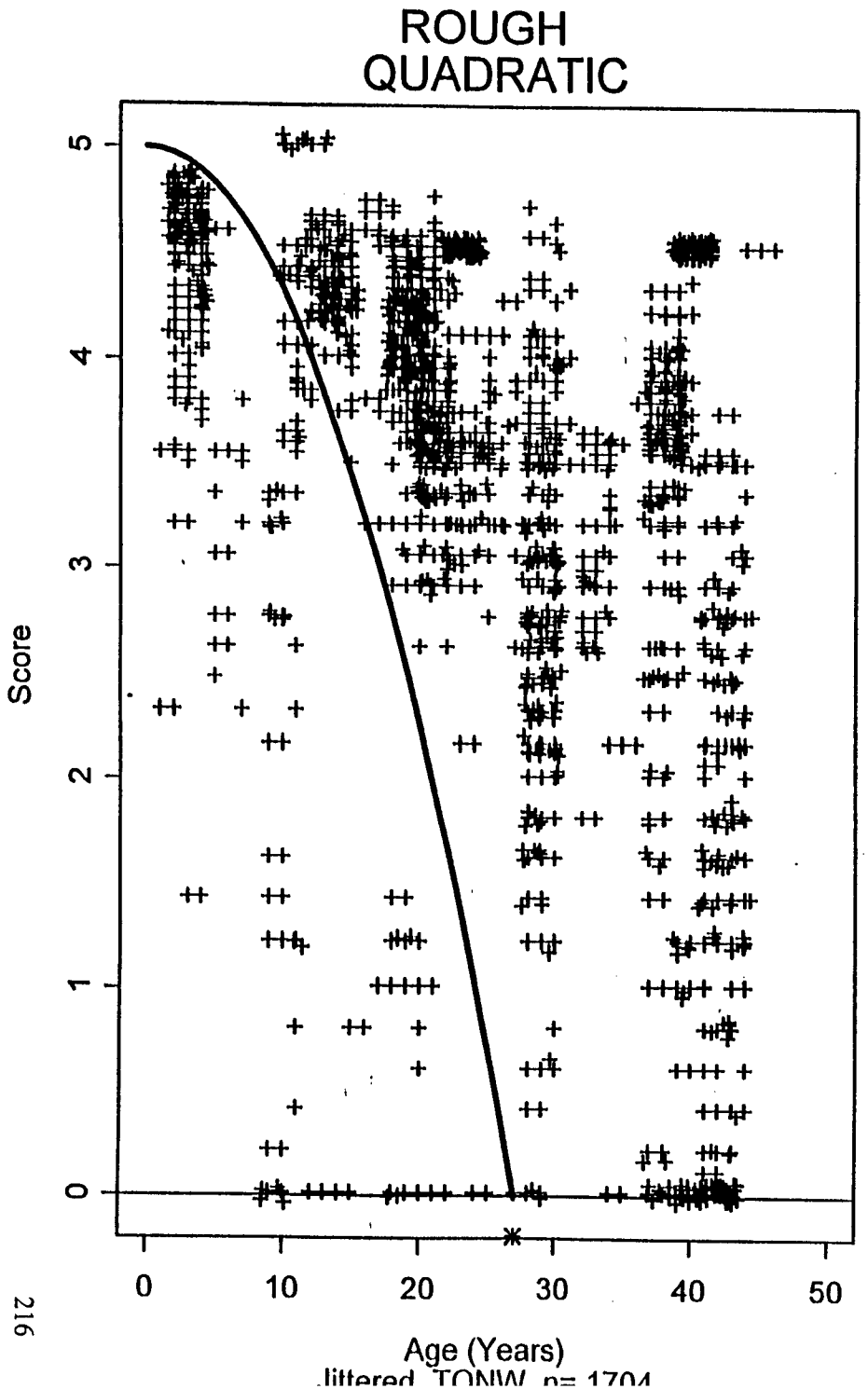
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.88	4.86	4.79	4.70	4.58	4.42	4.25	4.04	3.81	3.56	3.28

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.98	2.66	2.31	1.94	1.55	1.14	0.70	0.25	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:25:32 1998
Family: TONW
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 27

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.116	0.056	2.052	0.051

R-Squared = 0.144

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.185	0.058	3.19	0.004

R-Squared = 0.289

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.242	0.058	4.179	0

R-Squared = 0.411

RUT DEPTH ON TONW

NDEX = C - M * AGE ^ B

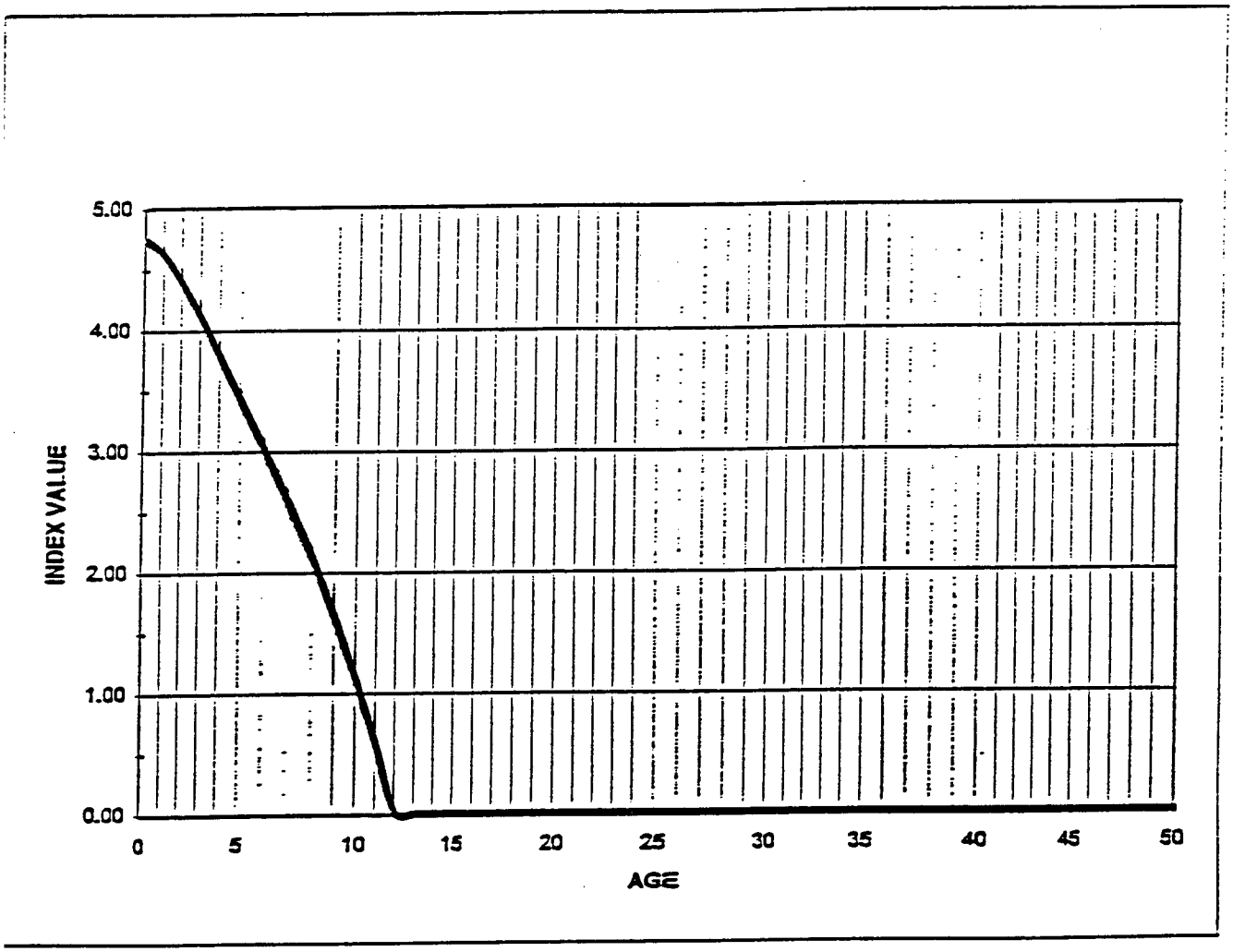
C Value: 4.75
M Value: 0.132256
B Value: 1.44

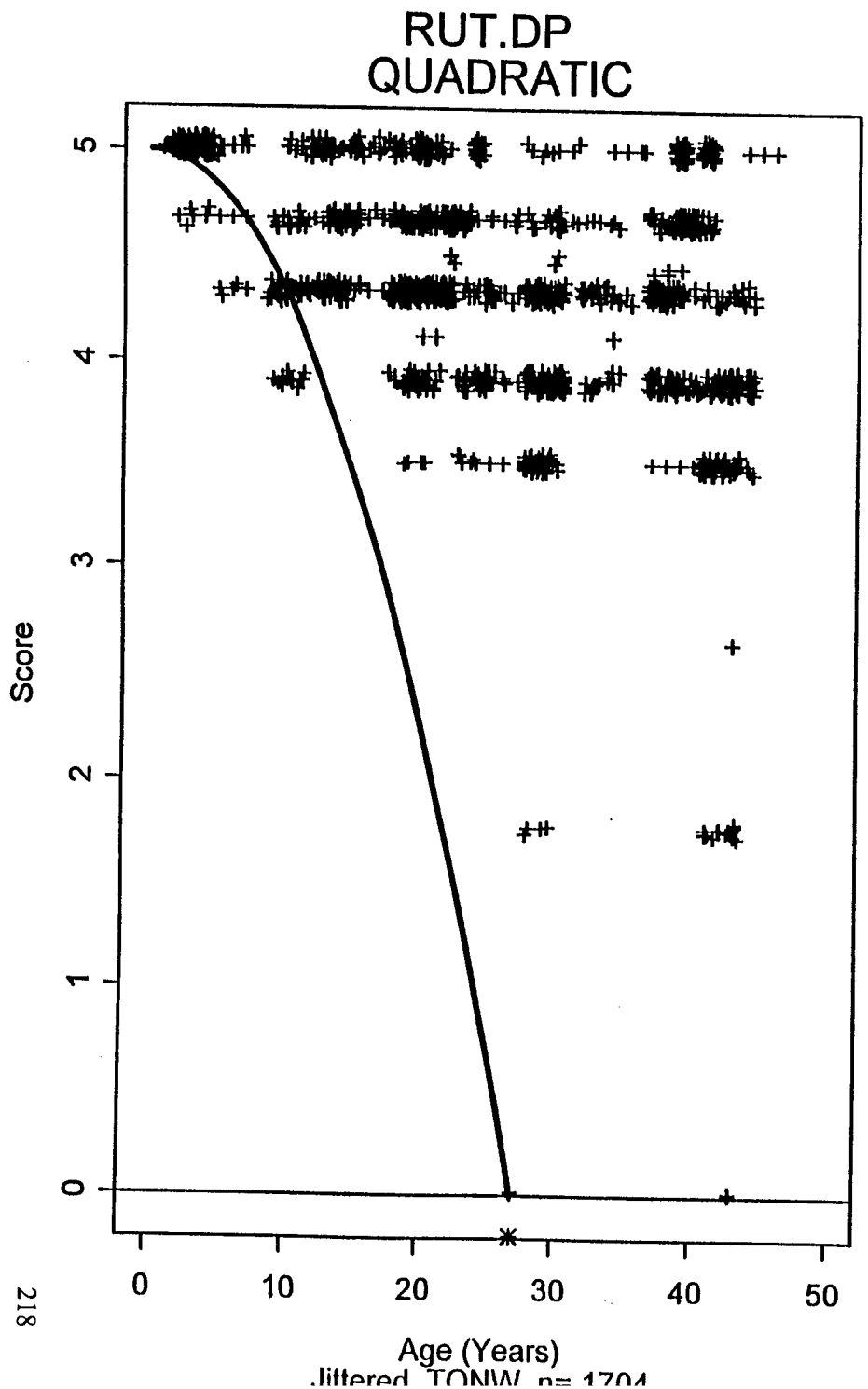
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.75	4.62	4.39	4.11	3.78	3.41	3.00	2.57	2.11	1.62	1.11

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	0.57	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:26:38 1998
Family: TONW
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 27

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.254	0.052	4.863	0

R-Squared = 0.486

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.286	0.059	4.846	0

R-Squared = 0.484

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.323	0.059	5.497	0

R-Squared = 0.547

TRANSVERSE CRACKING ON TONW

X = C - M * AGE ^ B

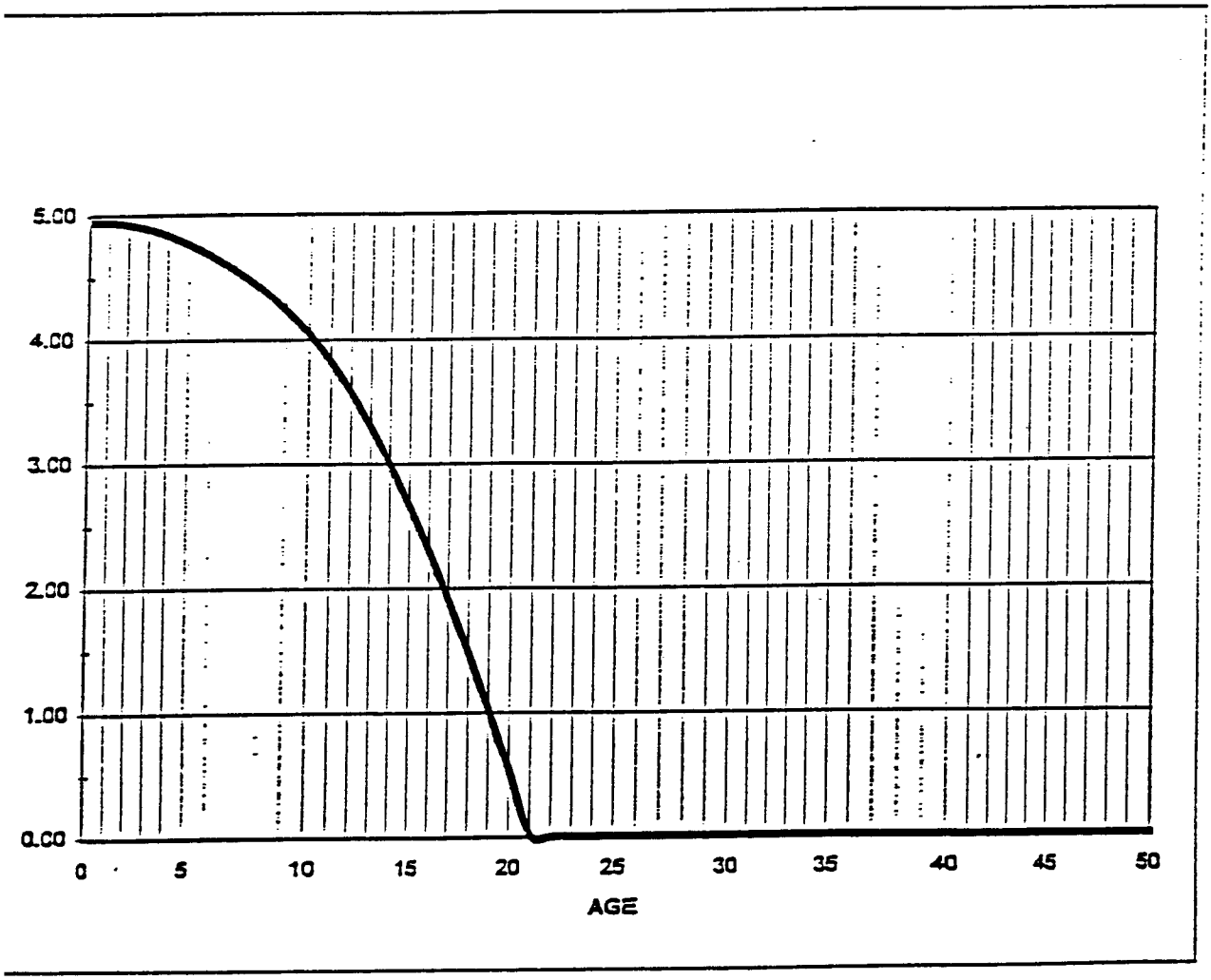
lue: 4.95
lue: 0.004936494
ue: 2.27

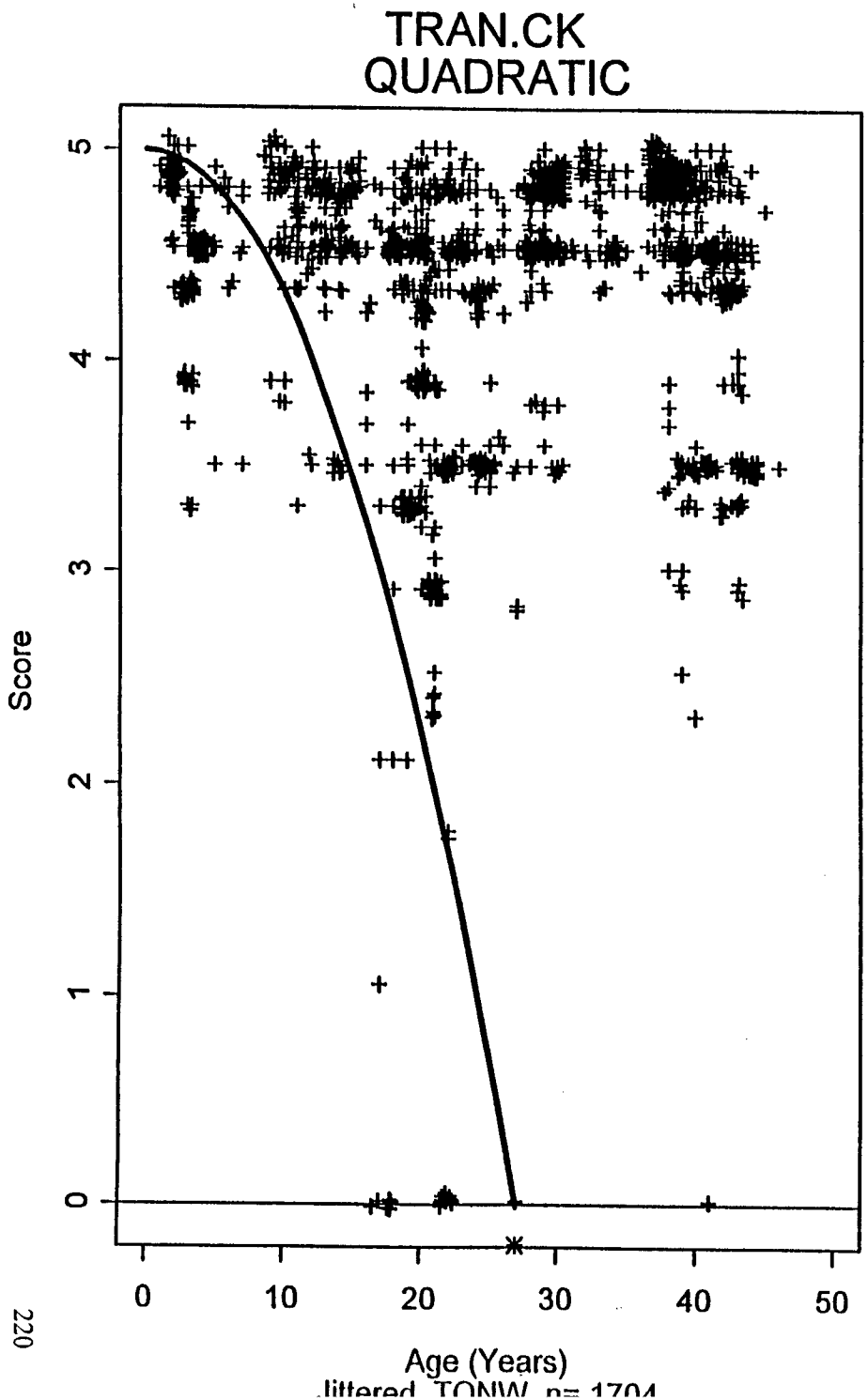
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.95	4.95	4.93	4.89	4.84	4.76	4.66	4.54	4.40	4.23	4.03

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.81	3.56	3.28	2.98	2.64	2.28	1.88	1.46	1.00	0.52	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:27:47 1998
Family: TONW
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 27

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.187	0.048	3.936	0.001

R-Squared = 0.383

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.229	0.05	4.552	0

R-Squared = 0.453

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.292	0.056	5.227	0

R-Squared = 0.522

APPENDIX E5.2

PERFORMANCE MODELS FOR TONW - A PAVEMENT FAMILY

PAVEMENT FAMILY: TONW – A [AC Overlay on Original]

Number of data points available for regression of performance curves : 6972

Range of years of data available for the given family : 03 to 29 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 18 years
   Historical data forced to end at 18 years has a R^2 value of : 0.355
   Optimum forced end point is obtained at 42 years with a R^2 value of : 0.704
   Adjusting from the expert curve of the Original Family use endpoint of 26 years
   Historical data forced to end at 26 years has a R^2 value of : 0.460 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 10 years
   Historical data forced to end at 10 years has a R^2 value of : 0.338
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.338 ✓

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 17 years
   Historical data forced to end at 17 years has a R^2 value of : 0.374
   Optimum forced end point is obtained at 15 years with a R^2 value of : 0.429 ✓

4. Roughness [ROUGH]
   Existing Expert Model ends at @ 13 years
   Historical data forced to end at 13 years has a R^2 value of : 0.214
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.291 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.387 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.243
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.305 ✓

BLOCK CRACKING ON TONW AFTER ASPHALT OVERLAY

NDEX = C - M * AGE ^ B

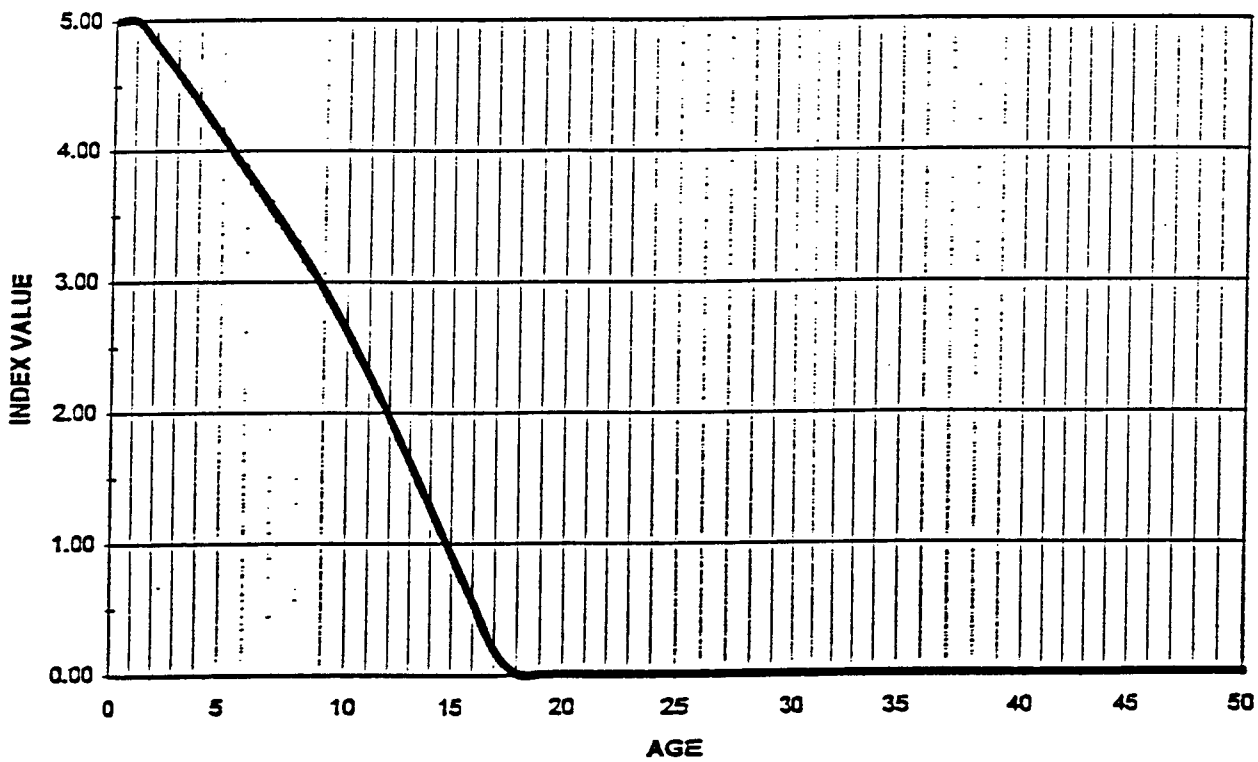
C Value: 5.14
M Value: 0.1361237
B Value: 1.27

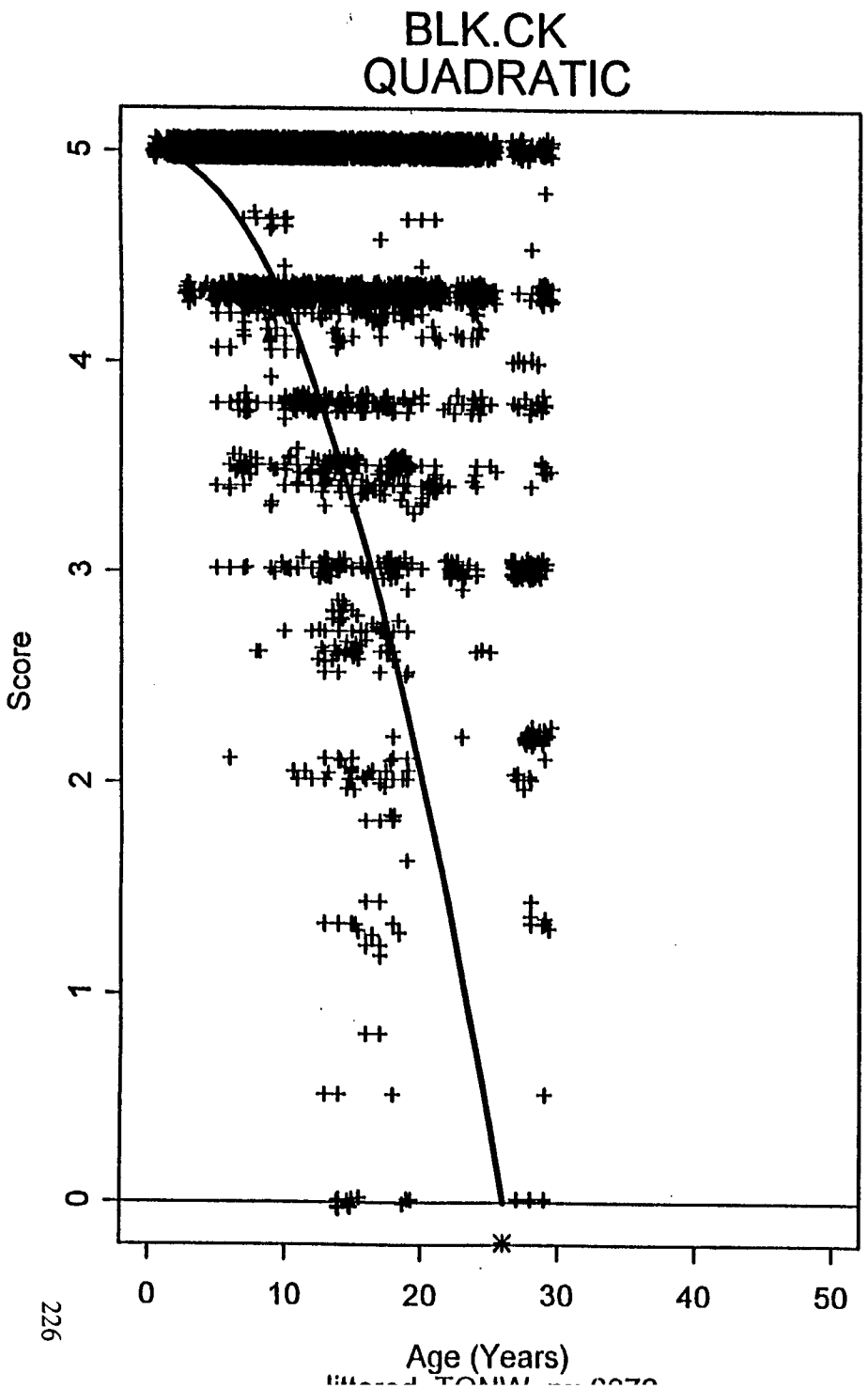
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.81	4.59	4.35	4.09	3.82	3.53	3.23	2.92	2.61

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.28	1.94	1.60	1.25	0.90	0.54	0.17	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:38:41 1998
Family: TONW
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 26

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.169	0.046	3.686	0.001

R-Squared = 0.362

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.225	0.05	4.522	0

R-Squared = 0.46

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.233	0.05	4.636	0

R-Squared = 0.472

FATIGUE CRACKING ON TONW AFTER ASPHALT OVERLAY

NDEX = C - M * AGE ^ B

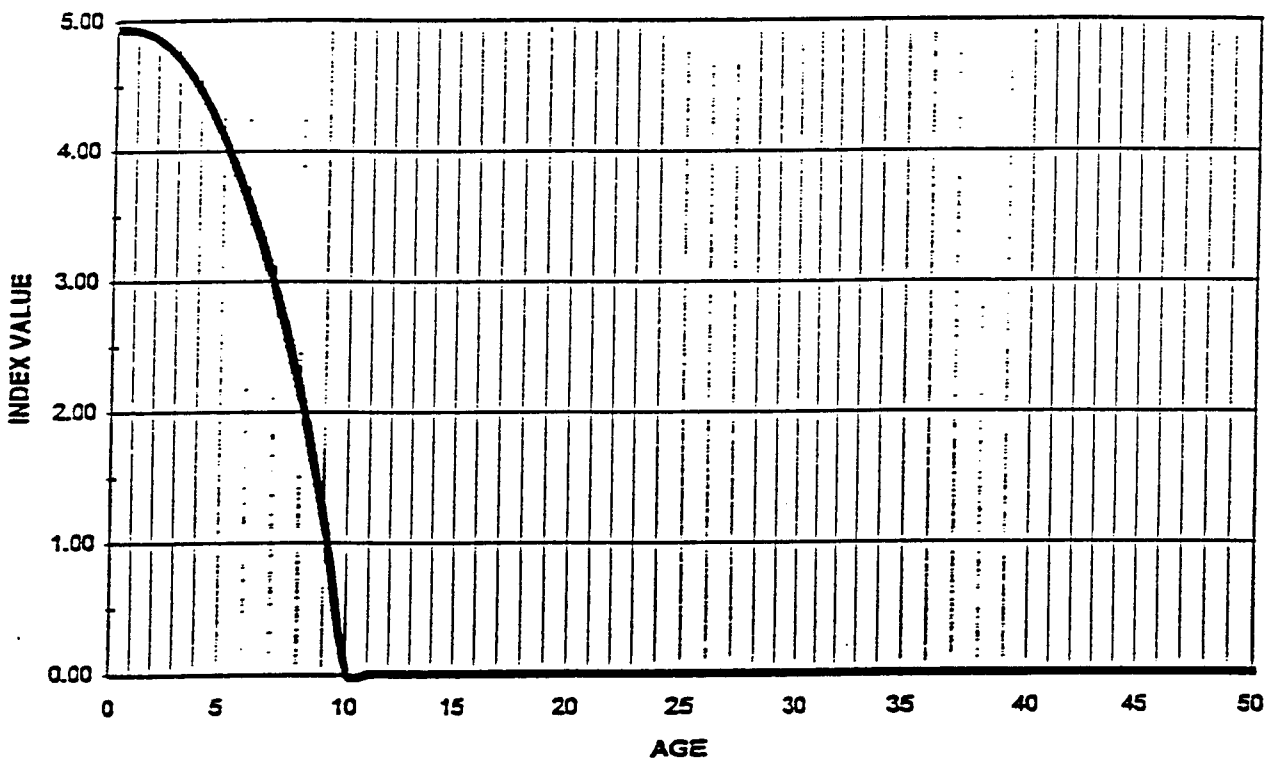
C Value: 4.94
M Value: 0.01467299
B Value: 2.53

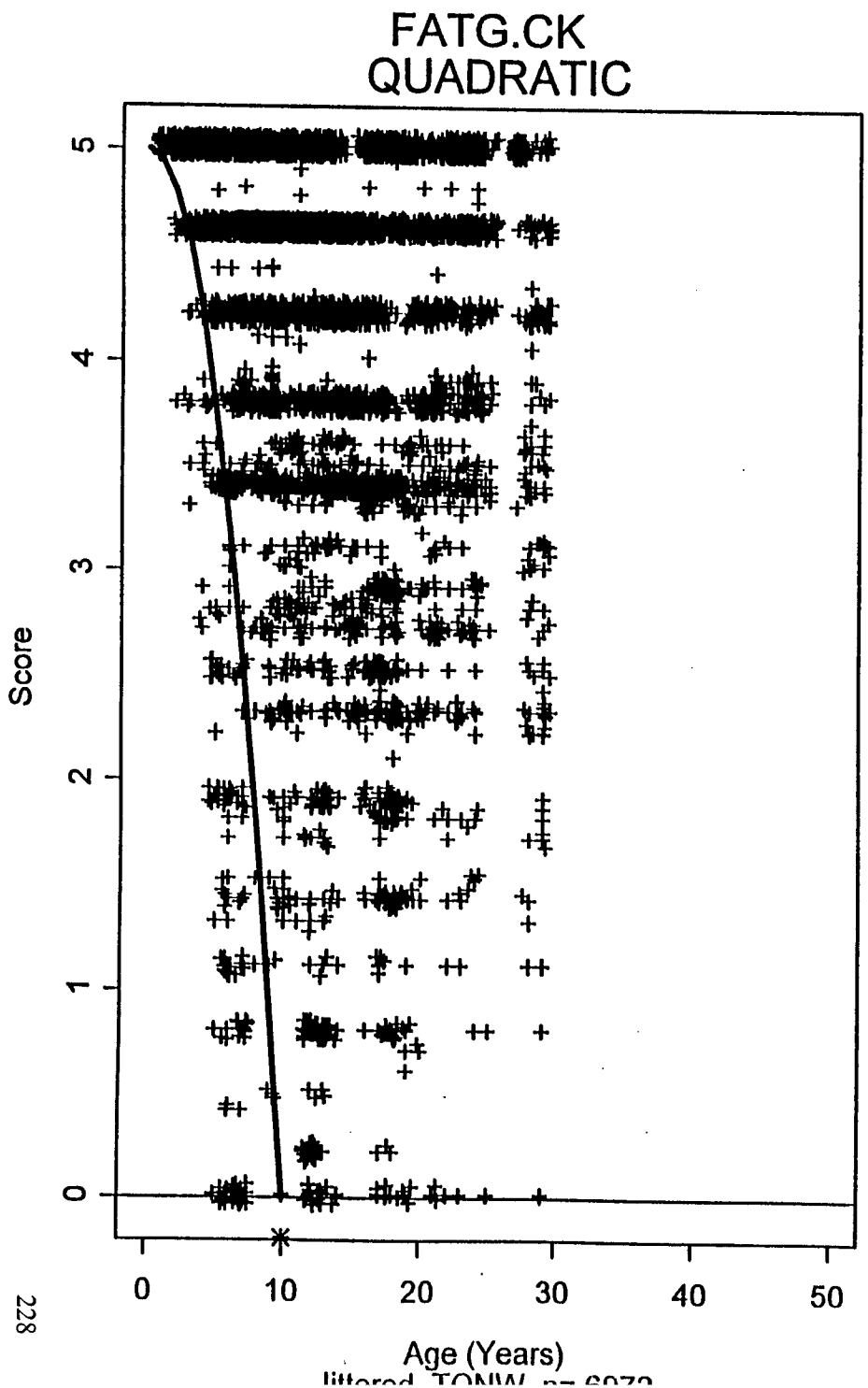
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.94	4.93	4.86	4.70	4.45	4.08	3.57	2.92	2.11	1.13	0.00

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:40:54 1998
Family: TONW
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.585	0.311	1.881	0.093

R-Squared = 0.282

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.771	0.36	2.142	0.061

R-Squared = 0.338

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.909	0.38	2.391	0.04

R-Squared = 0.388

PATCH DETERIORATION ON TONW AFTER ASPHALT OVERLAY

NDEX = C - M * AGE ^ B

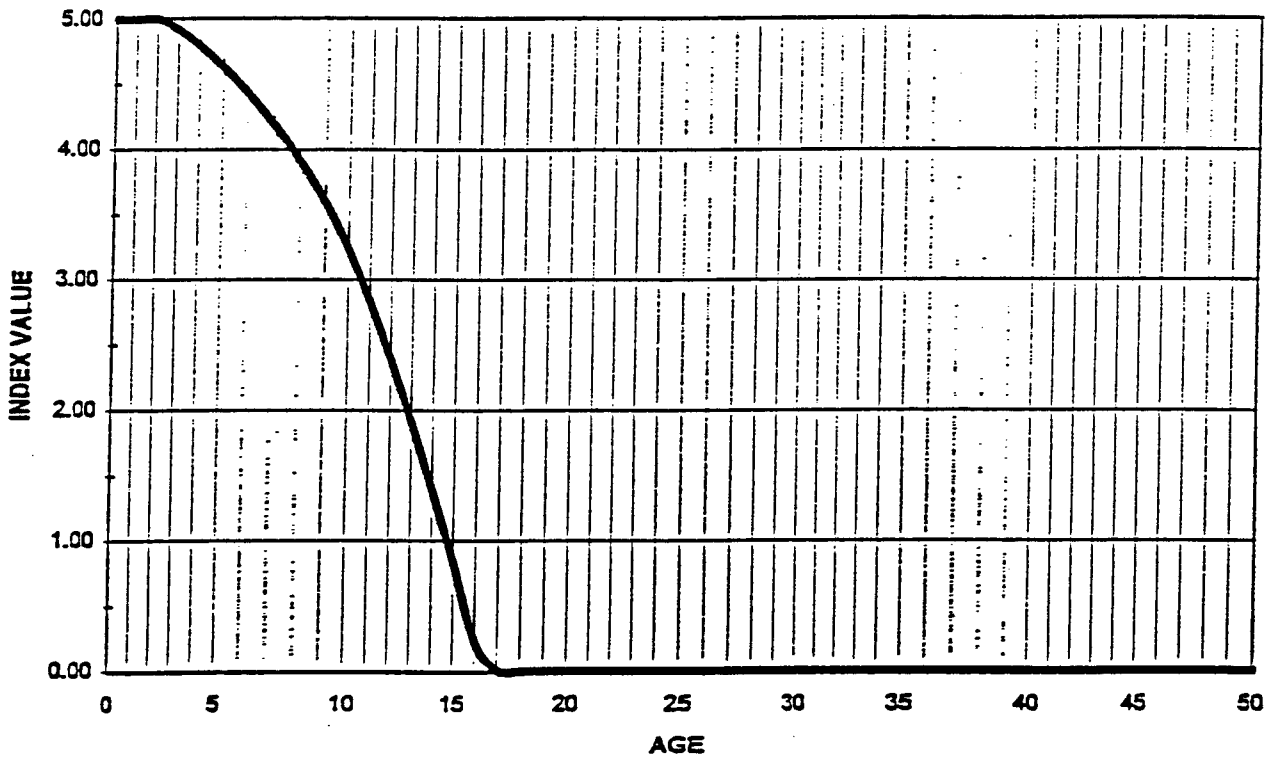
C Value: 5.07
M Value: 0.01654443
B Value: 2.05

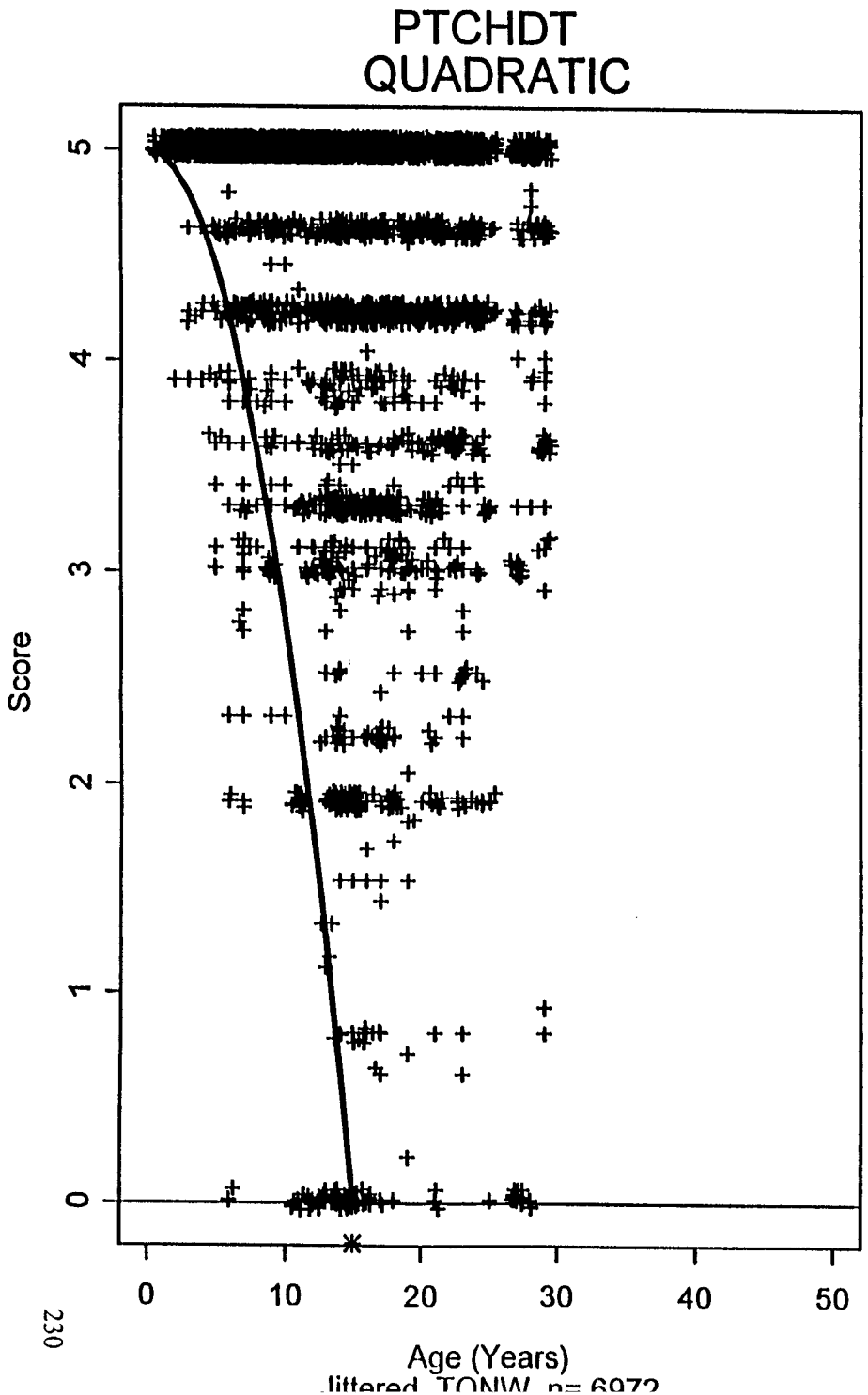
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	4.91	4.79	4.62	4.42	4.18	3.90	3.57	3.21

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.81	2.37	1.89	1.37	0.81	0.20	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:42:18 1998
Family: TONW
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.509	0.13	3.914	0.002

R-Squared = 0.522

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.529	0.163	3.249	0.006

R-Squared = 0.43

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.532	0.184	2.901	0.012

R-Squared = 0.375

ROUGHNESS ON TONW AFTER ASPHALT OVERLAY

NDEX = C - M * AGE ^ B

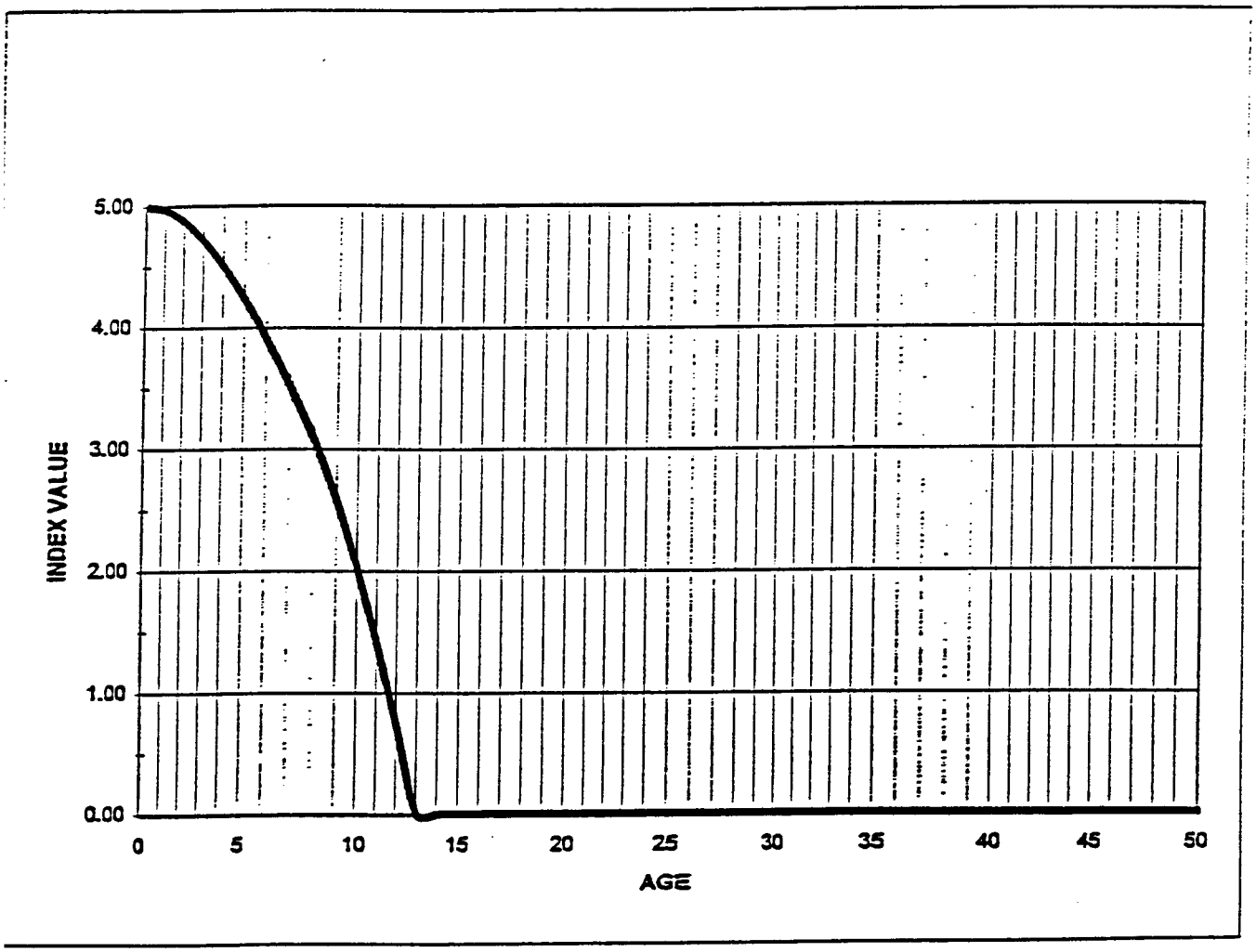
C Value: 5.00
M Value: 0.03362757
B Value: 1.95

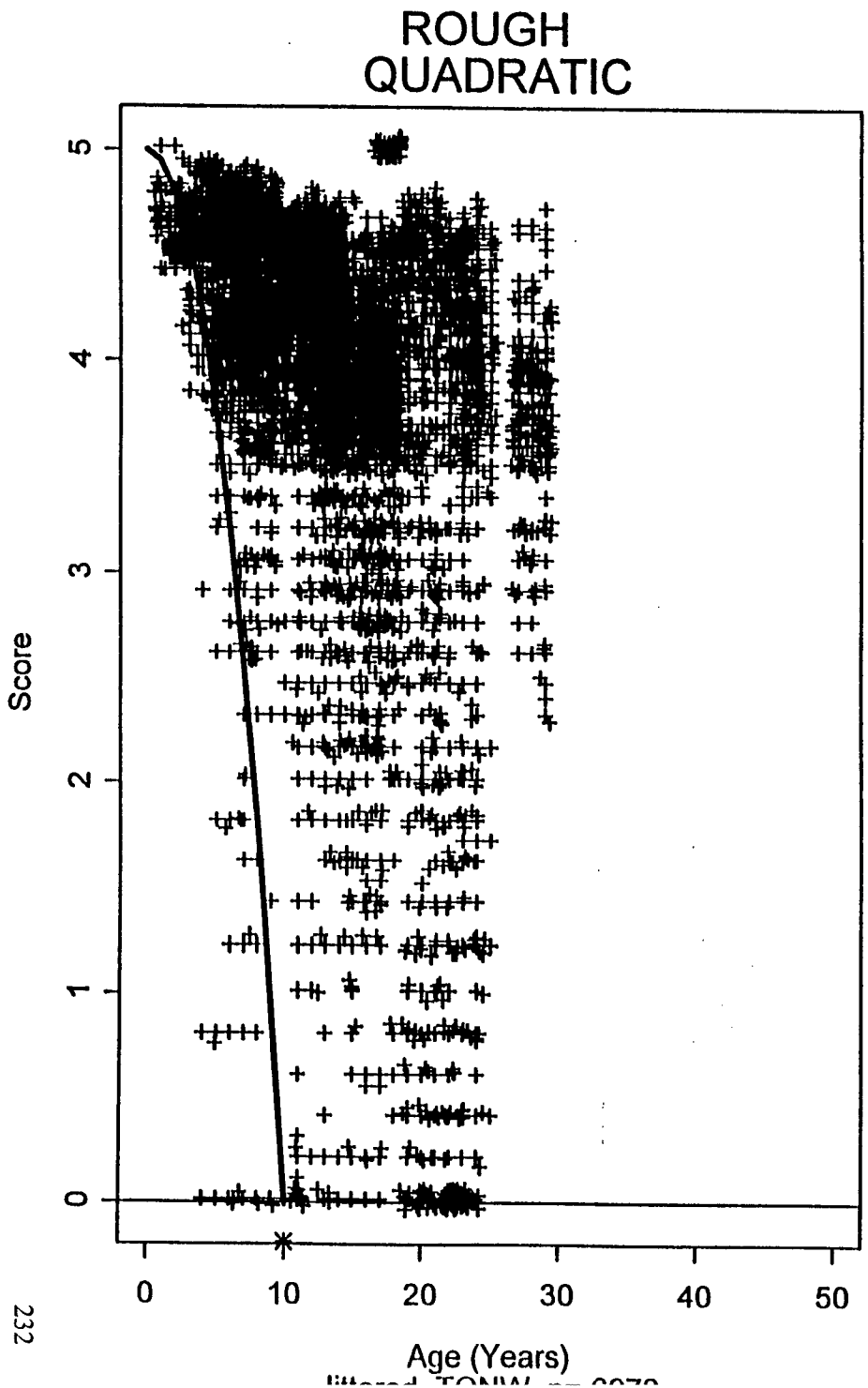
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.97	4.87	4.71	4.50	4.22	3.89	3.51	3.06	2.56	2.00

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.39	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:44:16 1998
Family: TONW
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.571	0.323	1.769	0.111

R-Squared = 0.258

50TH PERCENTILE
Coefficient Estimates:

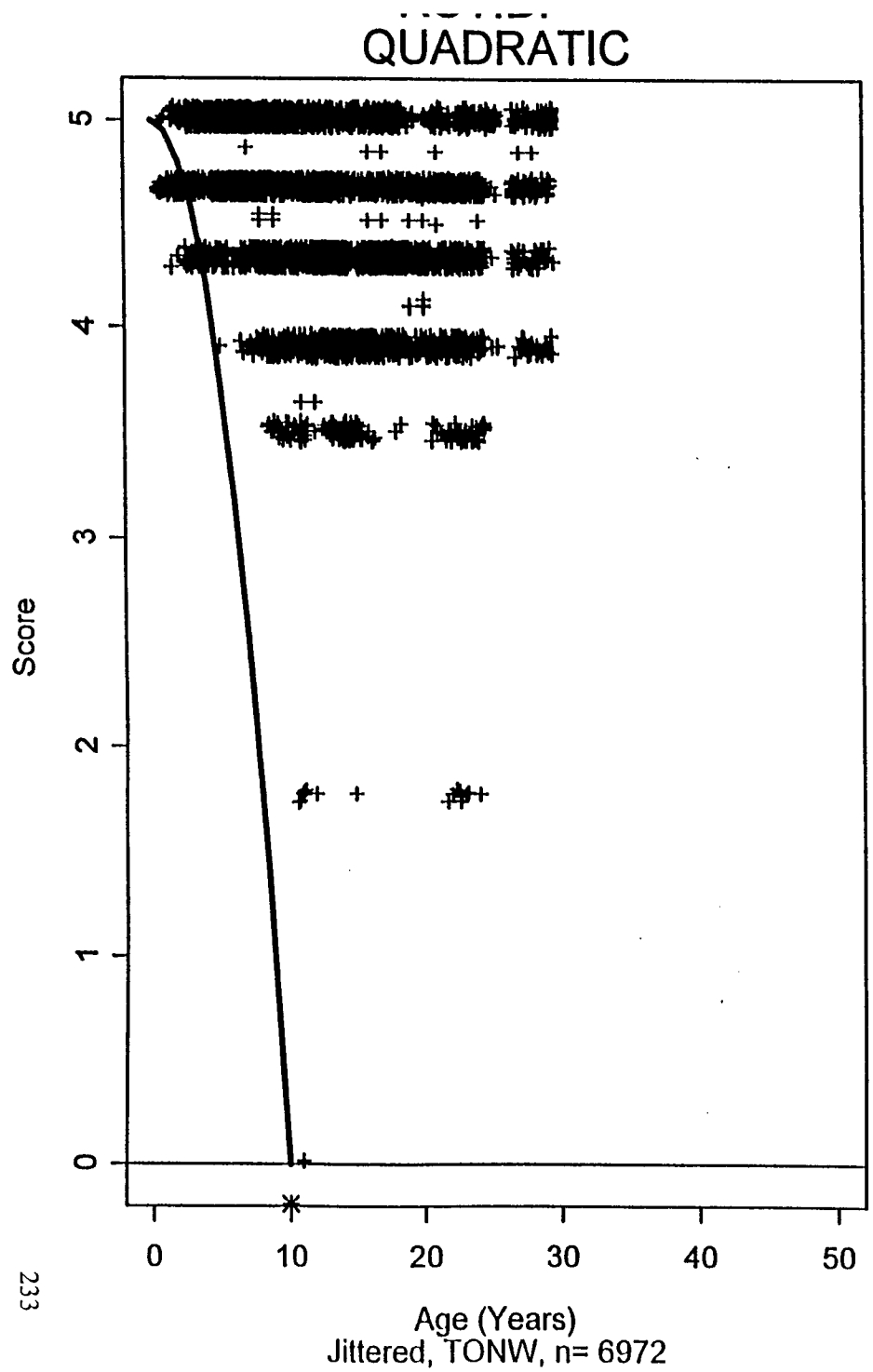
	Value	Std. Error	t value	Pr(>|t|)
1	0.676	0.352	1.921	0.087

R-Squared = 0.291

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.75	0.364	2.064	0.069

R-Squared = 0.321



Date of Analysis: Thu May 7 18:46:29 1998
Family: TONW
Index: RUT.DP
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.723	0.338	2.141	0.061

R-Squared = 0.338

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.873	0.366	2.384	0.041

R-Squared = 0.387

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.917	0.396	2.316	0.046

R-Squared = 0.373

TRANSVERSE CRACKING ON TONW AFTER ASPHALT OVERLAY

INDEX = C - M * AGE ^ B

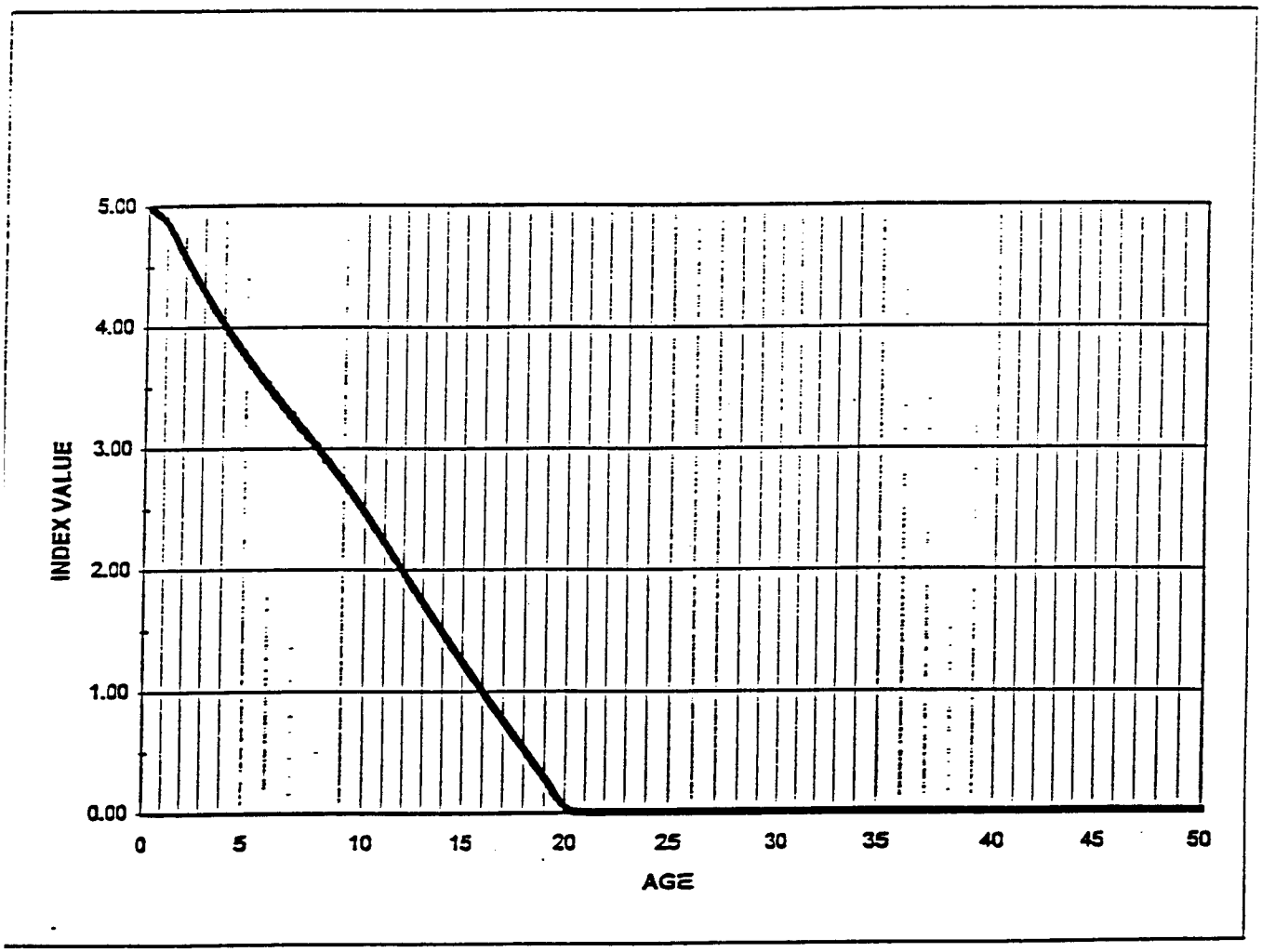
C Value: 5.18
M Value: 0.3271169
B Value: 0.92

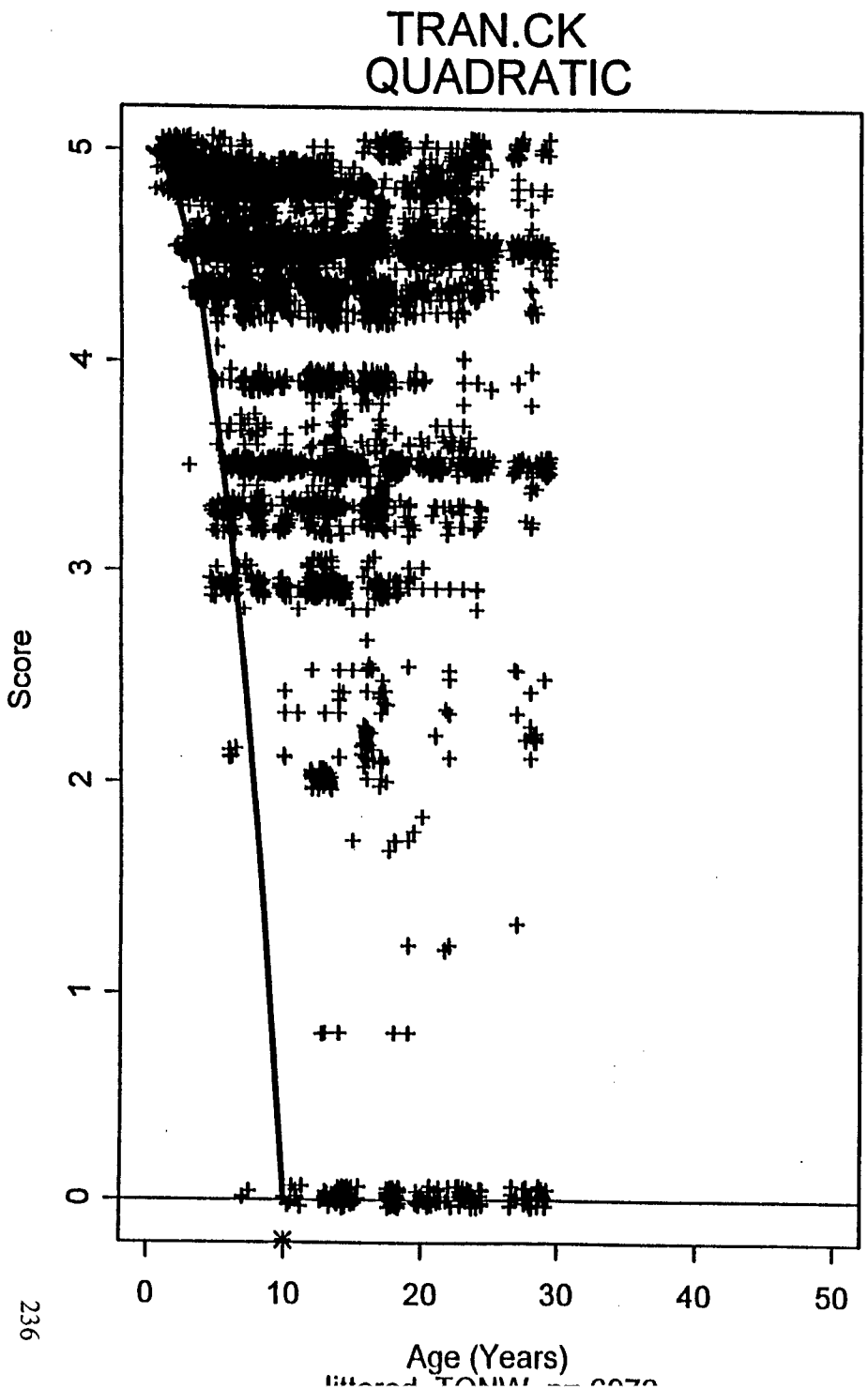
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.85	4.56	4.28	4.01	3.74	3.48	3.22	2.96	2.71	2.46

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.21	1.96	1.72	1.47	1.23	0.99	0.75	0.51	0.27	0.03	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:48:42 1998
Family: TONW
Index: TRAN.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.591	0.301	1.962	0.081

R-Squared = 0.3

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.706	0.356	1.986	0.078

R-Squared = 0.305

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.834	0.377	2.213	0.054

R-Squared = 0.352

APPENDIX E5.3

PERFORMANCE MODELS FOR TONW - M PAVEMENT FAMILY

PAVEMENT FAMILY: TONW – M [Mill & AC OL on Original]

Number of data points available for regression of performance curves : 426

Range of years of data available for the given family : 03 to 08 years

1. Block Cracking [BLK_CK]
   Existing Expert Model ends at @ 15 years
   Historical data forced to end at 15 years has a R^2 value of : 0.848
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.851 ✓

2. Fatigue Cracking [FATG_CK]
   Existing Expert Model ends at @ 11 years
   Historical data forced to end at 11 years has a R^2 value of : 0.428 ✓
   Optimum forced end point is obtained at 11 years with a R^2 value of : 0.428

3. Patch Deterioration [PTCH_DT]
   Existing Expert Model ends at @ 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.835
   Optimum forced end point is obtained at 15 years with a R^2 value of : 0.841 ✓

4. Roughness [ROUGH]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.002
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.480 ✓

5. Rut Depth [RUT_DP]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 11 years with a R^2 value of : 0.357 ✓

6. Transverse Cracking [TRAN_CK]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.254
   Optimum forced end point is obtained at 11 years with a R^2 value of : 0.860 ✓

BLOCK CRACKING ON TONW AFTER MILL & AC OVERLAY

NDEX = C - M * AGE ^ B

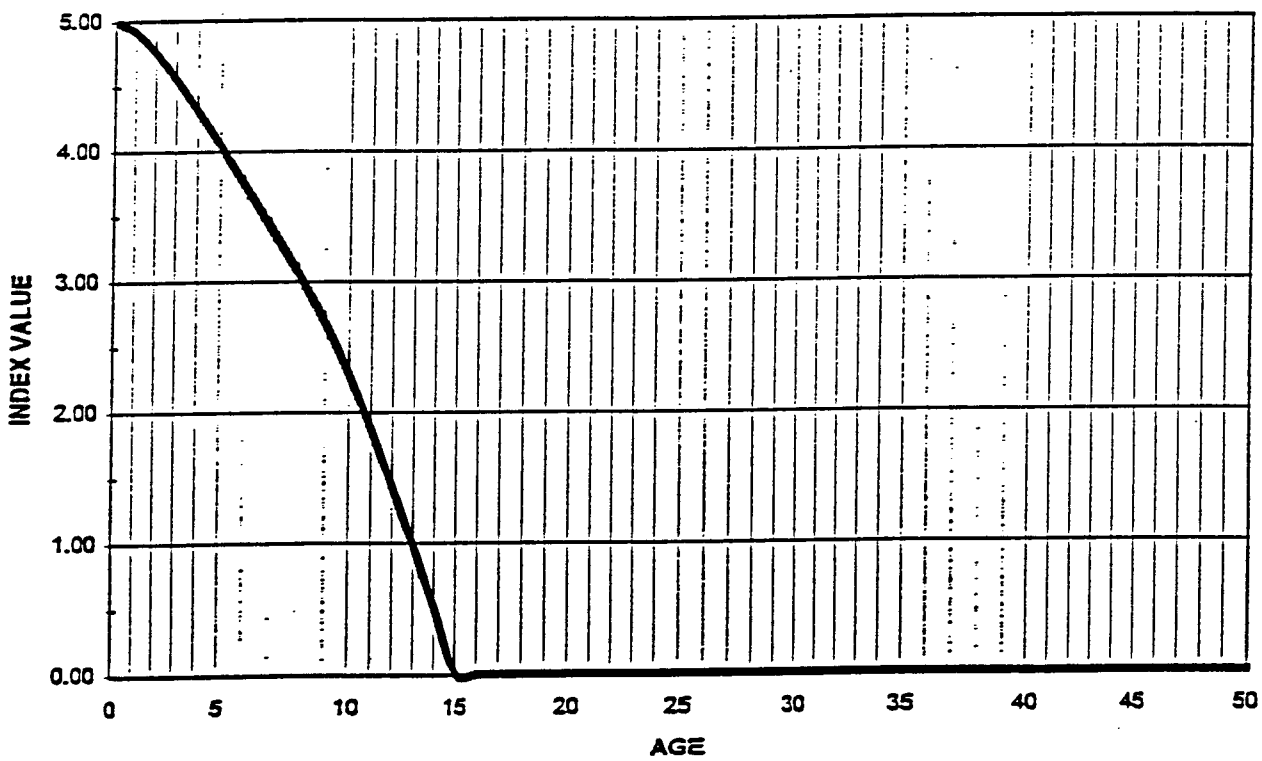
: Value: 5.00
M Value: 0.08842137
B Value: 1.49

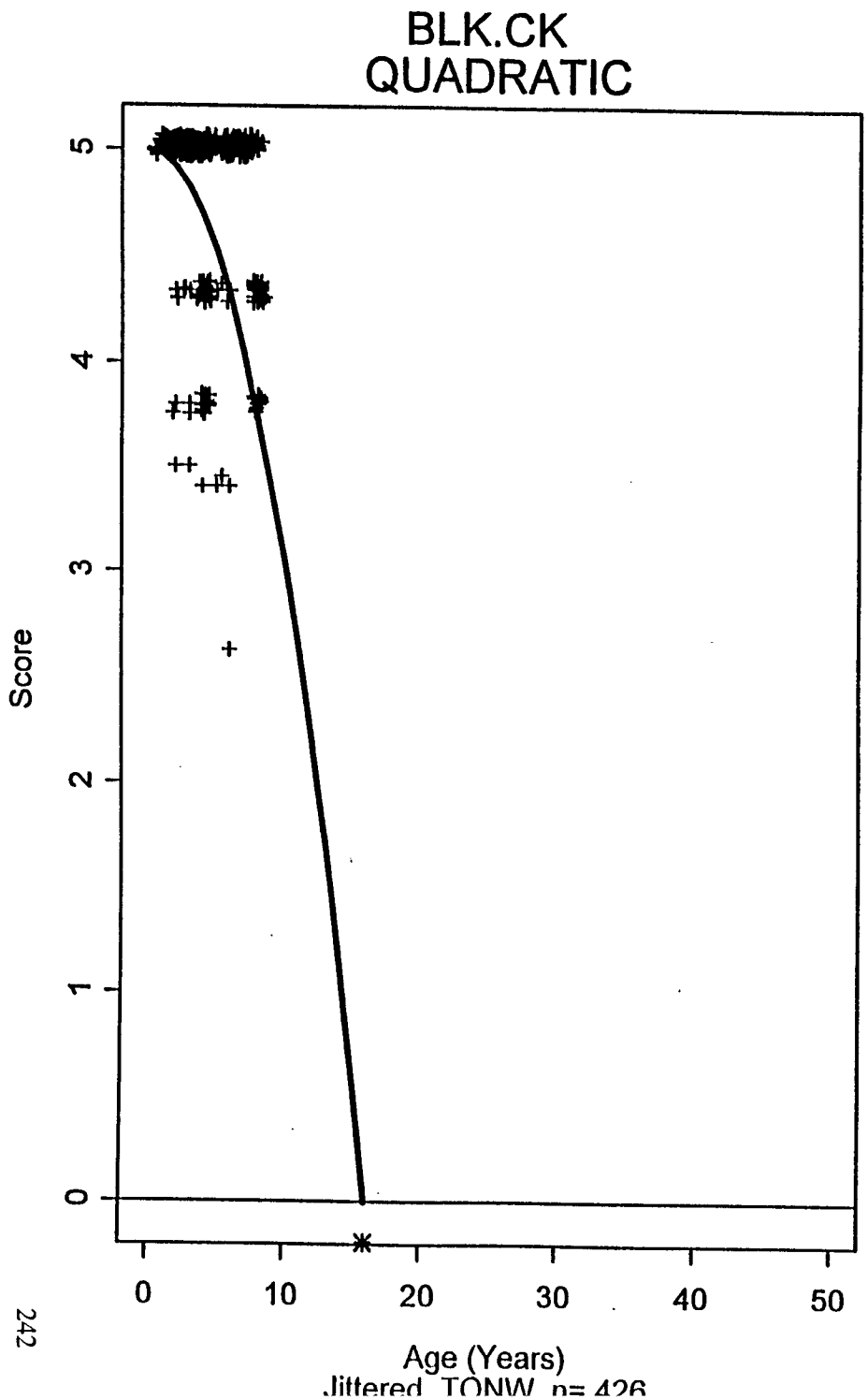
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.91	4.75	4.55	4.30	4.03	3.72	3.39	3.04	2.66	2.27

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.85	1.41	0.96	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:29:48 1998
Family: TONW
Index: BLK.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.1	0.048	2.073	0.077

R-Squared = 0.38

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.148	0.023	6.314	0

R-Squared = 0.851

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.175	0.029	5.937	0.001

R-Squared = 0.834

FATIGUE CRACKING ON TONW AFTER MILL & AC OVERLAY

NDEX = C - M * AGE ^ B

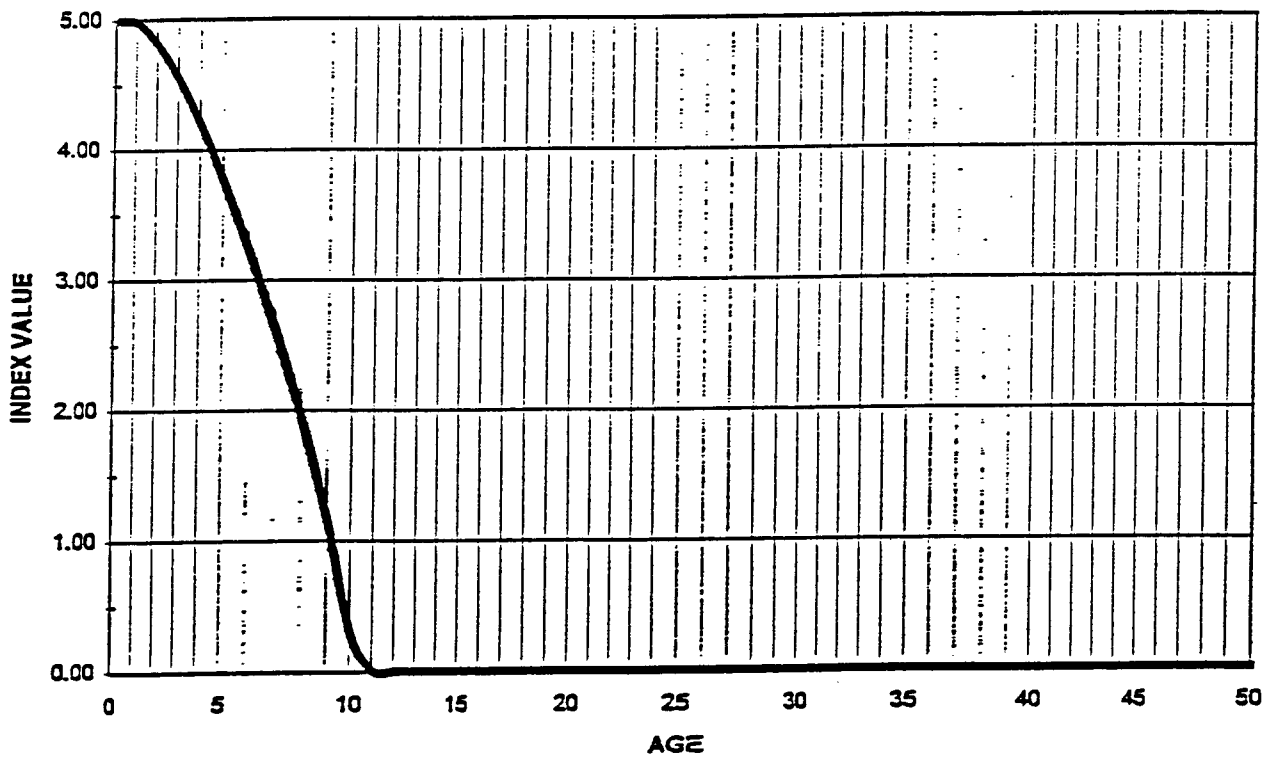
C Value: 5.04
M Value: 0.06272168
B Value: 1.88

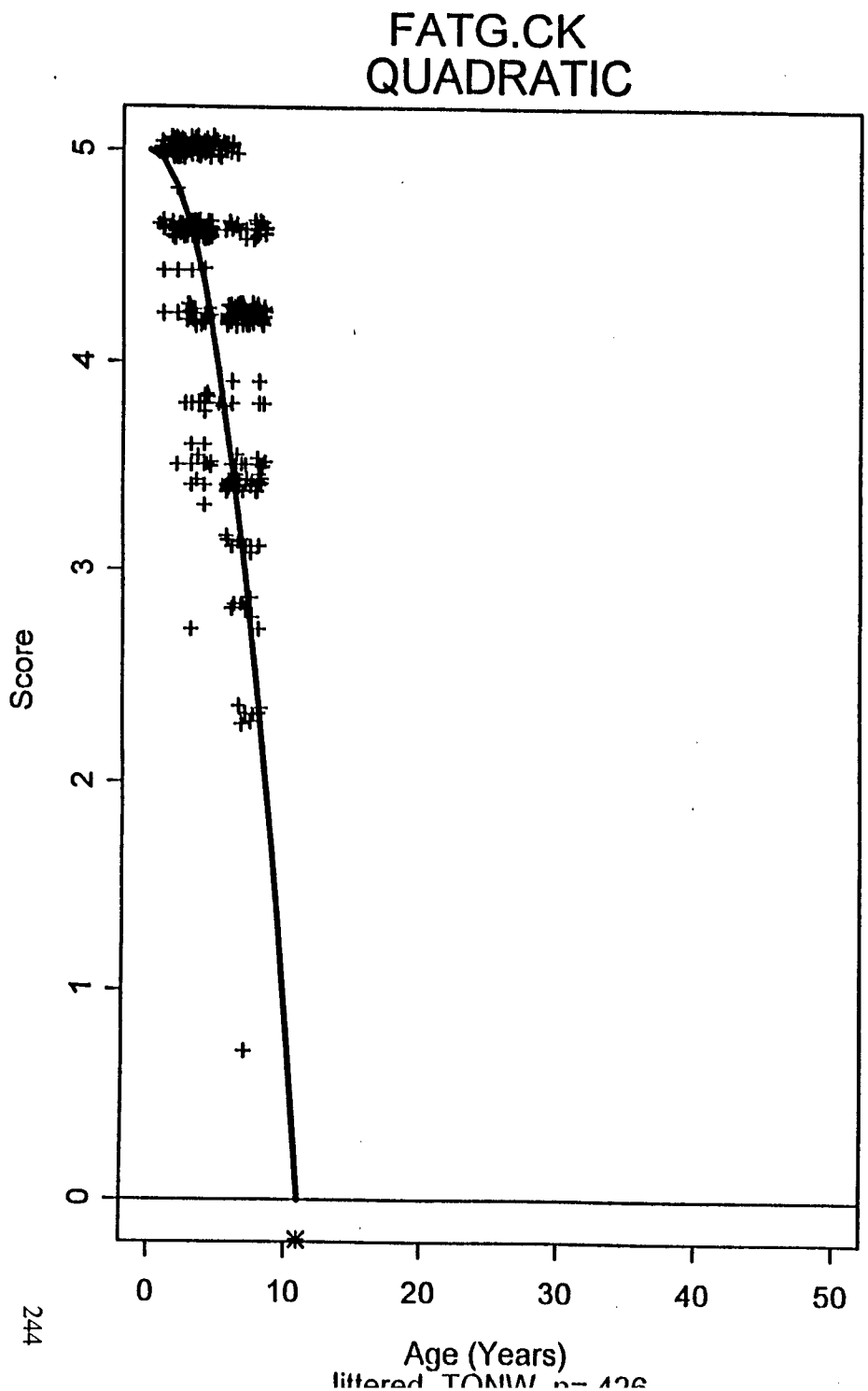
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.98	4.81	4.55	4.19	3.75	3.22	2.61	1.91	1.14	0.28

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:30:48 1998
Family: TONW
Index: FATG.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 11

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.039	0.072	0.548	0.601

R-Squared = 0.041

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.211	0.092	2.29	0.056

R-Squared = 0.428

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.257	0.097	2.638	0.034

R-Squared = 0.498

PATCH DETERIORATION ON TONW AFTER MILL & AC OVERLAY

NDEX = C - M * AGE ^ B

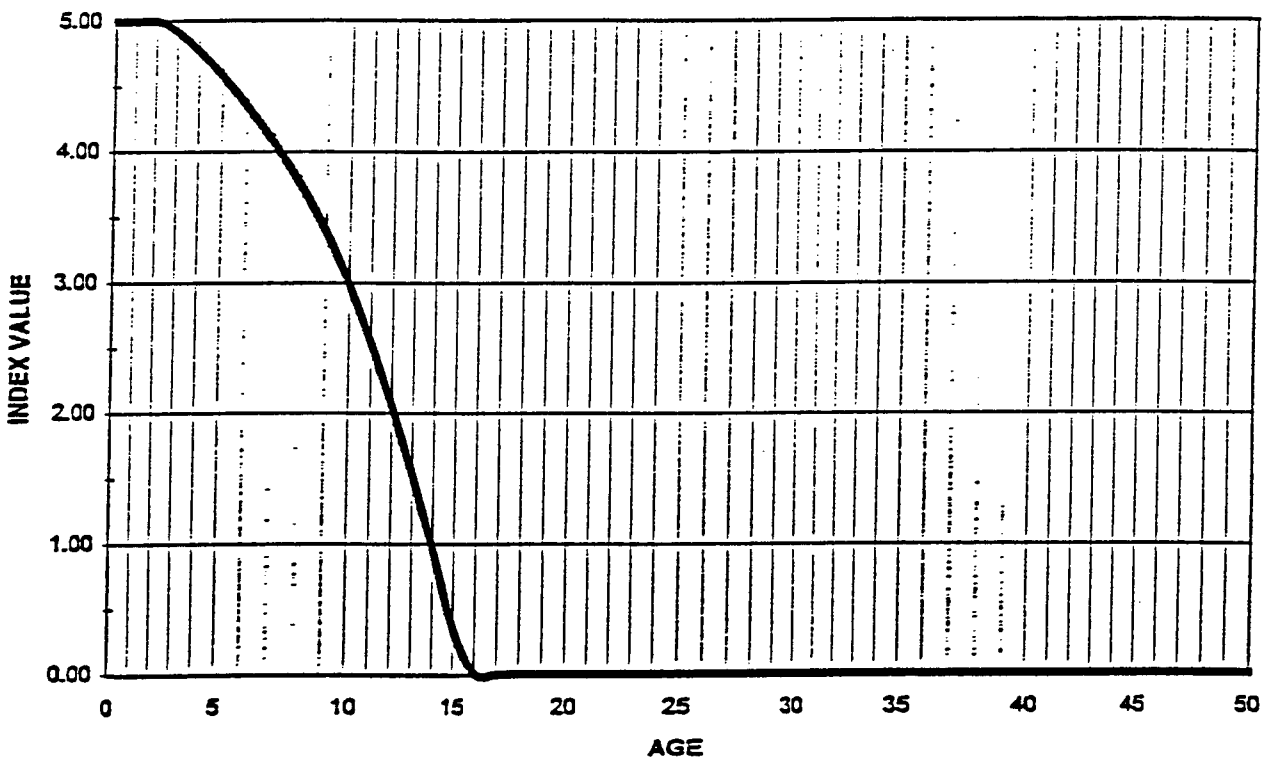
C Value: 5.11
M Value: 0.02243757
B Value: 1.98

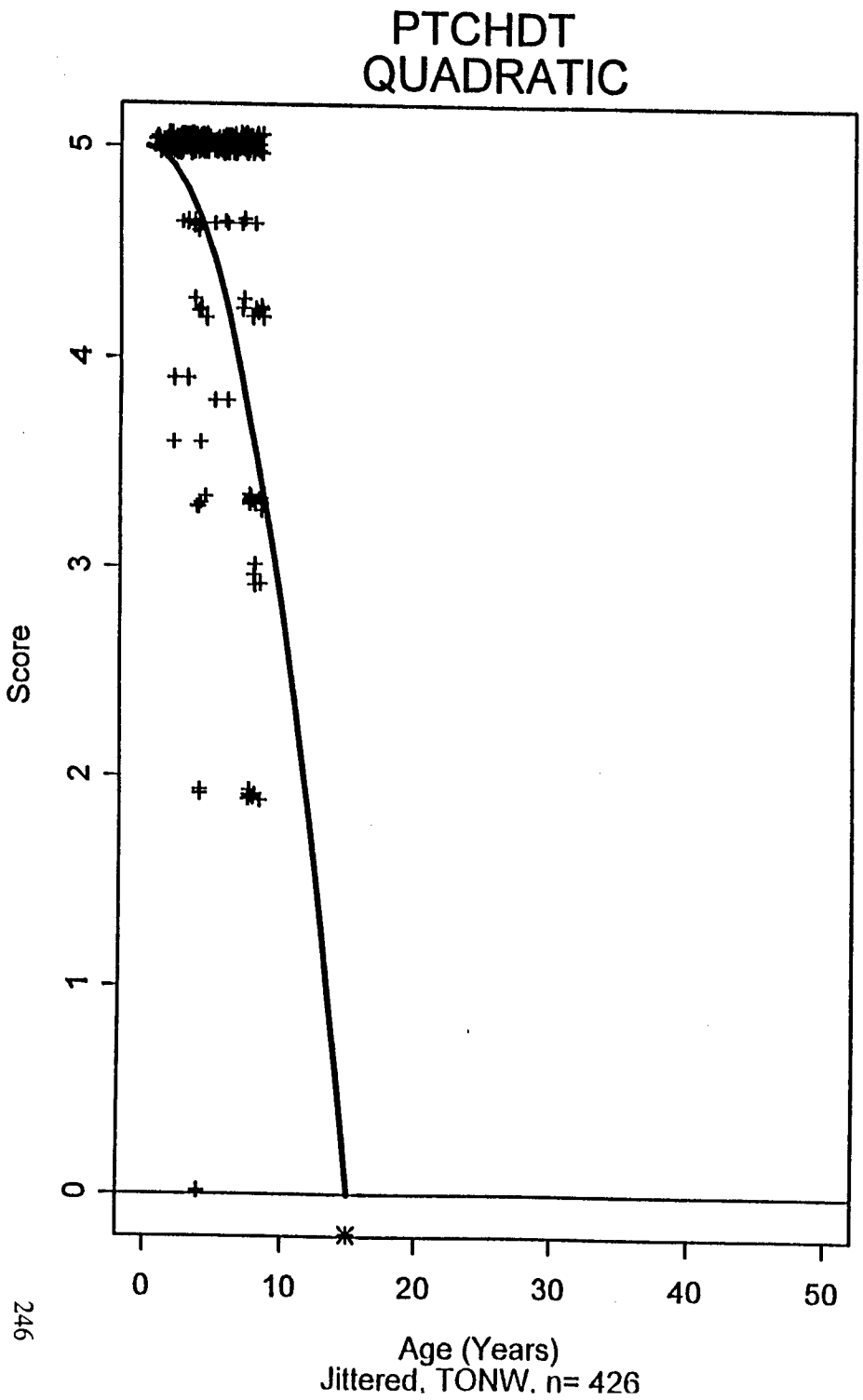
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	4.91	4.76	4.57	4.33	4.05	3.73	3.37	2.97

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.52	2.04	1.51	0.94	0.33	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:32:07 1998
Family: TONW
Index: PTCHDT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.129	0.047	2.75	0.028

R-Squared = 0.519

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.174	0.029	6.088	0

R-Squared = 0.841

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.215	0.042	5.157	0.001

R-Squared = 0.792

ROUGHNESS ON TONW AFTER MILL & AC OVERLAY

IDEX = C - M * AGE ^ B

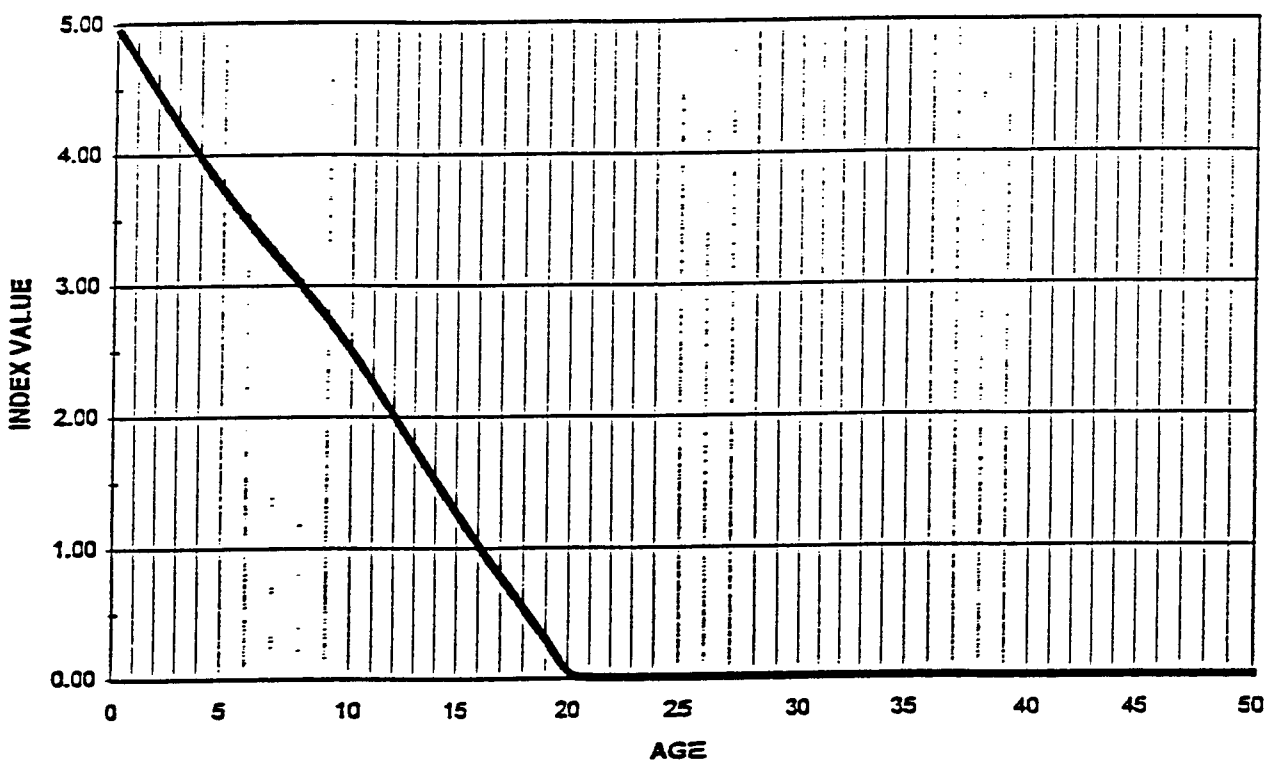
; Value: 4.97
1 Value: 0.2542087
I Value: 0.99

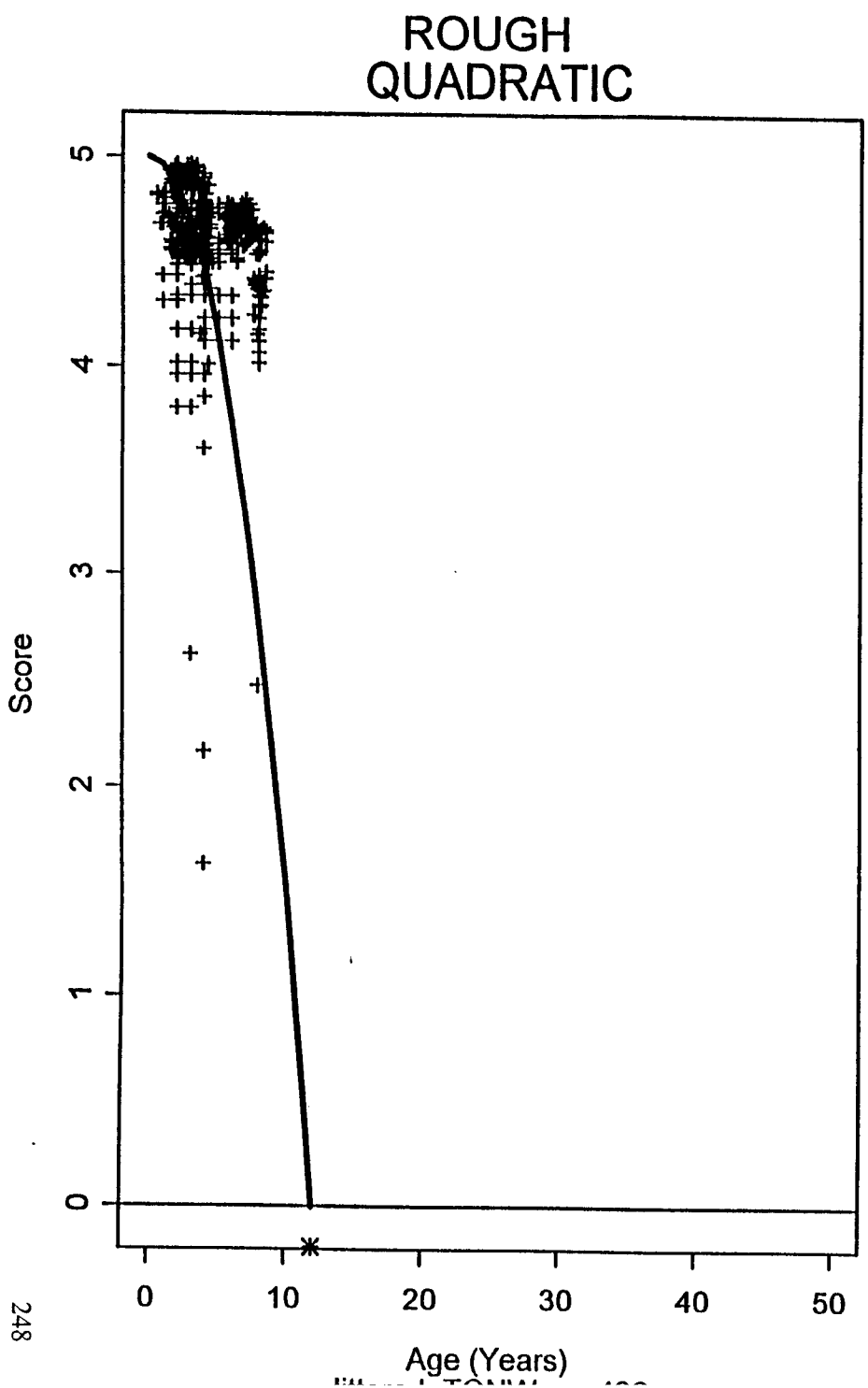
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.97	4.72	4.47	4.22	3.97	3.72	3.47	3.22	2.98	2.73	2.49

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.24	1.99	1.75	1.50	1.26	1.01	0.77	0.52	0.28	0.04	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:33:16 1998
Family: TONW
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.19	0.094	2.033	0.082

R-Squared = 0.371

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.224	0.088	2.544	0.038

R-Squared = 0.48

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.272	0.085	3.214	0.015

R-Squared = 0.596

TRANSVERSE CRACKING ON TONW AFTER MILL & AC OVERLAY

IDEX = C - M * AGE ^ B

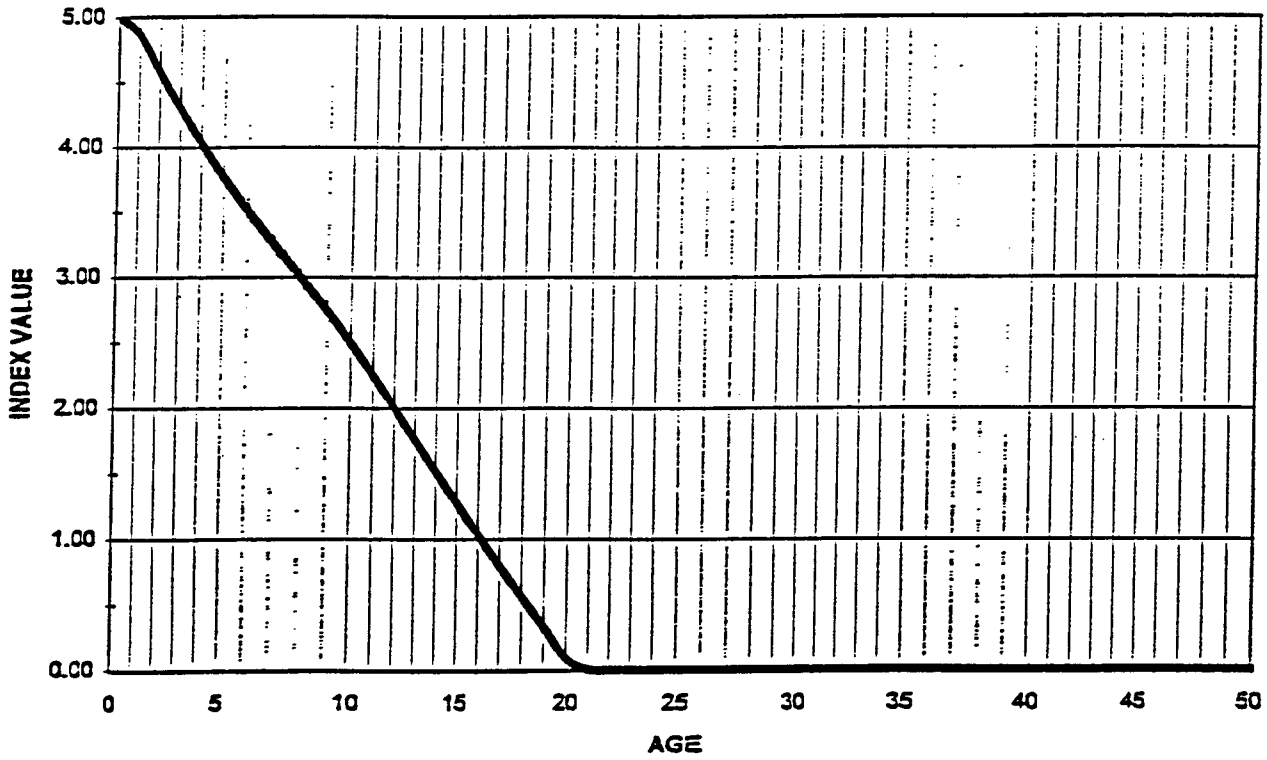
; Value: 5.18
I Value: 0.3242774
: Value: 0.92

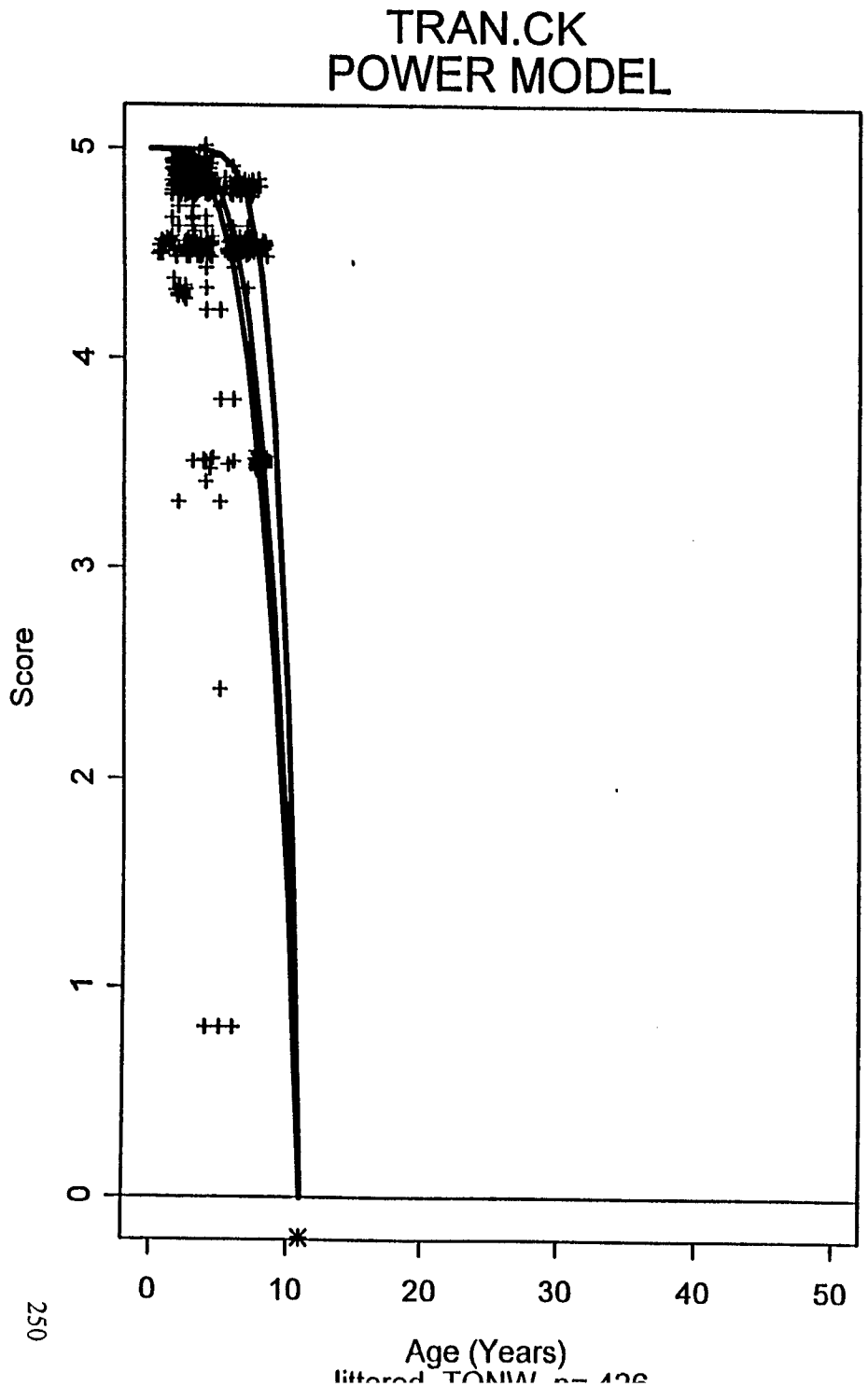
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.86	4.57	4.29	4.02	3.75	3.49	3.24	2.98	2.73	2.48

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.24	1.99	1.75	1.50	1.26	1.02	0.79	0.55	0.31	0.08	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 11:46:28 1998
Family: TONW
Index: TRAN.CK
Year(s): ALL
Model Type: POWER MODEL
Analysis Method: GQ
Forced Endpoint: 11

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	3.521	0.641	5.497

R-Squared = 0.628

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	4.079	0.391	10.425

R-Squared = 0.86

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	6.716	1.166	5.759

R-Squared = 0.426

APPENDIX F

PERFORMANCE MODELS FOR RIGID PAVEMENT FAMILIES

APPENDIX F1

PERFORMANCE MODELS FOR CRCP PAVEMENT FAMILY

APPENDIX F1.1

PERFORMANCE MODELS FOR CRCP - O PAVEMENT FAMILY

PAVEMENT FAMILY: CRCP – Original

Number of data points available for regression of performance curves : 3732

Range of years of data available for the given family : 22 to 34 years

1. Corner Cracking [CRNR_CK]
   Existing Expert Model ends at @ 49 years
   Historical data forced to end at 49 years has a R^2 value of : 0.998 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

2. D-Cracking/ASR [DASR]
   Existing Expert Model ends at @ 29 years
   Historical data forced to end at 29 years has a R^2 value of : 0.371
   Optimum forced end point is obtained at 34 years with a R^2 value of : 0.589

3. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 53 years with a R^2 value of : 0.998

4. Joint Spalling [JNT_SPL]
   Existing Expert Model ends at @ 57 years
   Historical data forced to end at 57 years has a R^2 value of : 0.931
   Optimum forced end point is obtained at 47 years with a R^2 value of : 0.961

5. Punchouts [PUNCH]
   Existing Expert Model ends at @ 55 years
   Historical data forced to end at 55 years has a R^2 value of : 0.973 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

6. Roughness [ROUGH]
   Existing Expert Model ends at @ 47 years
   Historical data forced to end at 47 years has a R^2 value of : 0.947
   Optimum forced end point is obtained at 51 years with a R^2 value of : 0.949

CORNER CRACKING ON CRCP

'NDEX = C - M * AGE ^ B

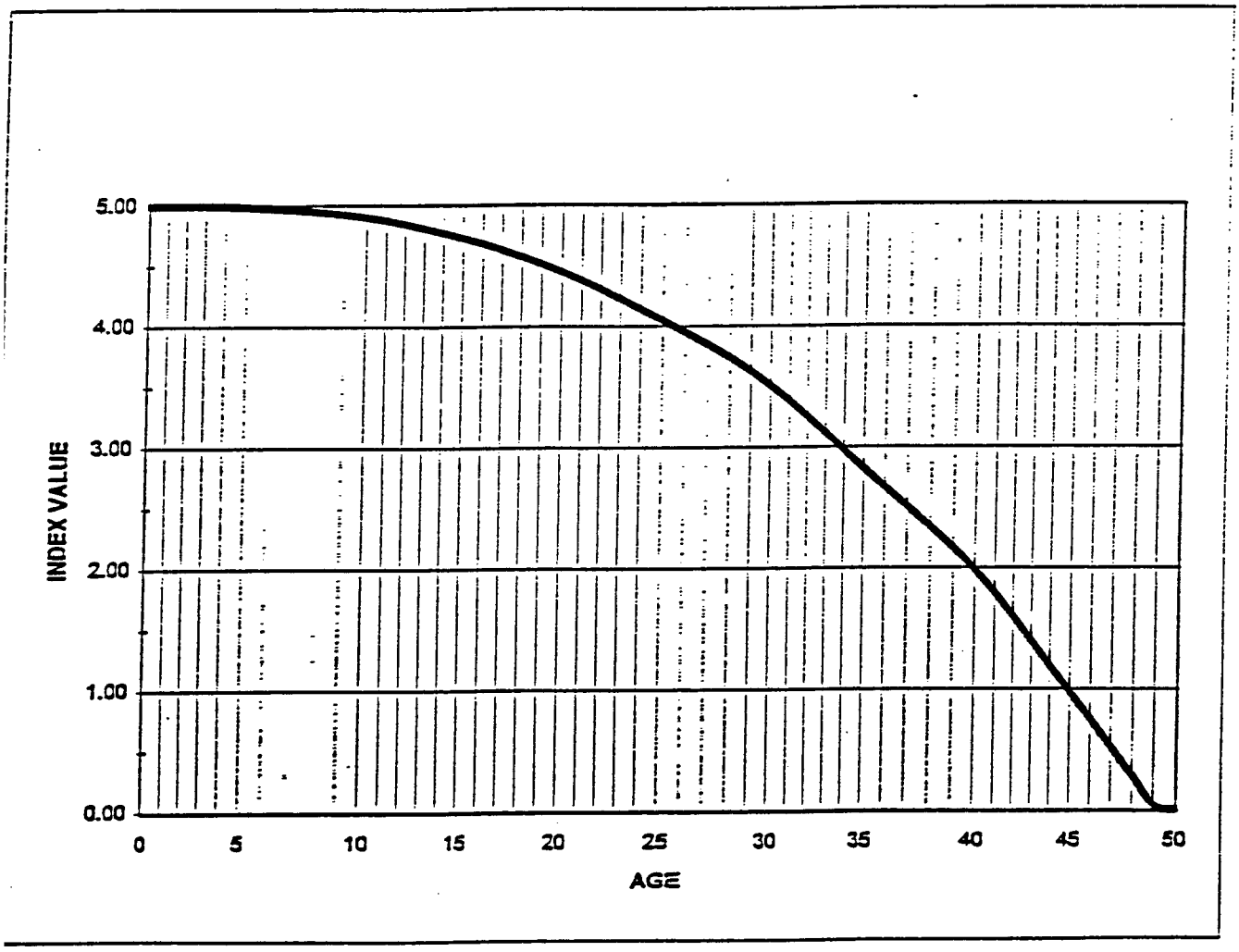
C Value: 5.01
M Value: 0.0003891
B Value: 2.43

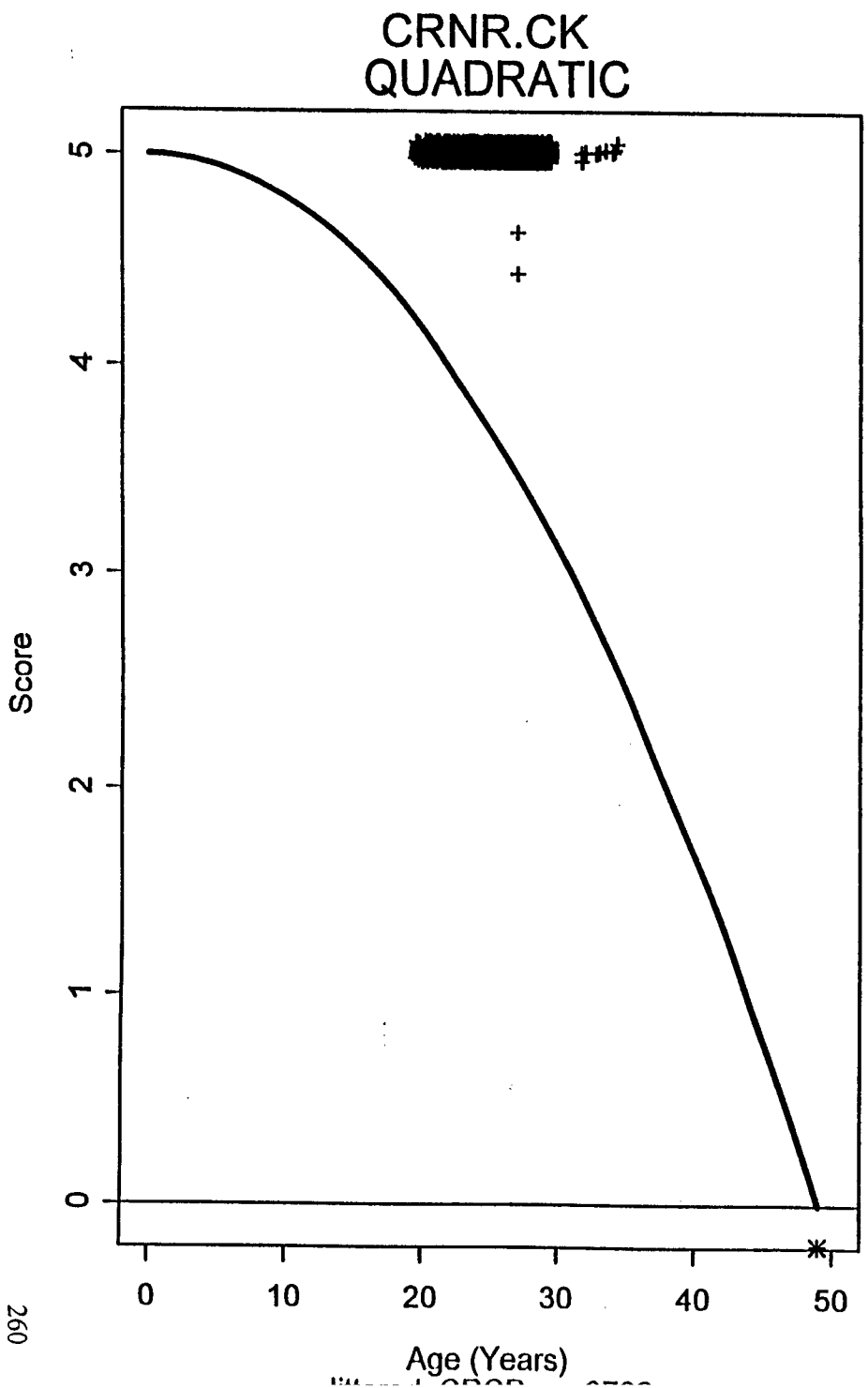
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	5.00	4.99	4.98	4.97	4.95	4.93	4.91

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.88	4.85	4.81	4.77	4.73	4.68	4.63	4.57	4.51	4.45	4.37

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.30	4.22	4.13	4.04	3.94	3.84	3.73	3.62	3.50	3.37	3.24

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	3.10	2.96	2.81	2.66	2.49	2.33	2.15	1.97	1.78	1.59	1.38





Date of Analysis: Thu May 7 19:02:19 1998
Family: CRCP
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 49

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.113	0.006	18.632	0

R-Squared = 0.967

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.113	0.006	18.632	0

R-Squared = 0.967

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.113	0.006	18.632	0

R-Squared = 0.967

D-CRACKING / ASR ON CRCP

IDEX = C - M * AGE ^ B

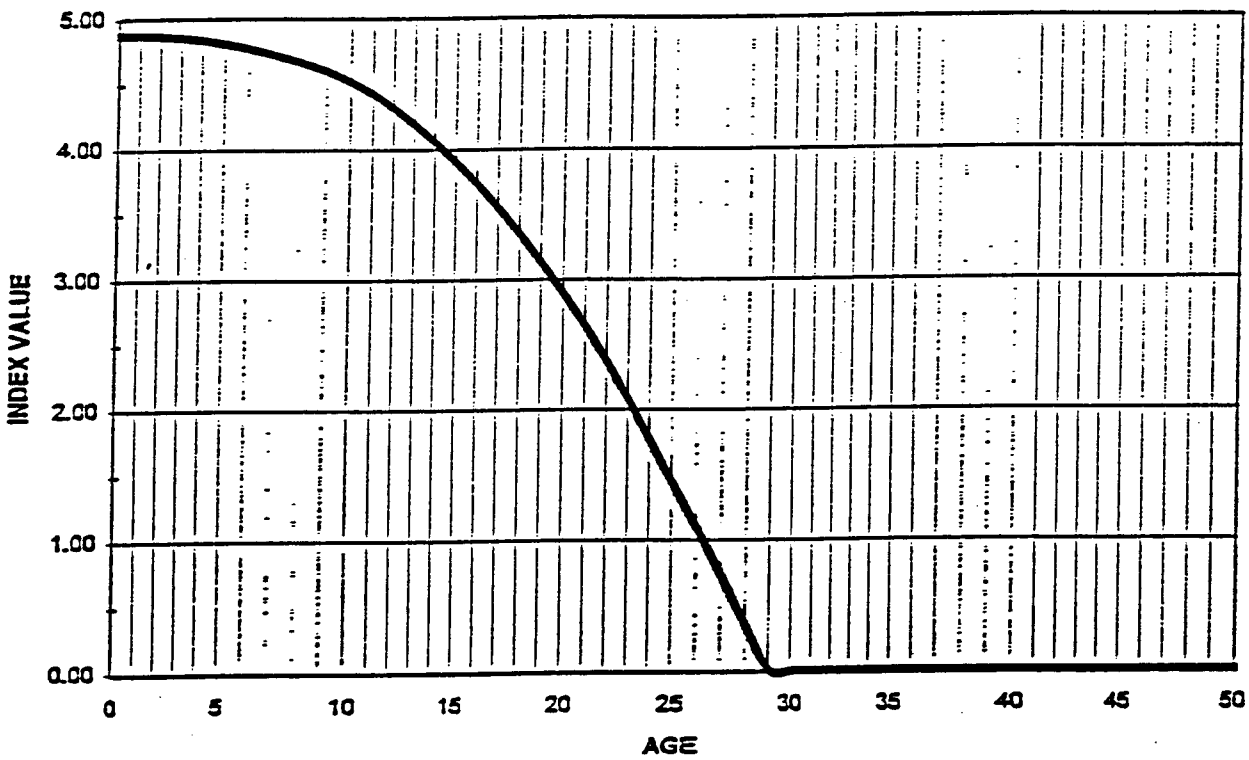
; Value: 4.88
I Value: 0.001297
I Value: 2.45

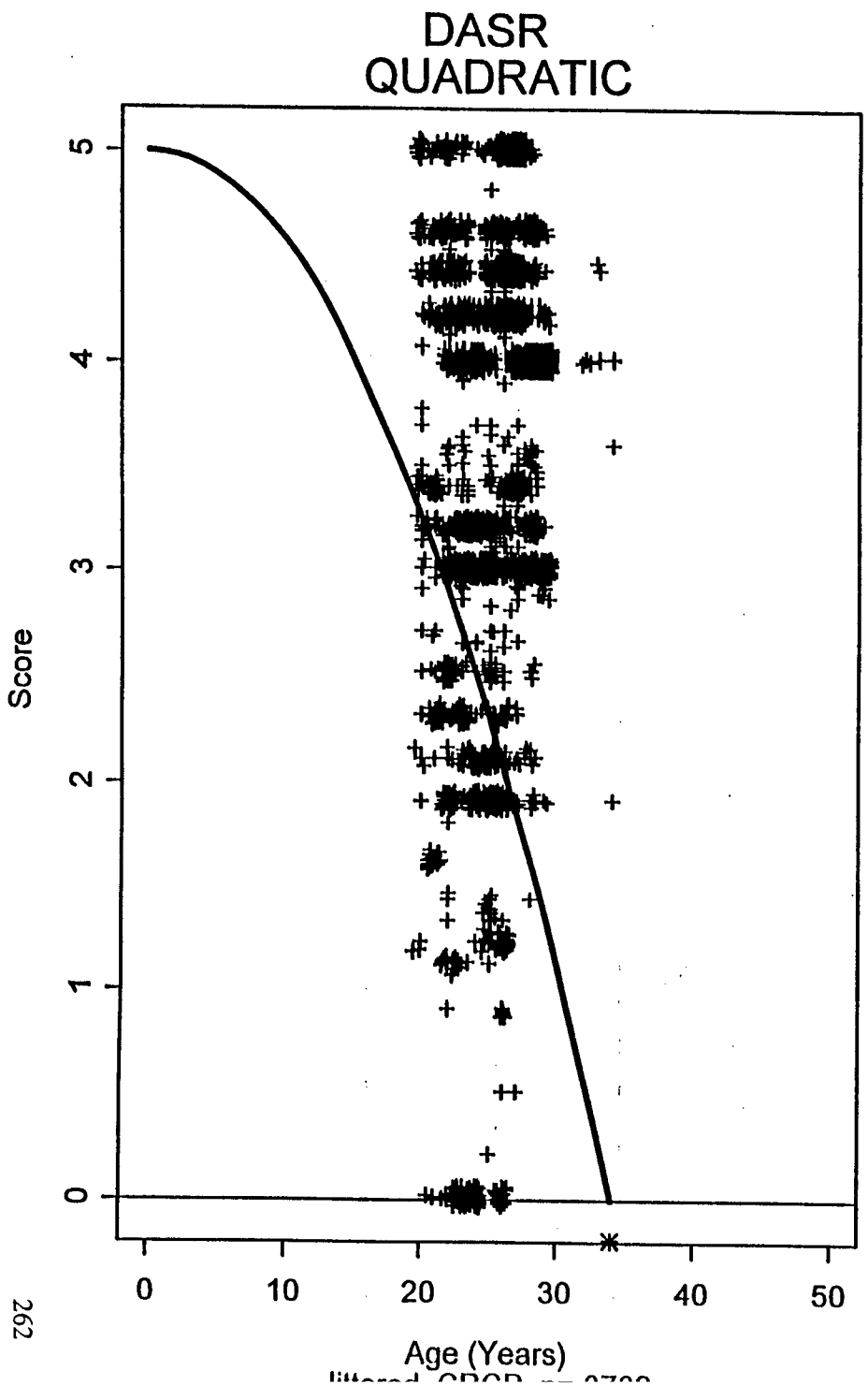
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.88	4.88	4.87	4.86	4.84	4.81	4.78	4.73	4.67	4.60	4.51

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.42	4.31	4.18	4.05	3.89	3.72	3.54	3.34	3.12	2.88	2.63

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	2.36	2.07	1.76	1.43	1.08	0.71	0.33	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 18:59:57 1998
Family: CRCP
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 34

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.12	0.056	2.157	0.052

R-Squared = 0.279

50TH PERCENTILE
Coefficient Estimates:

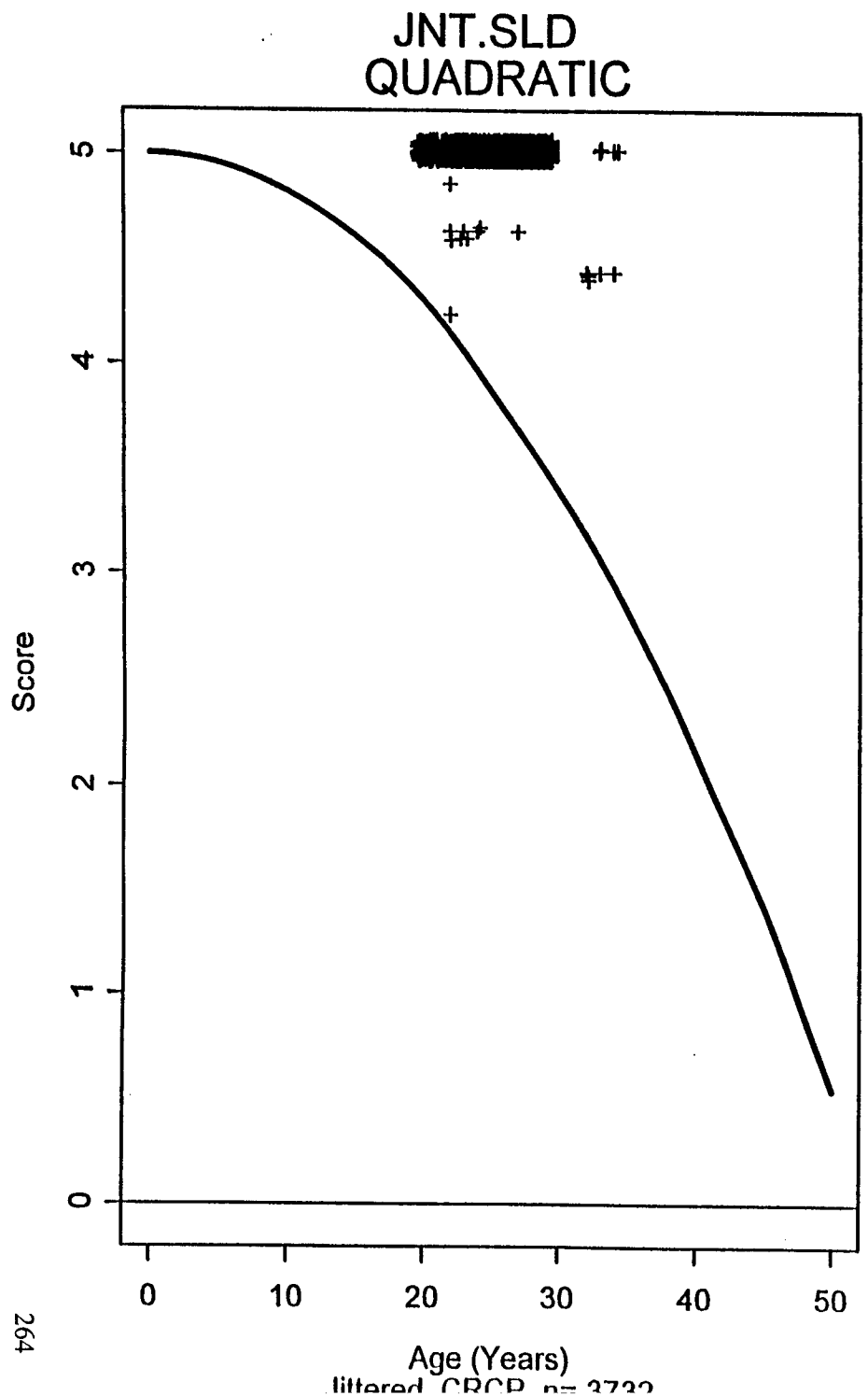
	Value	Std. Error	t value	Pr(>|t|)
1	0.221	0.053	4.142	0.001

R-Squared = 0.588

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.328	0.046	7.055	0

R-Squared = 0.806



Date of Analysis: Thu May 7 19:04:54 1998
Family: CRCP
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 53

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.089	0.004	20.509	0

R-Squared = 0.972

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.089	0.004	20.33	0

R-Squared = 0.972

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.089	0.004	20.33	0

R-Squared = 0.972

JOINT SPALLING ON CRCP

NDEX = C - M * AGE ^ B

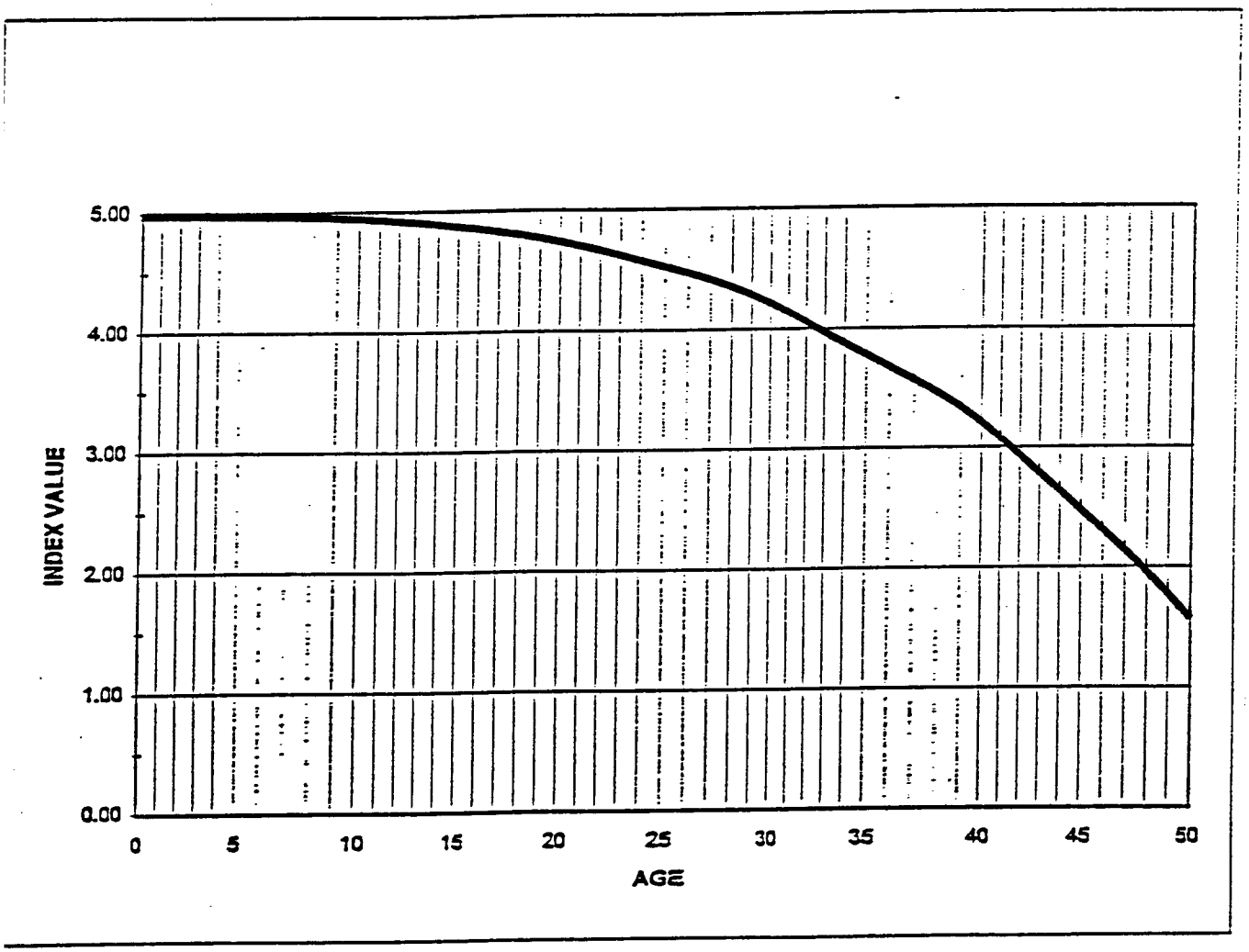
C Value: 4.98
M Value: 0.00003889
B Value: 2.91

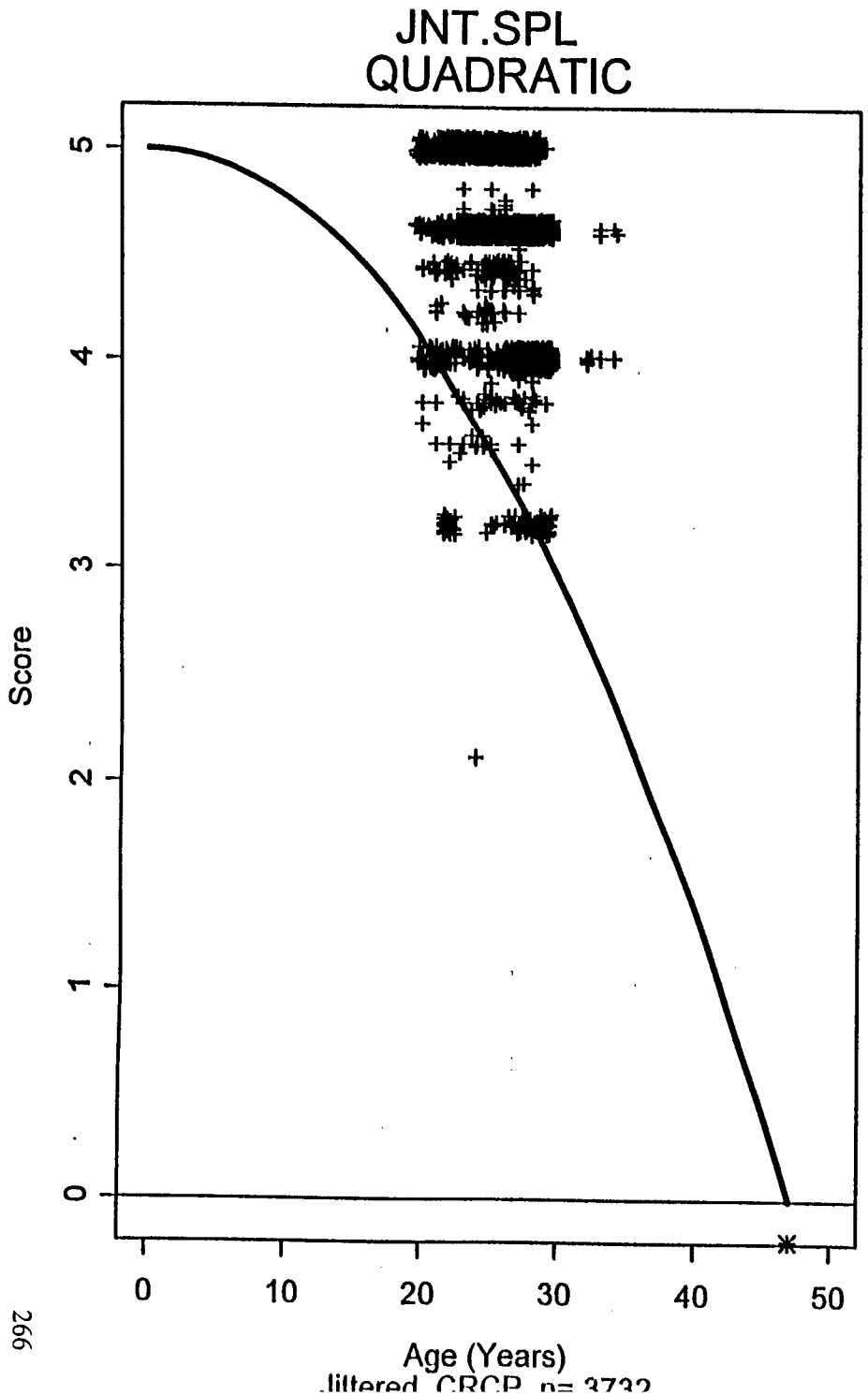
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.98	4.98	4.98	4.98	4.98	4.98	4.97	4.97	4.96	4.96	4.95

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.94	4.93	4.91	4.90	4.88	4.86	4.83	4.81	4.78	4.74	4.71

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.67	4.62	4.58	4.53	4.47	4.41	4.35	4.28	4.21	4.13	4.05

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	3.96	3.87	3.77	3.67	3.56	3.44	3.32	3.19	3.06	2.92	2.78





Date of Analysis: Thu May 7 19:01:12 1998
Family: CRCP
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 47

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.081	0.007	11.924	0

R-Squared = 0.922

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.093	0.005	17.184	0

R-Squared = 0.961

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.114	0.004	27.456	0

R-Squared = 0.984

PUNCHOUTS ON CRCP

INDEX = C - M * AGE ^ B

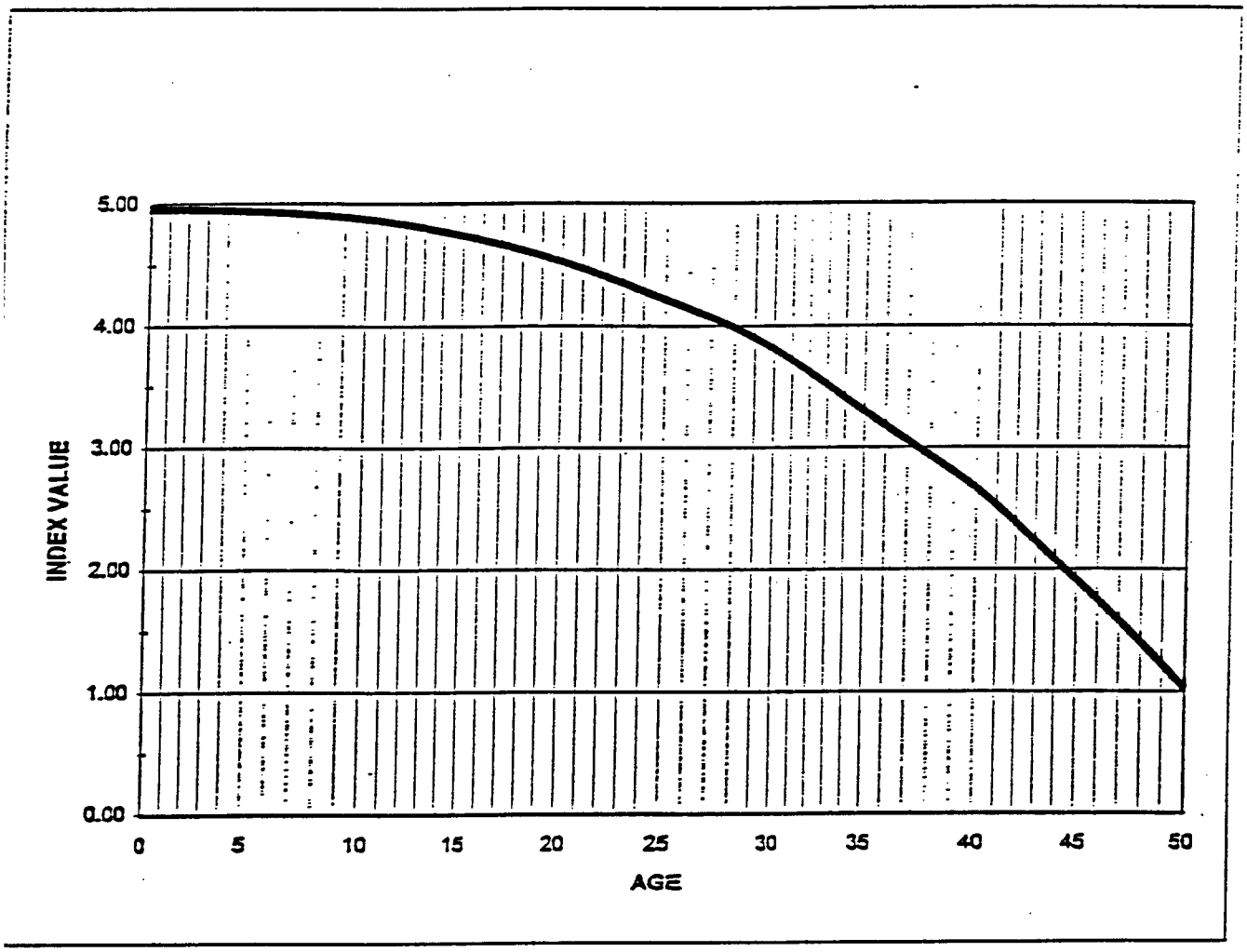
C Value: 4.96
M Value: 0.0003422
B Value: 2.39

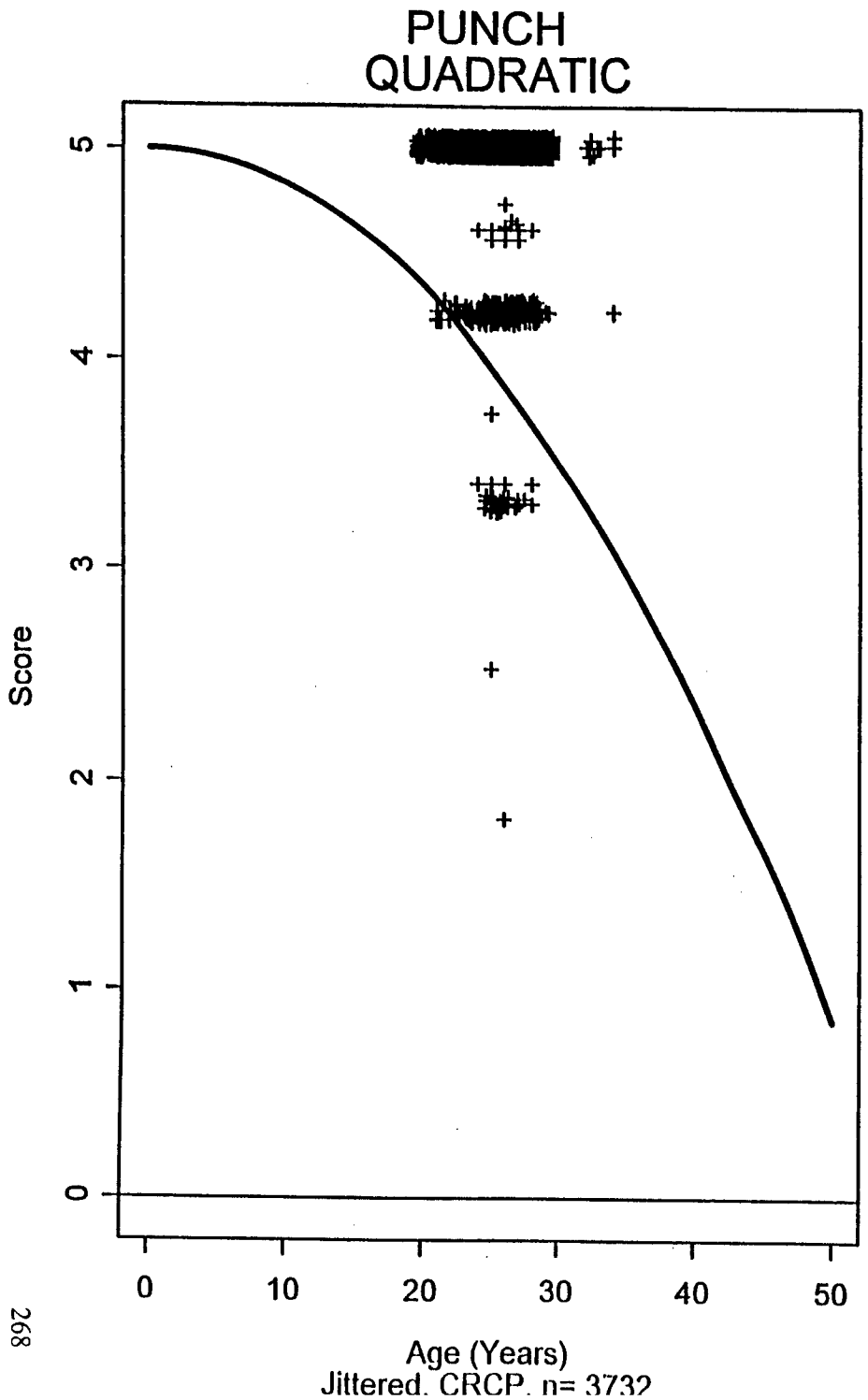
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.96	4.96	4.96	4.96	4.95	4.94	4.94	4.92	4.91	4.89	4.88

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.85	4.83	4.80	4.77	4.74	4.70	4.66	4.62	4.57	4.52	4.47

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.41	4.35	4.28	4.21	4.14	4.06	3.98	3.89	3.80	3.71	3.61

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	3.50	3.39	3.28	3.17	3.04	2.92	2.79	2.65	2.51	2.37	2.22





Date of Analysis: Thu May 7 19:05:56 1998
Family: CRCP
Index: PUNCH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 55

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.08	0.004	21.095	0

R-Squared = 0.974

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.08	0.004	20.961	0

R-Squared = 0.973

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.08	0.004	20.961	0

R-Squared = 0.973

ROUGHNESS ON CRCP

NDEX = C - M * AGE ^ B

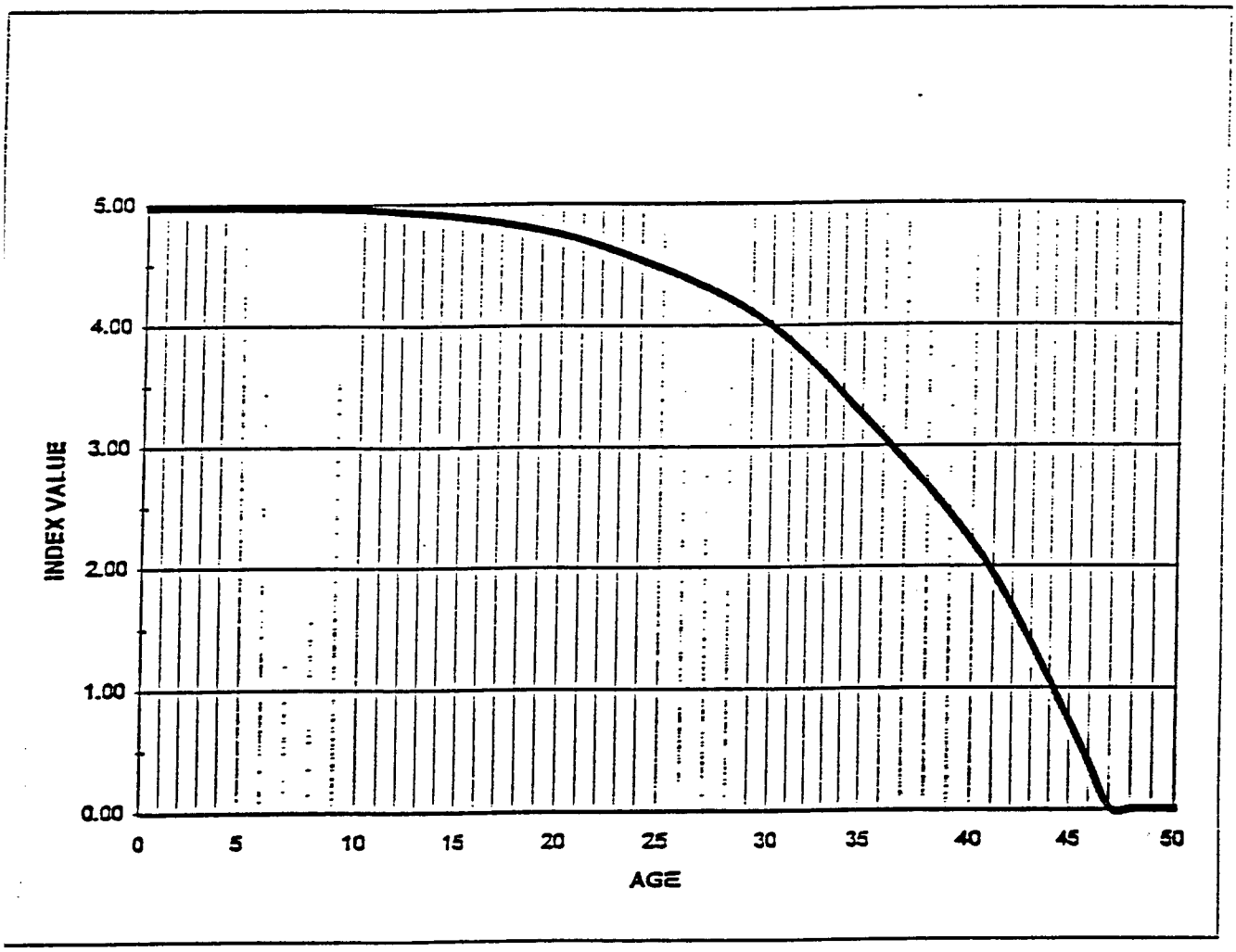
C Value: 4.98
M Value: 0.000005152
B Value: 3.58

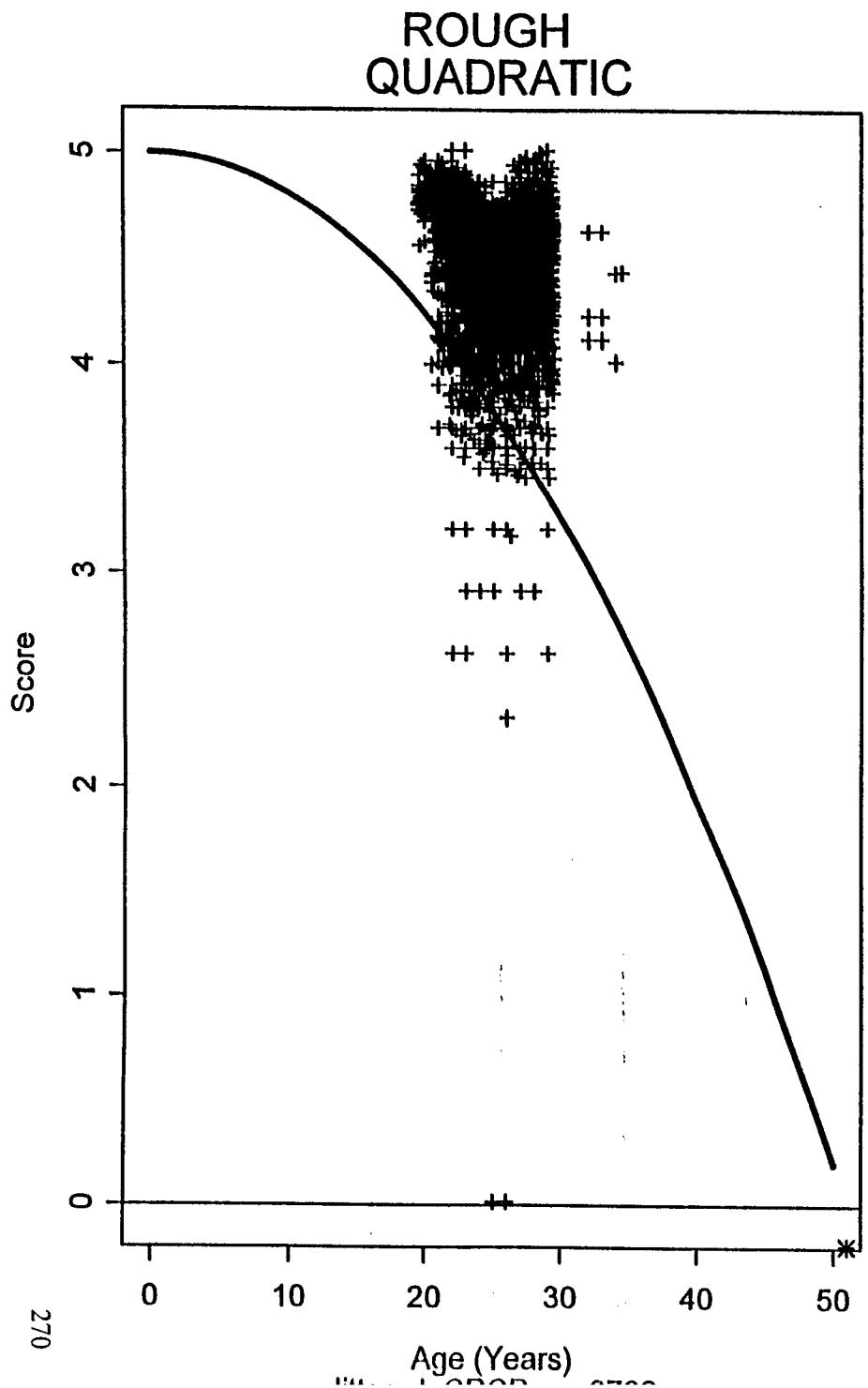
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.97	4.97	4.97	4.96

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.95	4.94	4.93	4.91	4.90	4.87	4.85	4.82	4.79	4.75	4.70

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.65	4.59	4.53	4.46	4.38	4.29	4.20	4.09	3.98	3.86	3.72

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	3.57	3.41	3.24	3.06	2.86	2.65	2.42	2.18	1.92	1.64	1.35





Date of Analysis: Thu May 7 18:58:53 1998
Family: CRCP
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 51

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.046	0.005	9.812	0

R-Squared = 0.889

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.063	0.004	14.891	0

R-Squared = 0.949

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.07	0.005	15.589	0

R-Squared = 0.953

APPENDIX F2

PERFORMANCE MODELS FOR MESH PAVEMENT FAMILY

APPENDIX F2.1

PERFORMANCE MODELS FOR MESH - O PAVEMENT FAMILY

PAVEMENT FAMILY: MESH – Original

Number of data points available for regression of performance curves : 405

Range of years of data available for the given family : 30 to 66 years

1. Corner Cracking [CRNR_CK]
   Existing Expert Model ends at @ 43 years
   Historical data forced to end at 43 years has a R^2 value of : 0.952
   Optimum forced end point is obtained at 51 years with a R^2 value of : 0.982 ✓

2. D-Cracking/ASR [DASR]
   Existing Expert Model ends at @ 32 years
   Historical data forced to end at 32 years has a R^2 value of : 0.374
   Optimum forced end point is obtained at 40 years with a R^2 value of : 0.531 ✓

3. Faulting [FAULT]
   Existing Expert Model ends at @ 32 years
   Historical data forced to end at 32 years has a R^2 value of : 0.328
   Optimum forced end point is obtained at 48 years with a R^2 value of : 0.888 ✓

4. Joint Seal Damage [JNT_SLD]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : N/A
   Optimum forced end point is obtained at 30 years with a R^2 value of : 0.831 ✓

5. Joint Spalling [JNT_SPL]
   Existing Expert Model ends at @ 31 years
   Historical data forced to end at 31 years has a R^2 value of : 0.819 ✓
   Optimum forced end point is obtained at 31 years with a R^2 value of : 0.819

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   Existing Expert Model ends at @ 36 years
   Historical data forced to end at 36 years has a R^2 value of : 0.377
   Optimum forced end point is obtained at 47 years with a R^2 value of : 0.869 ✓

CORNER CRACKING ON MESH

NDEX = C - M * AGE ^ B

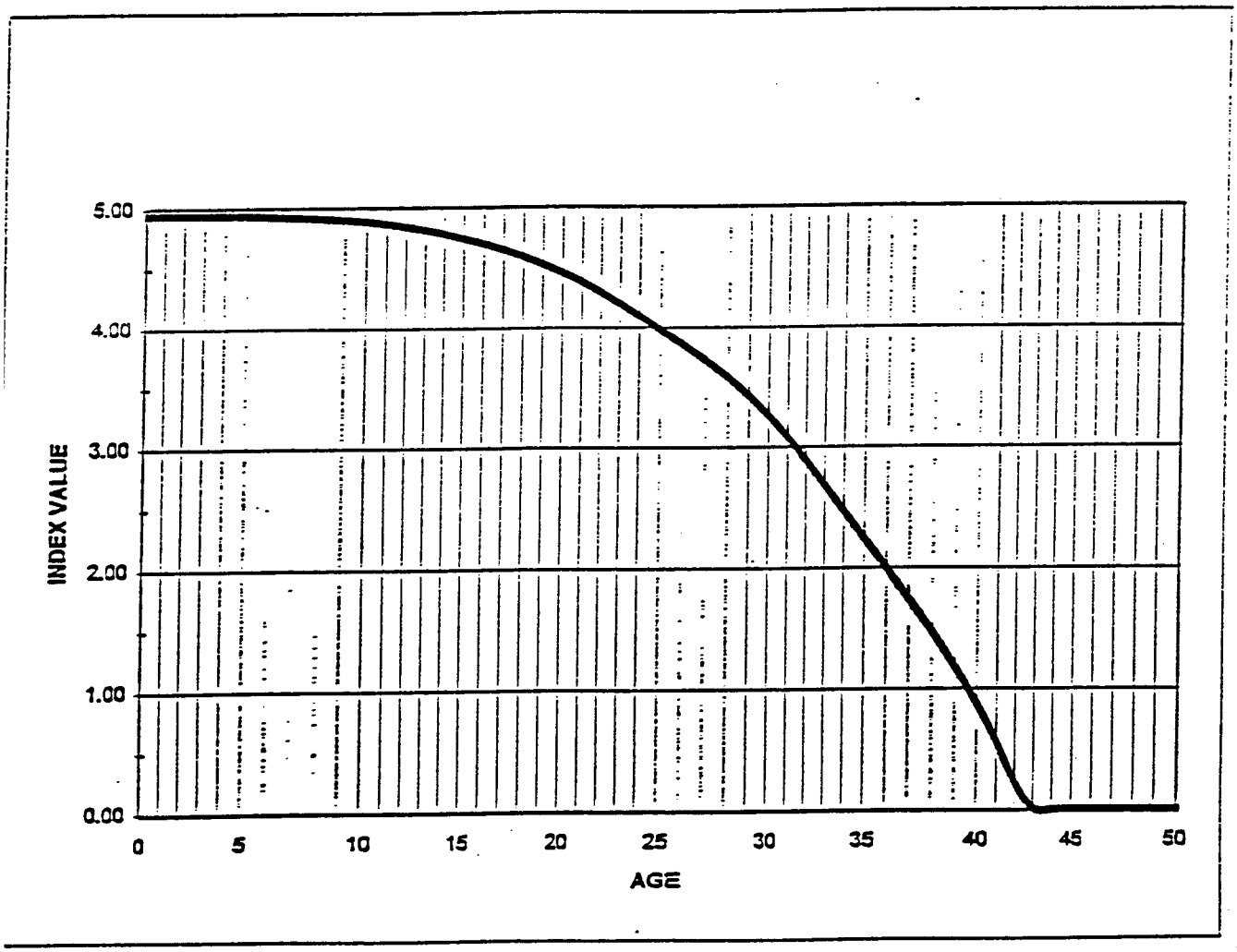
C Value: 4.95
M Value: 0.00005515
B Value: 3.04

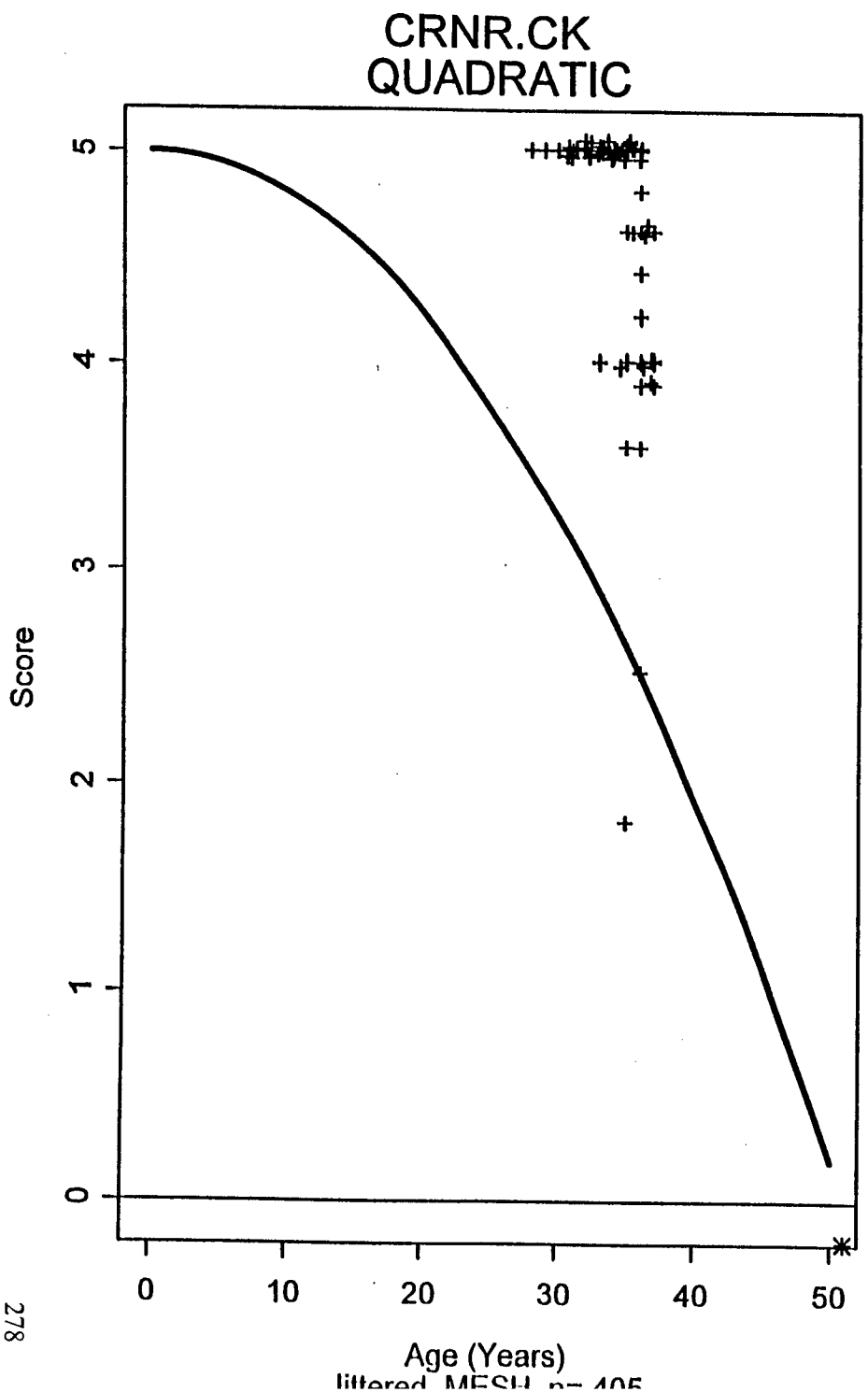
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.95	4.95	4.95	4.95	4.95	4.94	4.94	4.93	4.92	4.91	4.89

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.87	4.84	4.82	4.78	4.74	4.70	4.65	4.59	4.52	4.45	4.37

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.29	4.19	4.08	3.97	3.85	3.71	3.57	3.41	3.24	3.07	2.87

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	2.67	2.45	2.22	1.98	1.72	1.45	1.16	0.86	0.54	0.21	0.00





Date of Analysis: Thu May 7 19:13:35 1998
Family: MESH
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 51

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.159	0.006	24.684	0

R-Squared = 0.985

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.181	0.008	22.352	0

R-Squared = 0.982

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.191	0.009	21.661	0

R-Squared = 0.981

D-CRACKING / ASR ON MESH

EX = C - M * AGE ^ B

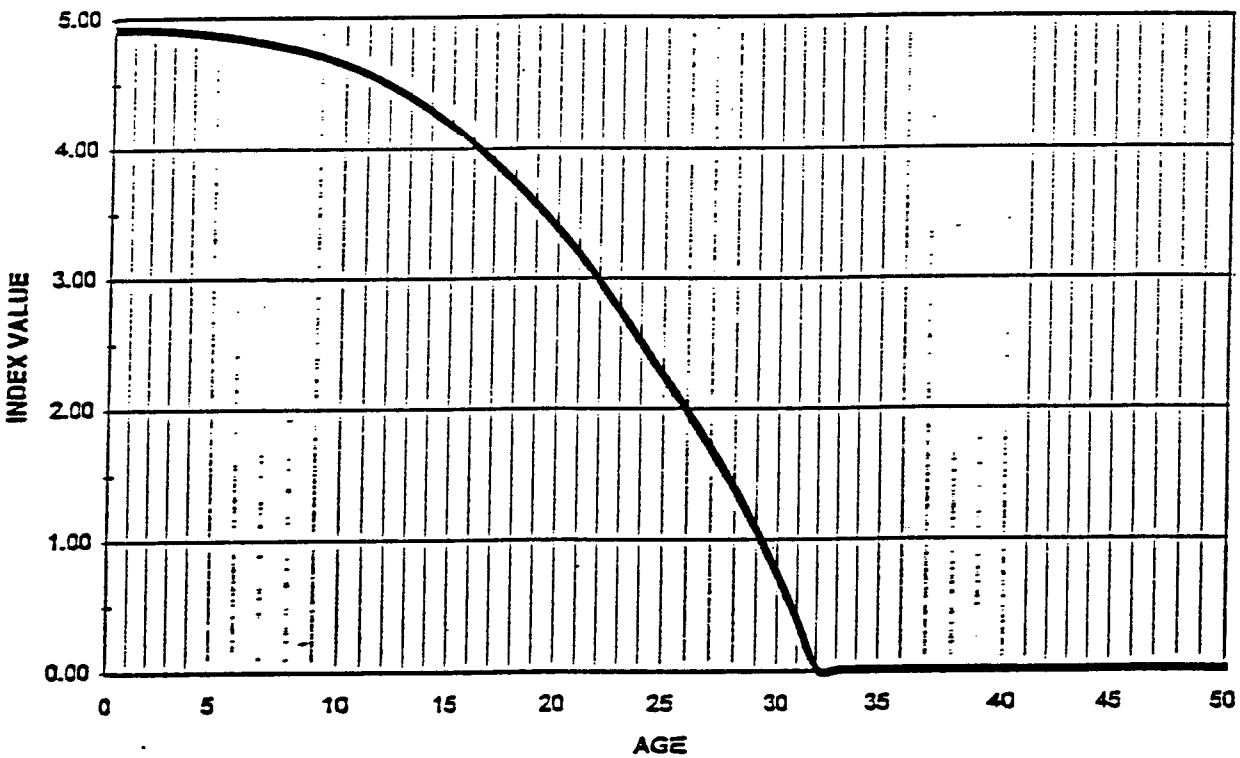
'alue: 4.92
'alue: 0.0009775
'alue: 2.46

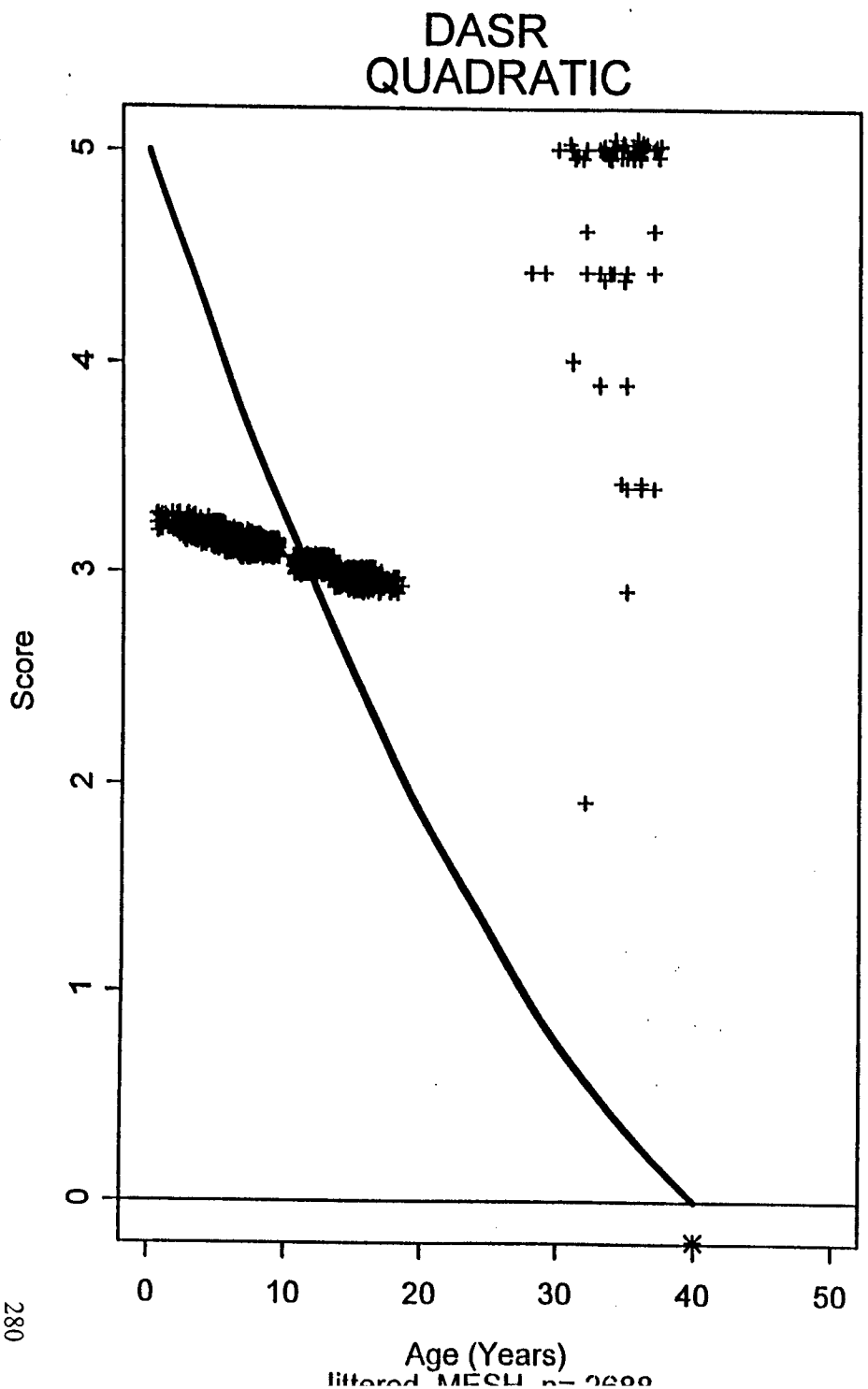
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.92	4.92	4.91	4.91	4.89	4.87	4.84	4.80	4.76	4.70	4.64

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.56	4.48	4.38	4.27	4.16	4.02	3.88	3.72	3.55	3.37	3.17

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	2.96	2.73	2.49	2.23	1.96	1.67	1.37	1.05	0.71	0.36	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:10:44 1998
Family: MESH
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 40

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.191	0.027	-7.176	0

R-Squared = 0.664

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.19	0.028	-6.857	0

R-Squared = 0.644

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.189	0.028	-6.828	0

R-Squared = 0.642

FAULTING ON MESH

INDEX = C - M * AGE ^ B

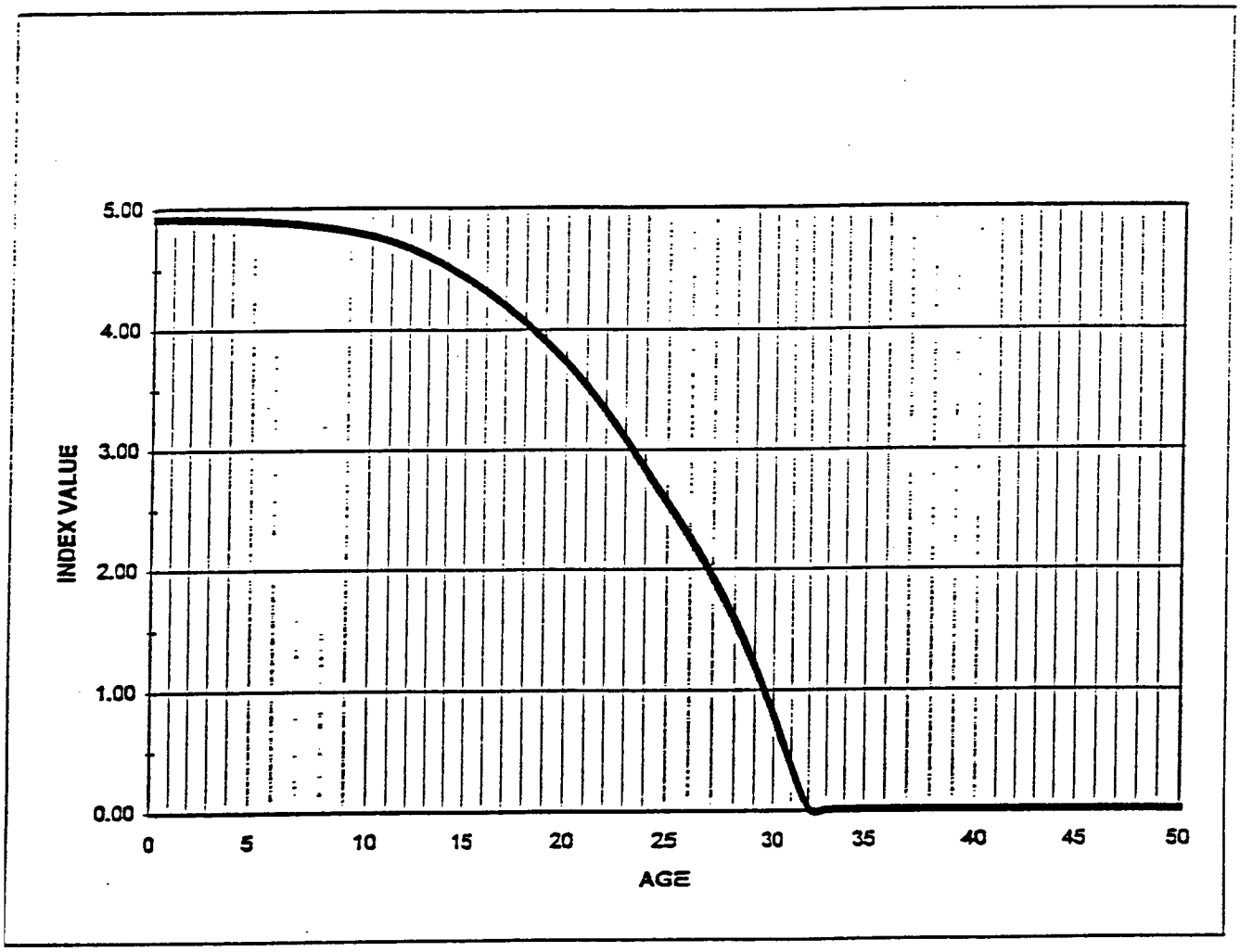
C Value: 4.92
M Value: 0.0001296
B Value: 3.05

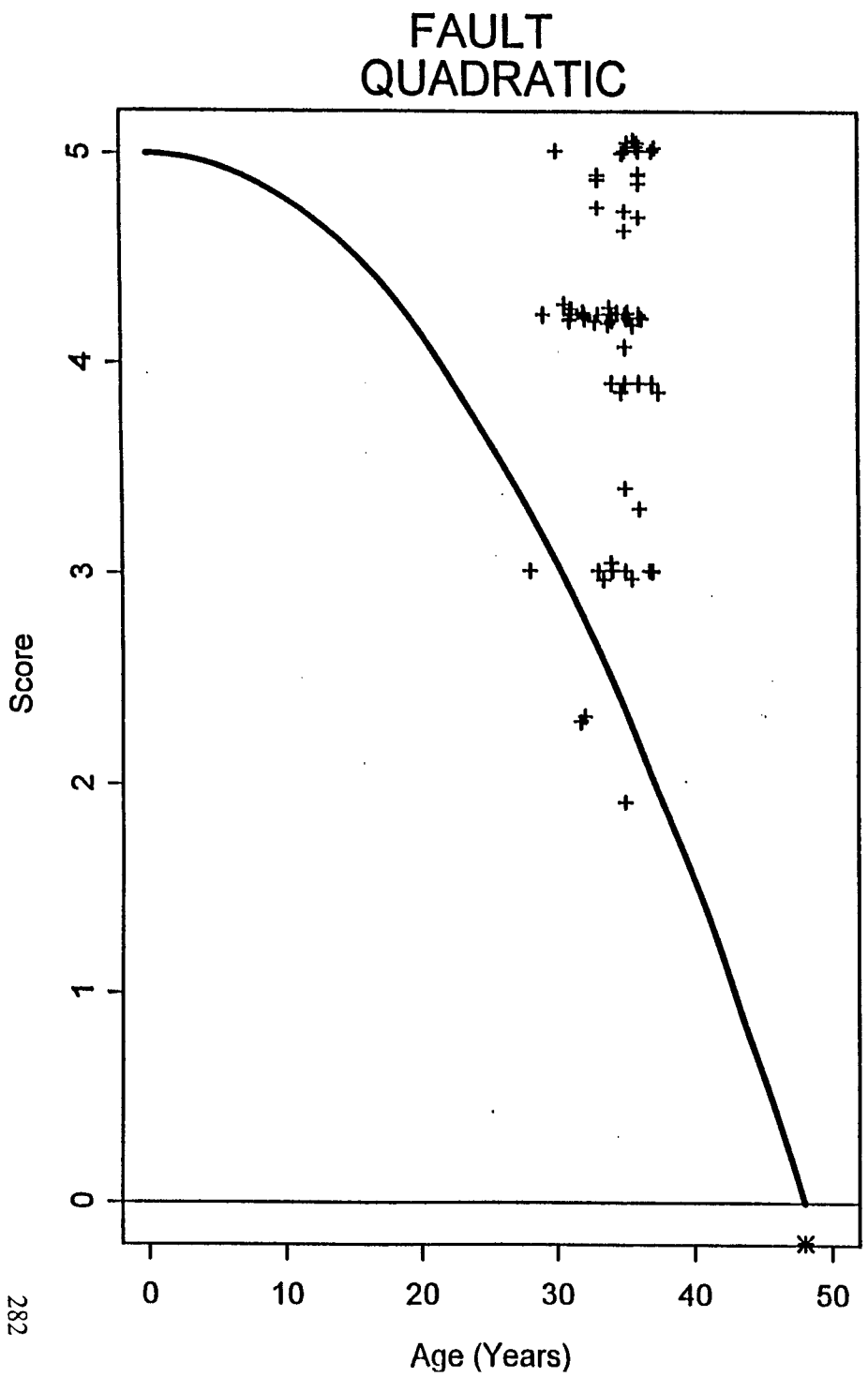
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.92	4.92	4.92	4.92	4.91	4.90	4.89	4.87	4.85	4.81	4.77

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.73	4.67	4.60	4.51	4.42	4.31	4.19	4.05	3.89	3.72	3.52

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	3.31	3.08	2.82	2.54	2.24	1.91	1.56	1.18	0.77	0.34	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:15:04 1998
Family: MESH
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 48

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.12	0.024	4.984	0.001

R-Squared = 0.734

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.185	0.022	8.436	0

R-Squared = 0.888

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.211	0.025	8.335	0

R-Squared = 0.885

JOINT SEAL DAMAGE ON MESH

INDEX = C - M * AGE ^ B

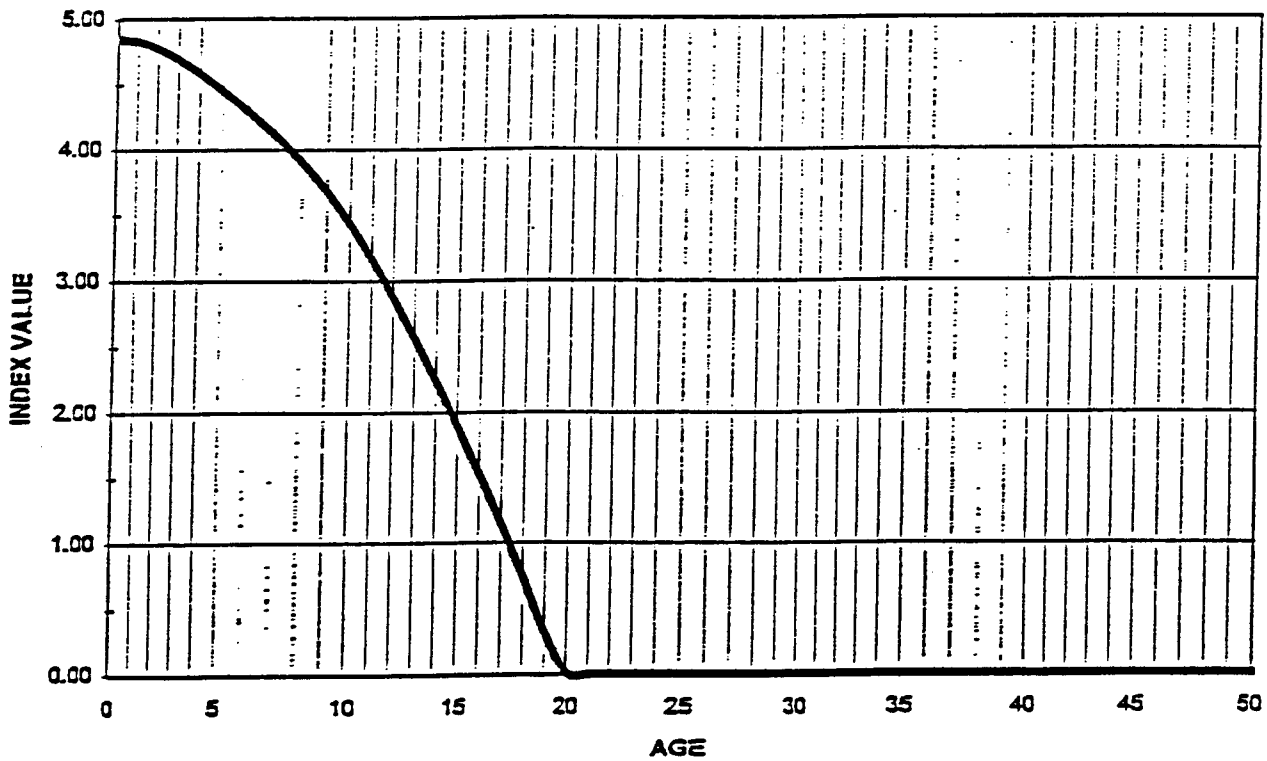
C Value: 4.85
M Value: 0.02273
B Value: 1.80

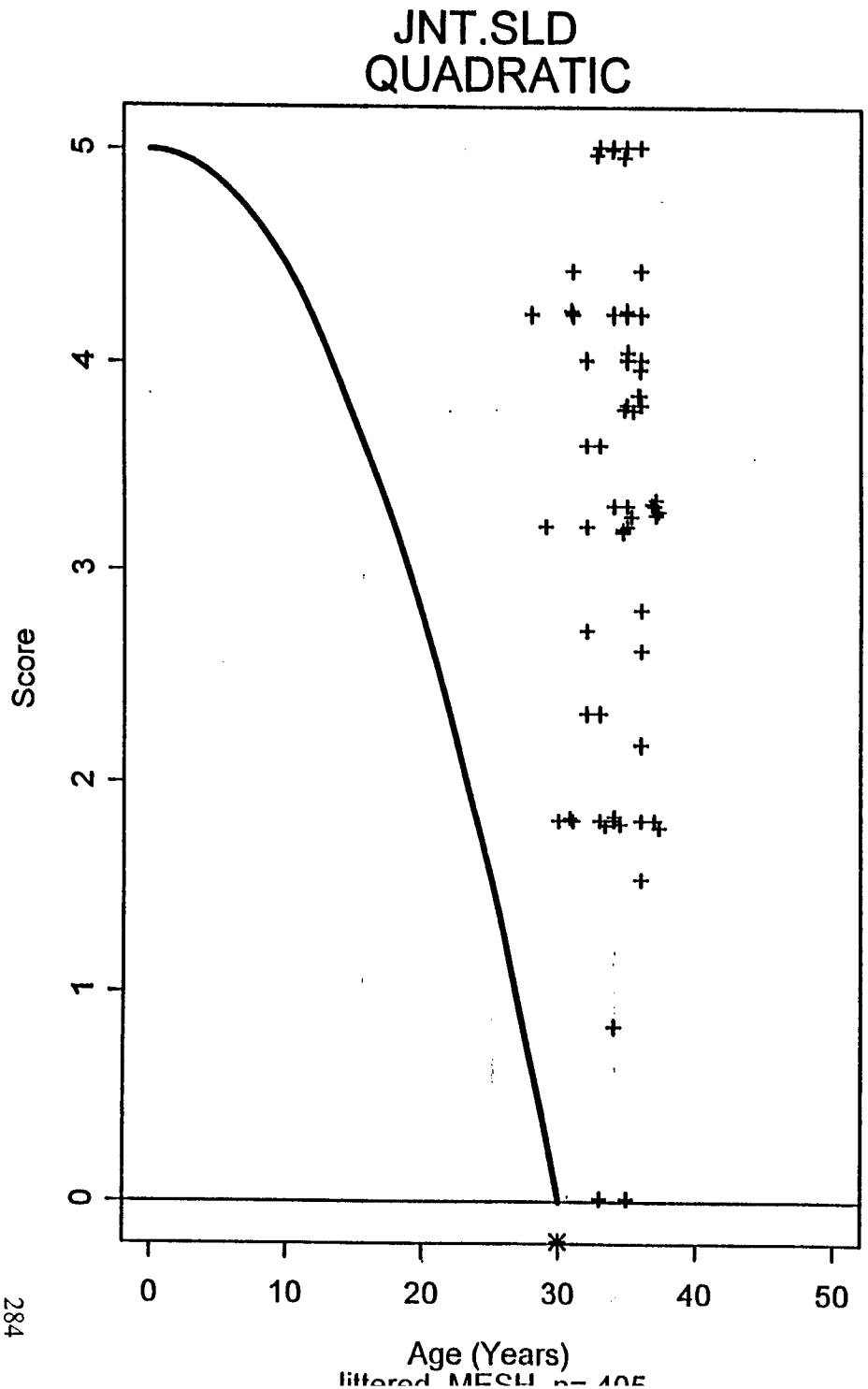
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.85	4.83	4.77	4.69	4.57	4.44	4.28	4.10	3.89	3.66	3.42

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.15	2.86	2.55	2.22	1.87	1.51	1.12	0.72	0.30	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:16:35 1998
Family: MESH
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 30

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	2.13	0.679	3.136	0.088

R-Squared = 0.831

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	2.13	0.679	3.136	0.088

R-Squared = 0.831

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	2.13	0.679	3.136	0.088

R-Squared = 0.831

JOINT SPALLING ON MESH

NDEX = C - M * AGE ^ B

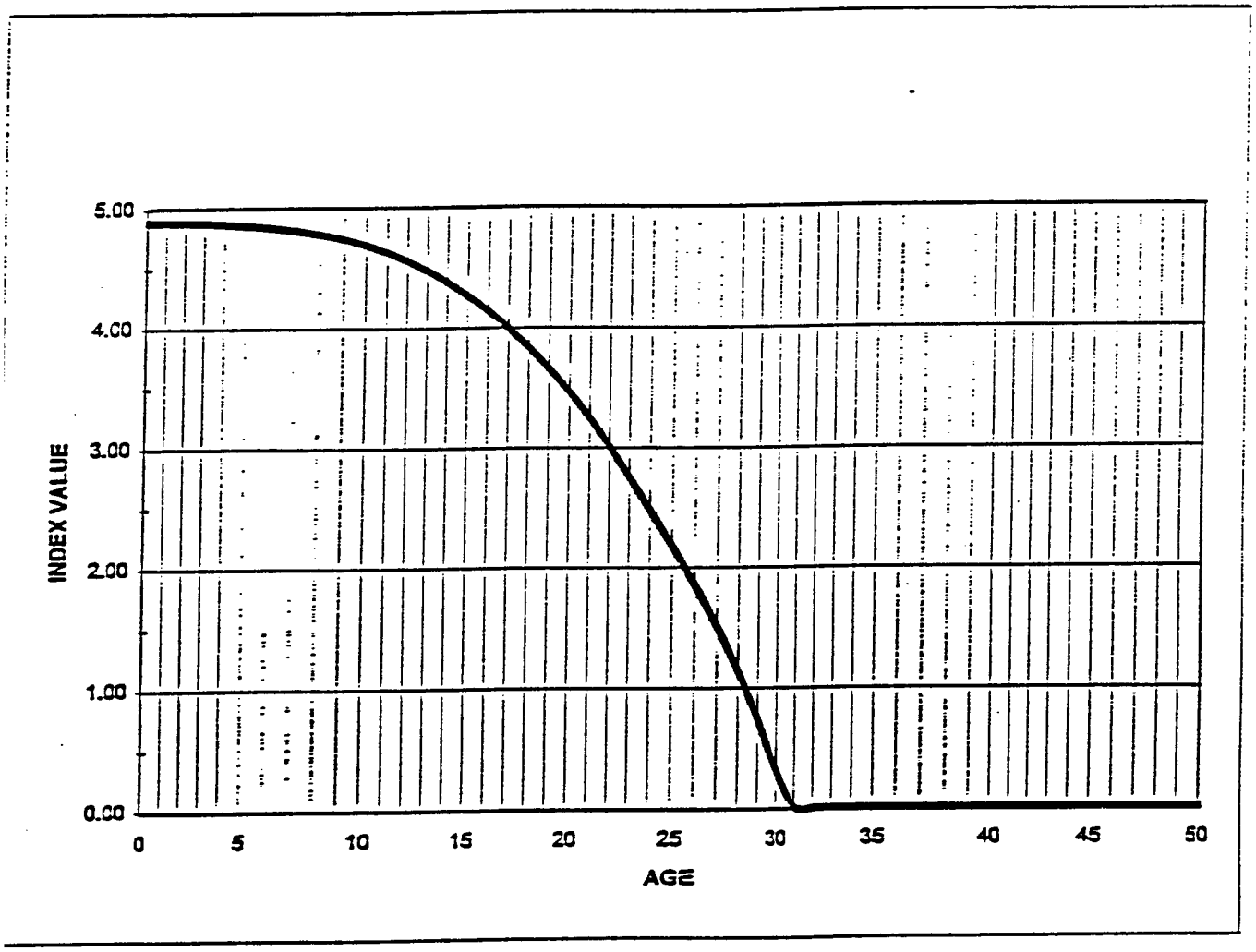
C Value: 4.89
M Value: 0.0002741
B Value: 2.86

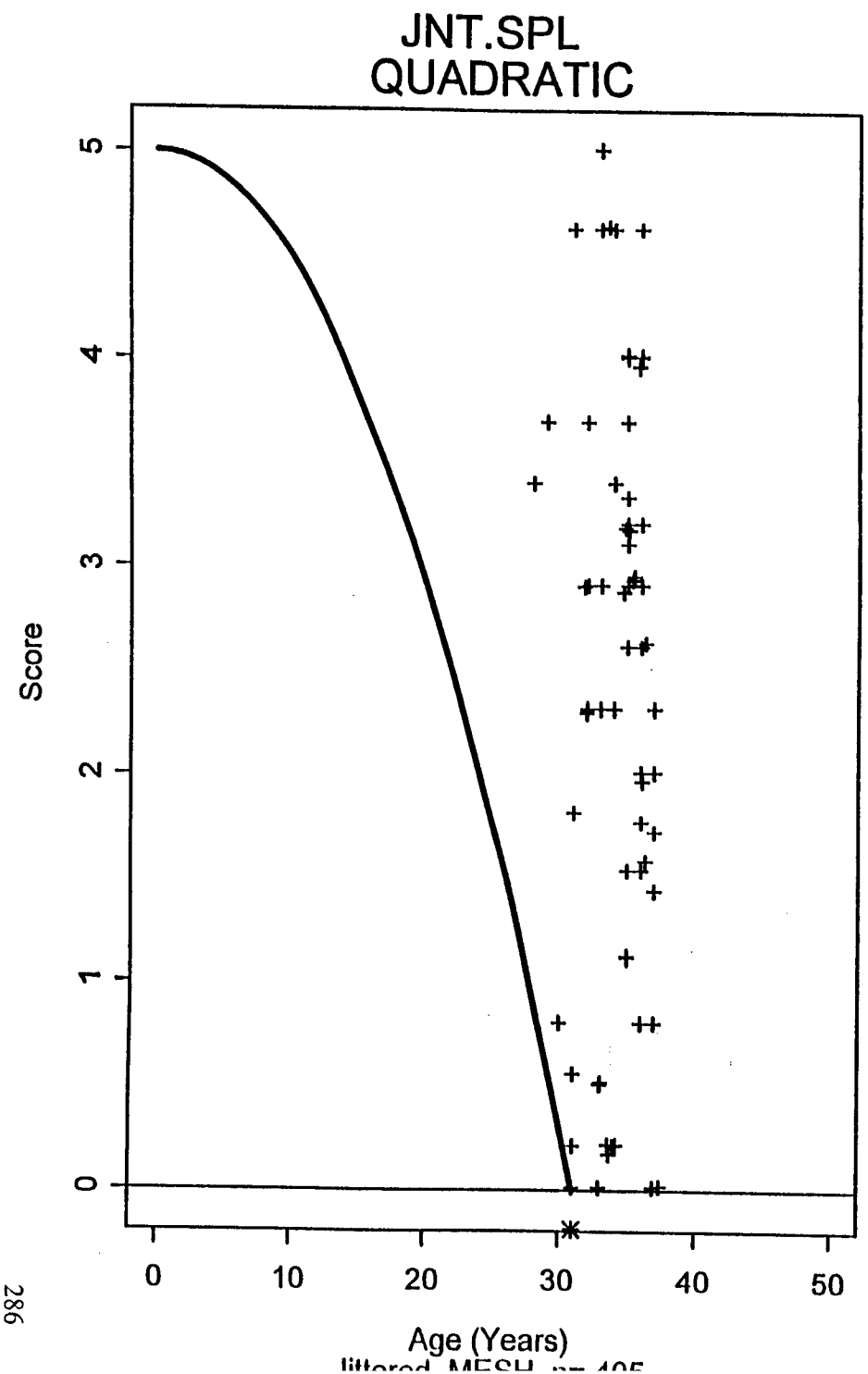
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.89	4.89	4.88	4.88	4.86	4.84	4.82	4.79	4.74	4.69

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.63	4.56	4.47	4.37	4.26	4.13	3.98	3.82	3.65	3.45	3.23

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	3.00	2.74	2.46	2.16	1.84	1.49	1.12	0.72	0.29	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:12:06 1998
Family: MESH
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 31

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.098	0.227	4.833	0.017

R-Squared = 0.886

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.098	0.298	3.686	0.035

R-Squared = 0.819

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.098	0.71	1.547	0.22

R-Squared = 0.444

ROUGHNESS ON MESH

INDEX = C - M * AGE ^ B

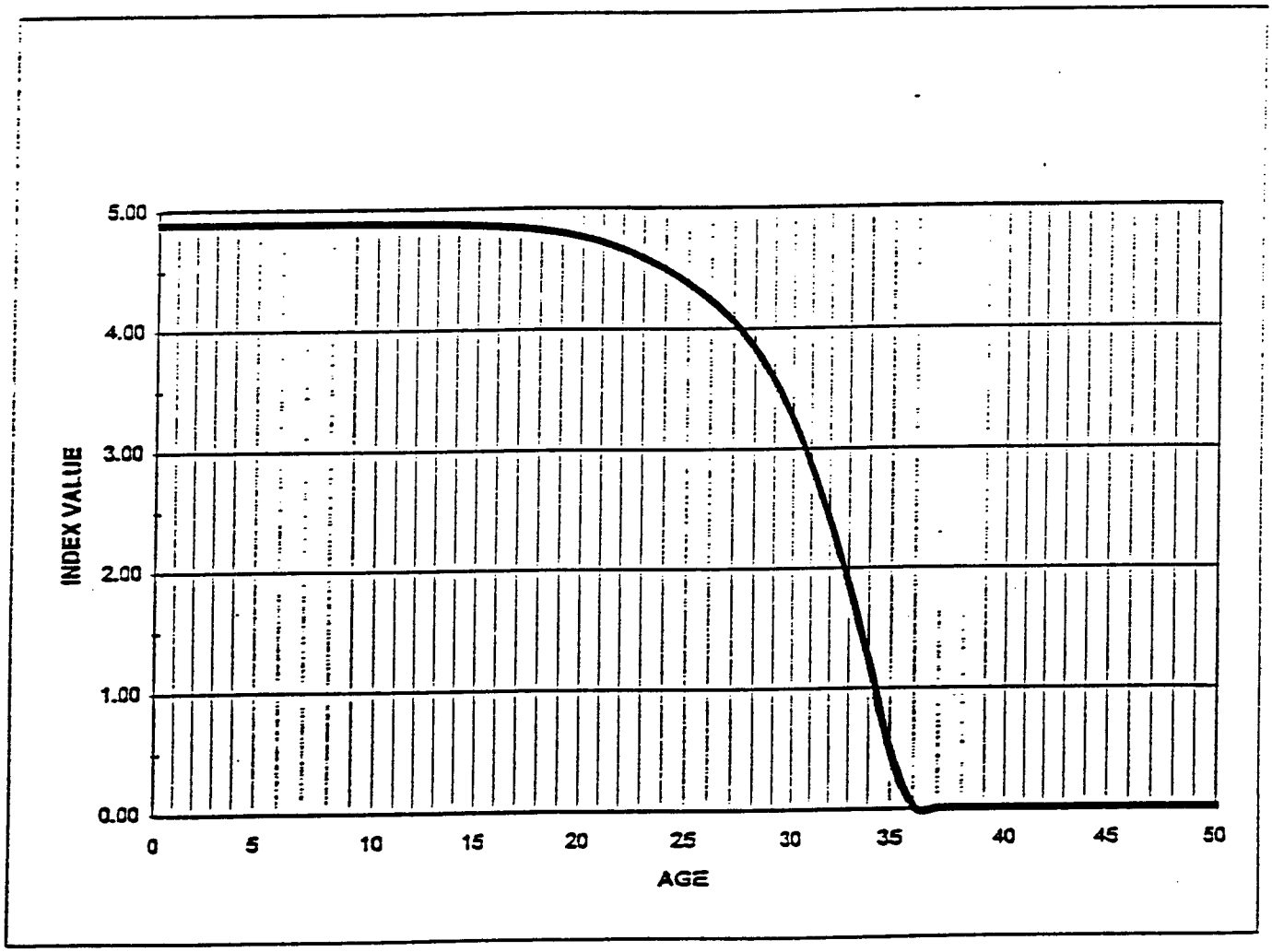
C Value: 4.89
M Value: 0.000000000C6481
B Value: 6.37

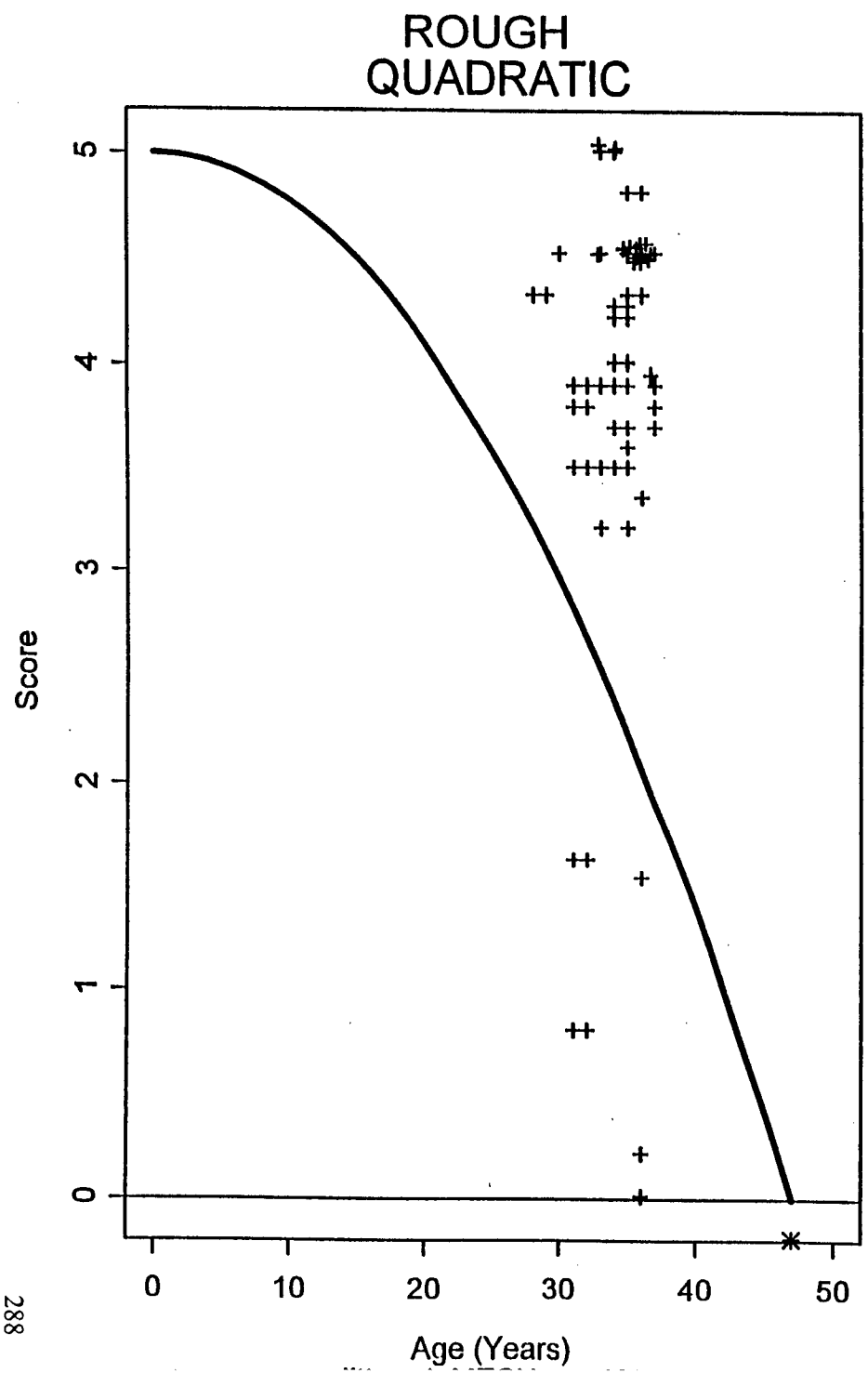
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89	4.89

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.89	4.89	4.88	4.88	4.87	4.86	4.85	4.83	4.80	4.76	4.72

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.66	4.58	4.49	4.37	4.22	4.04	3.82	3.55	3.23	2.84	2.38

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	1.84	1.20	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:09:12 1998
Family: MESH
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 47

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.106	0.038	2.803	0.021

R-Squared = 0.466

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.192	0.025	7.719	0

R-Squared = 0.869

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.218	0.025	8.642	0

R-Squared = 0.892

APPENDIX F2.2

PERFORMANCE MODELS FOR MESH - G PAVEMENT FAMILY

PAVEMENT FAMILY: MESH – G [Grinding on Original]

Number of data points available for regression of performance curves : 936

Range of years of data available for the given family : 03 to 16 years

1. Corner Cracking [CRNR_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 32 years with a R^2 value of : 0.797 ✓

2. D-Cracking/ASR [DASR]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 25 years with a R^2 value of : 0.657 ✓

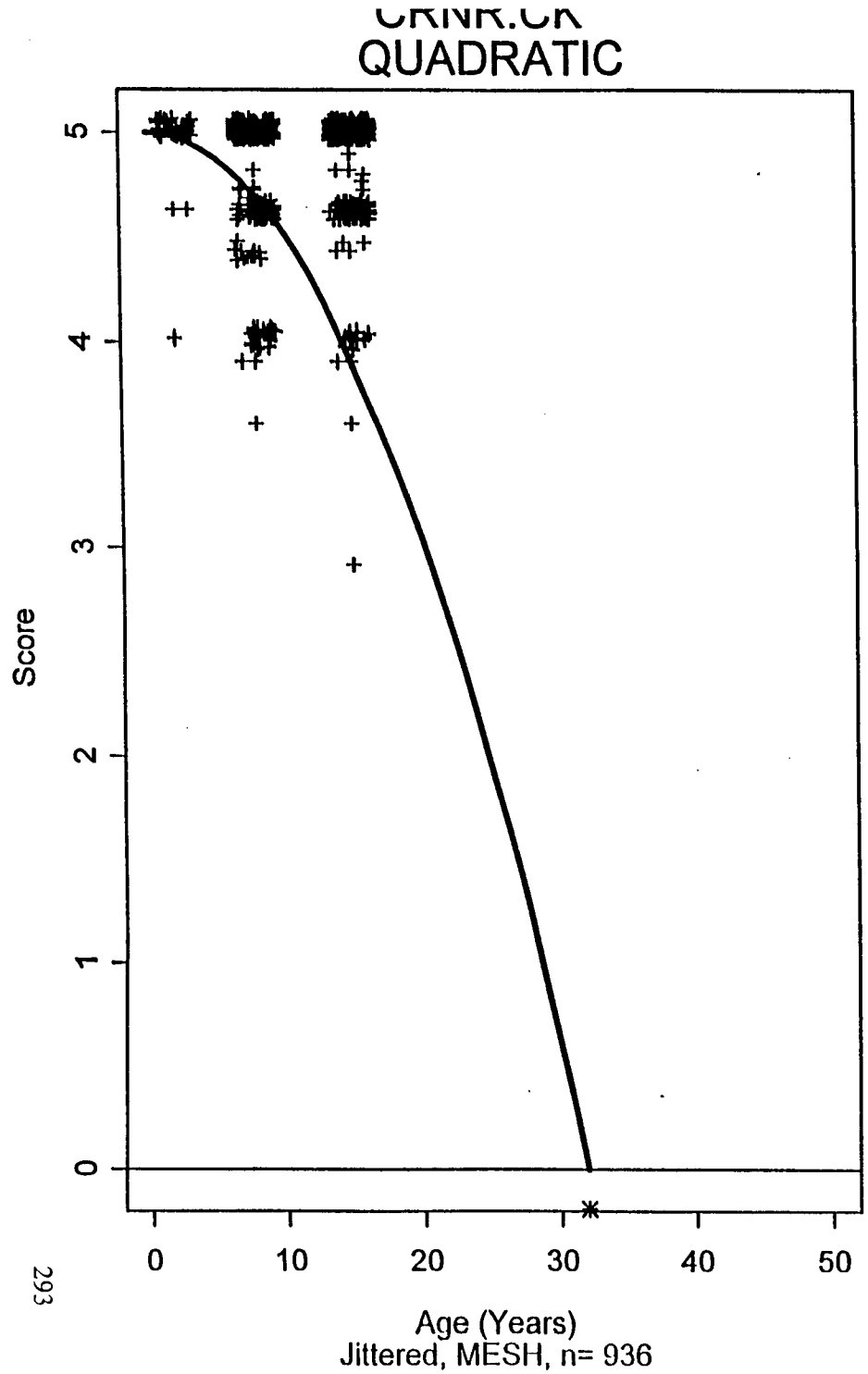
3. Faulting [FAULT]
   Existing Expert Model ends at @ 29 years
   Historical data forced to end at 29 years has a R^2 value of : 0.001 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

4. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 20 years with a R^2 value of : 0.215 ✓

5. Joint Spalling [JNT_SPL]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Mesh-J Family use endpoint of 15 years
   Historical data forced to end at 15 years has a R^2 value of : 0.024 ✓

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   Existing Expert Model ends at @ 25 years
   Historical data forced to end at 25 years has a R^2 value of : 0.017
   Optimum forced end point is obtained at 19 years with a R^2 value of : 0.169 ✓



Date of Analysis: Thu May 7 19:23:48 1998
Family: MESH
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 32

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.088	0.021	4.207	0.003

R-Squared = 0.689

50TH PERCENTILE
Coefficient Estimates:

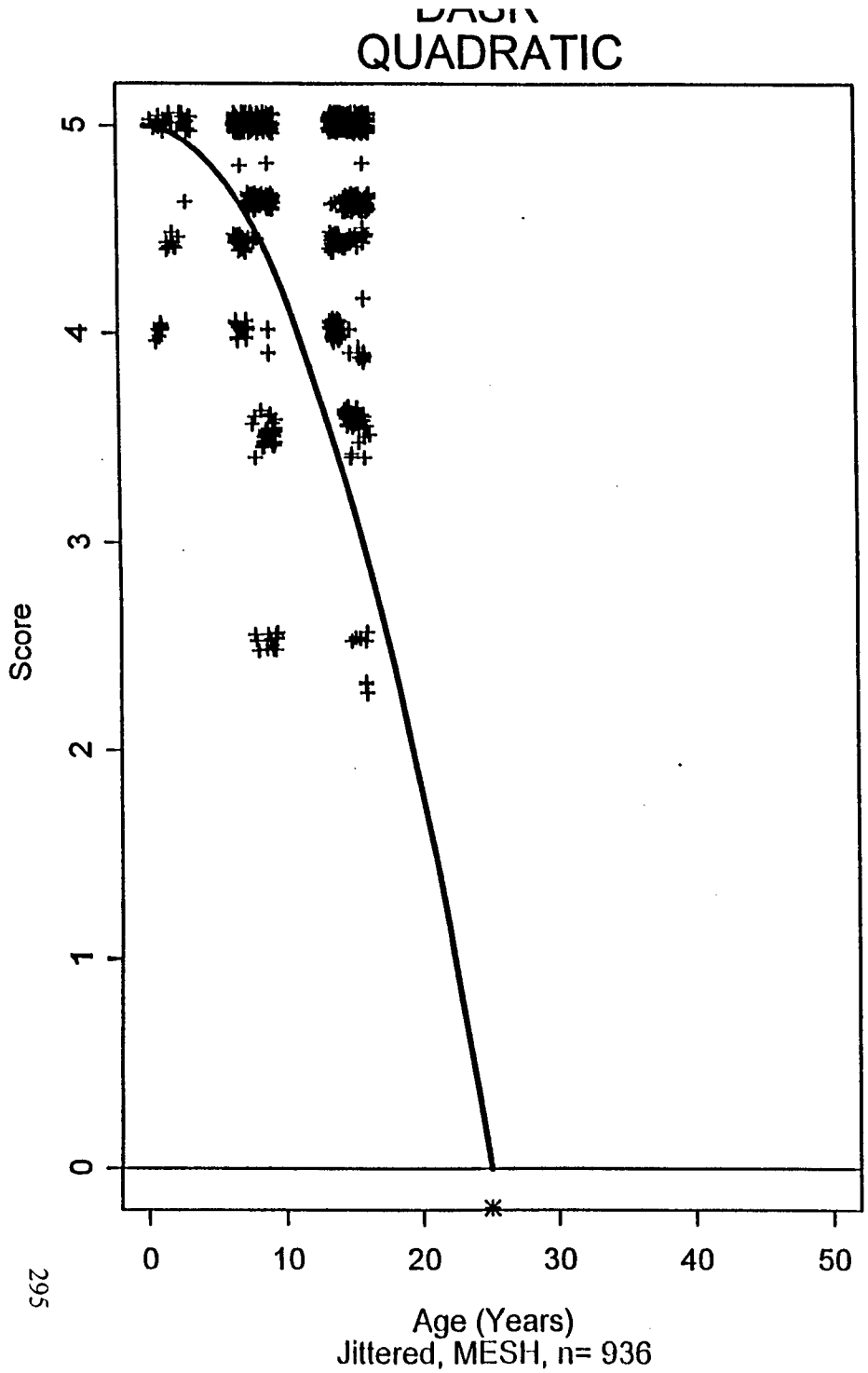
	Value	Std. Error	t value	Pr(>|t|)
1	0.107	0.019	5.597	0.001

R-Squared = 0.797

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.113	0.015	7.744	0

R-Squared = 0.882



Date of Analysis: Thu May 7 19:20:27 1998
Family: MESH
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 25

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.065	0.048	1.367	0.209

R-Squared = 0.189

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.167	0.043	3.915	0.004

R-Squared = 0.657

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.223	0.037	5.965	0

R-Squared = 0.816

FAULTING ON MESH AFTER GRINDING

INDEX = C - M * AGE ^ B

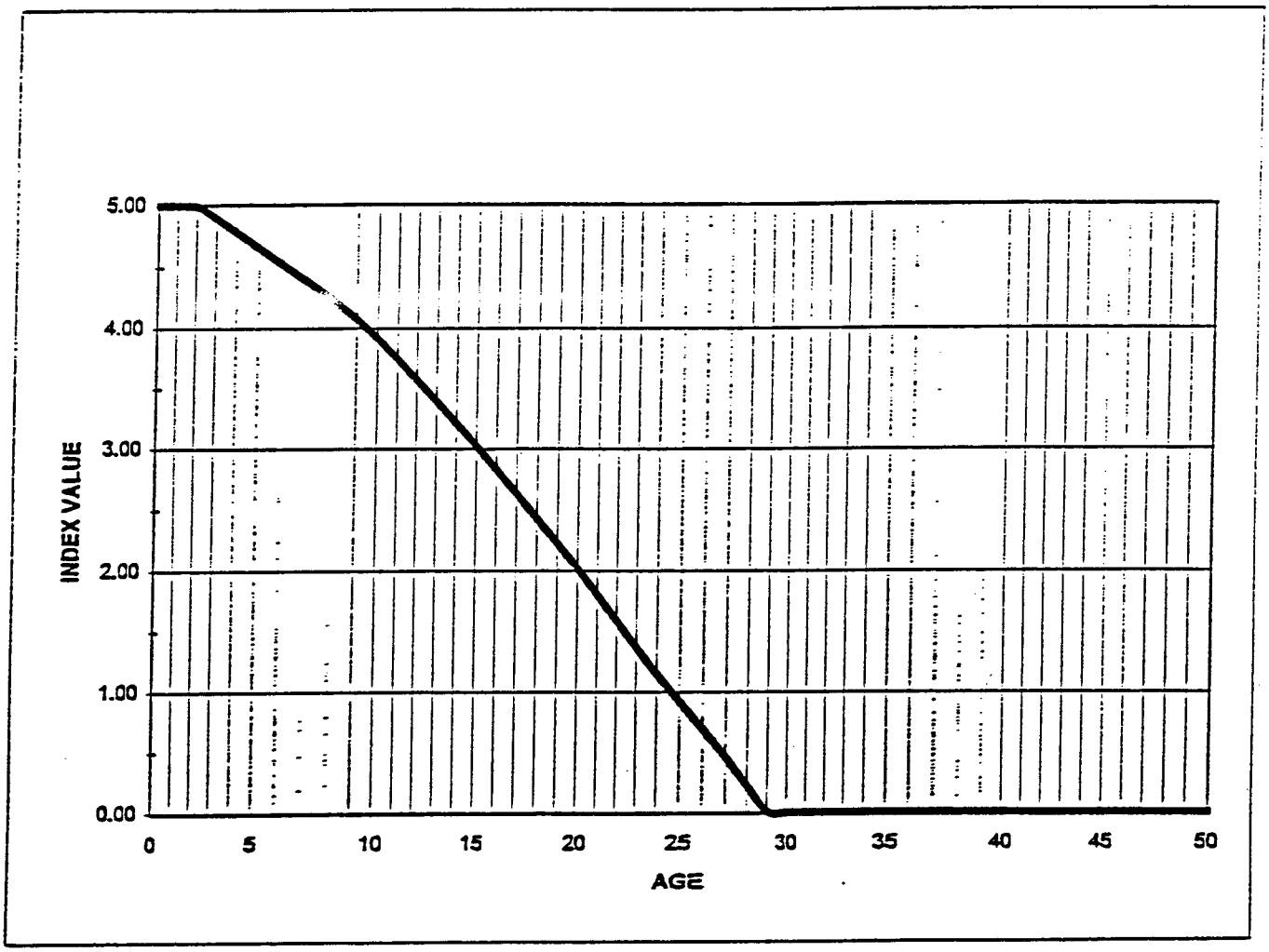
C Value: 5.13
M Value: 0.05473305
B Value: 1.35

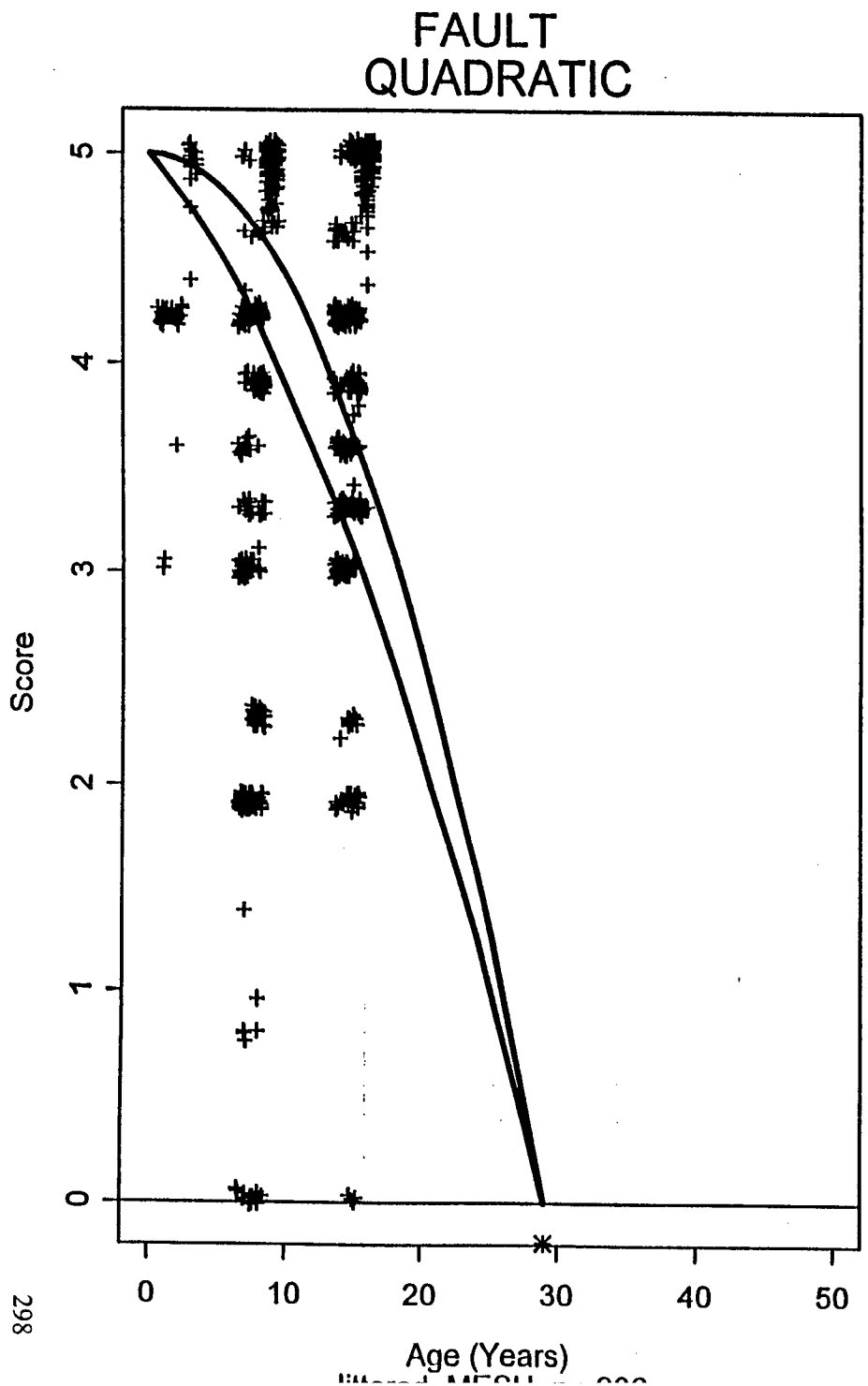
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.99	4.89	4.77	4.65	4.52	4.37	4.22	4.07	3.90

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.74	3.56	3.38	3.20	3.01	2.82	2.62	2.42	2.22	2.01	1.79

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.58	1.36	1.13	0.91	0.68	0.45	0.21	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:26:04 1998
Family: MESH
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 29

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.077	0.079	-0.98	0.356

R-Squared = 0.107

50TH PERCENTILE
Coefficient Estimates:

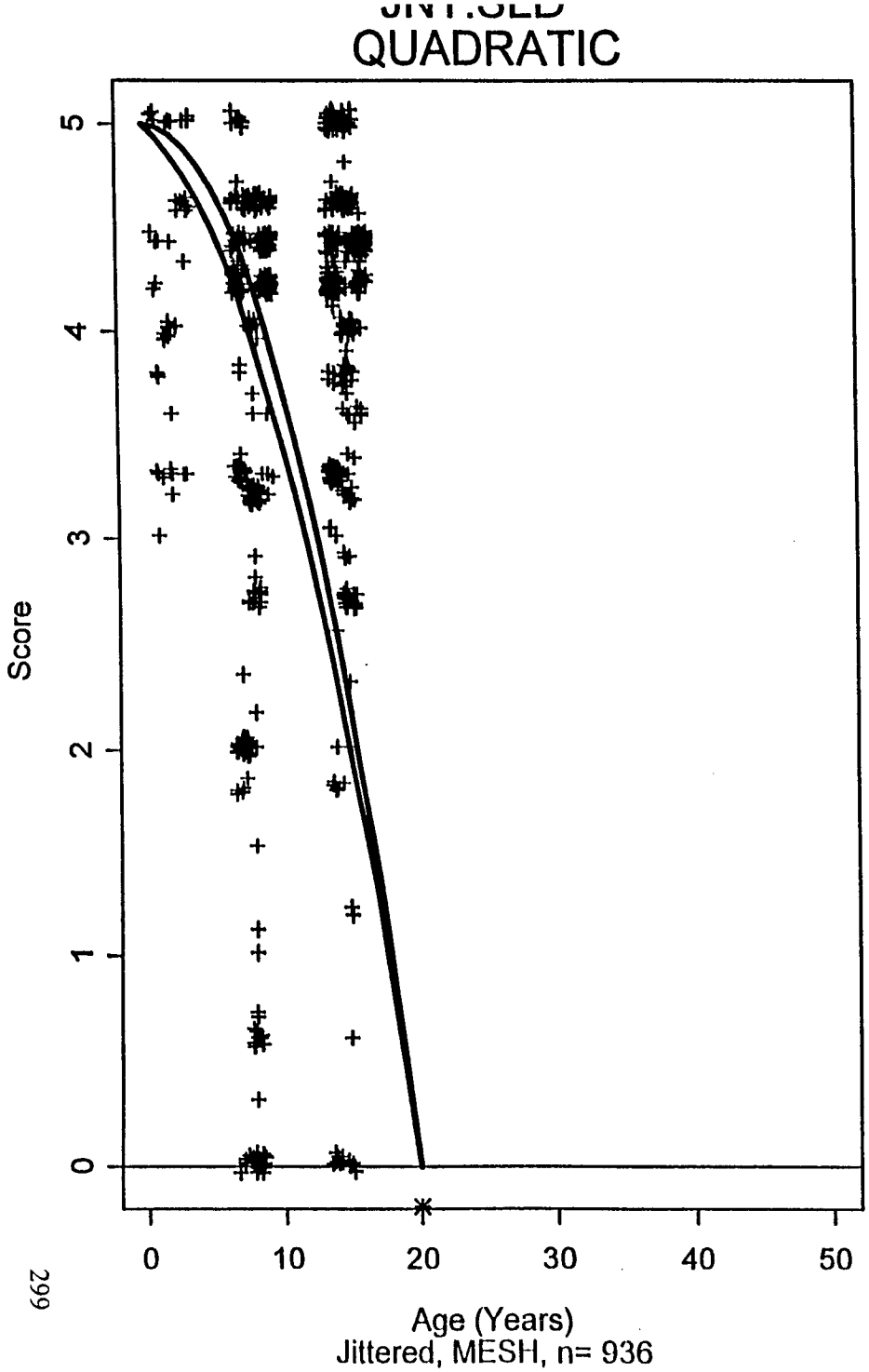
	Value	Std. Error	t value	Pr(>|t|)
1	0.004	0.056	0.07	0.946

R-Squared = 0.001

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.052	0.045	1.171	0.275

R-Squared = 0.146



Date of Analysis: Thu May 7 19:27:47 1998
Family: MESH
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.054	0.172	-0.315	0.761

R-Squared = 0.012

50TH PERCENTILE
Coefficient Estimates:

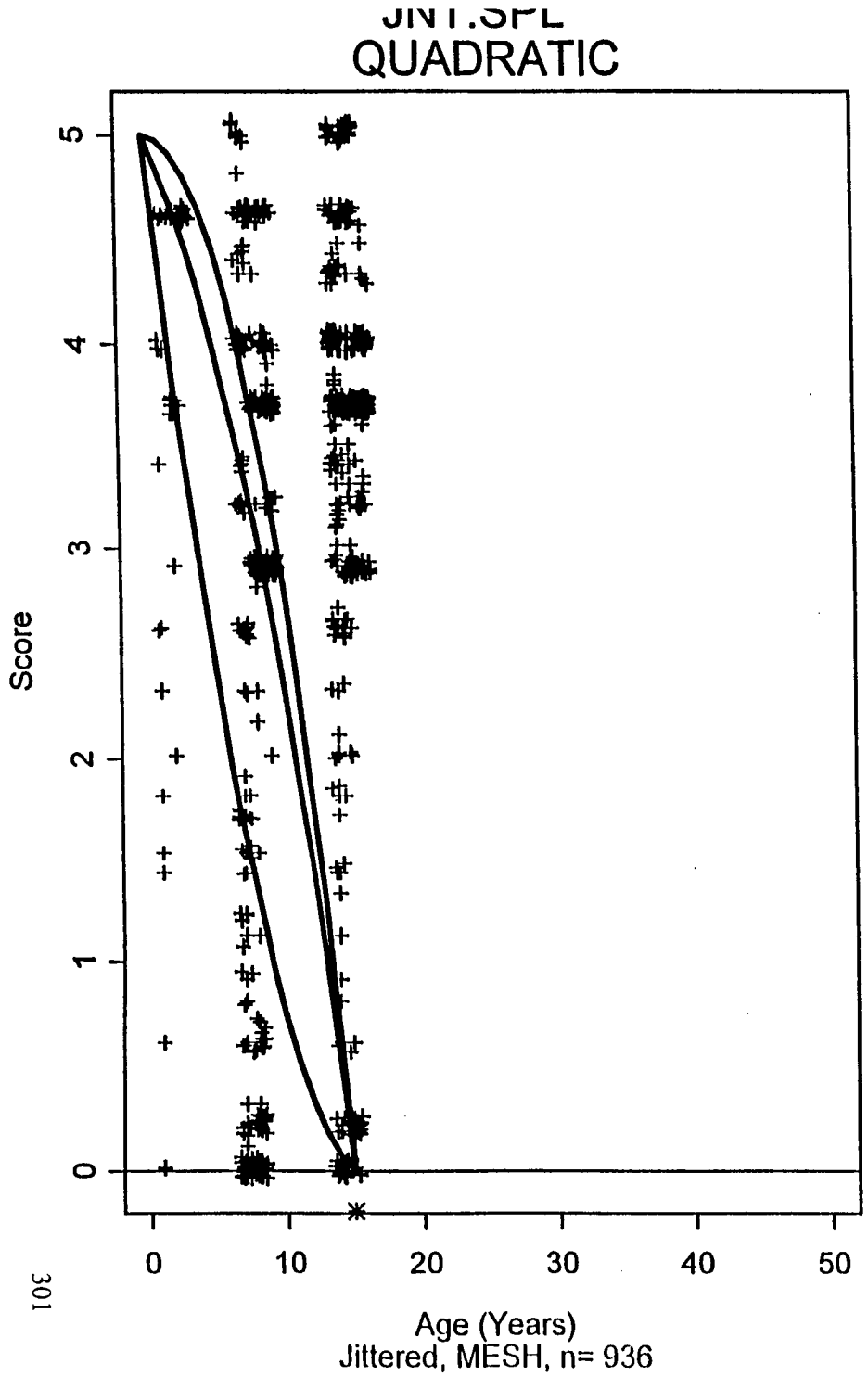
	Value	Std. Error	t value	Pr(>|t|)
1	0.199	0.134	1.48	0.177

R-Squared = 0.215

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.257	0.118	2.178	0.061

R-Squared = 0.372



Date of Analysis: Thu May 7 19:22:01 1998
Family: MESH
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.614	0.284	-2.161	0.068

R-Squared = 0.4

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.141	0.338	-0.416	0.69

R-Squared = 0.024

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.129	0.38	0.34	0.744

R-Squared = 0.016

ROUGHNESS ON MESH AFTER GRINDING

NDEX = C - M * AGE ^ B

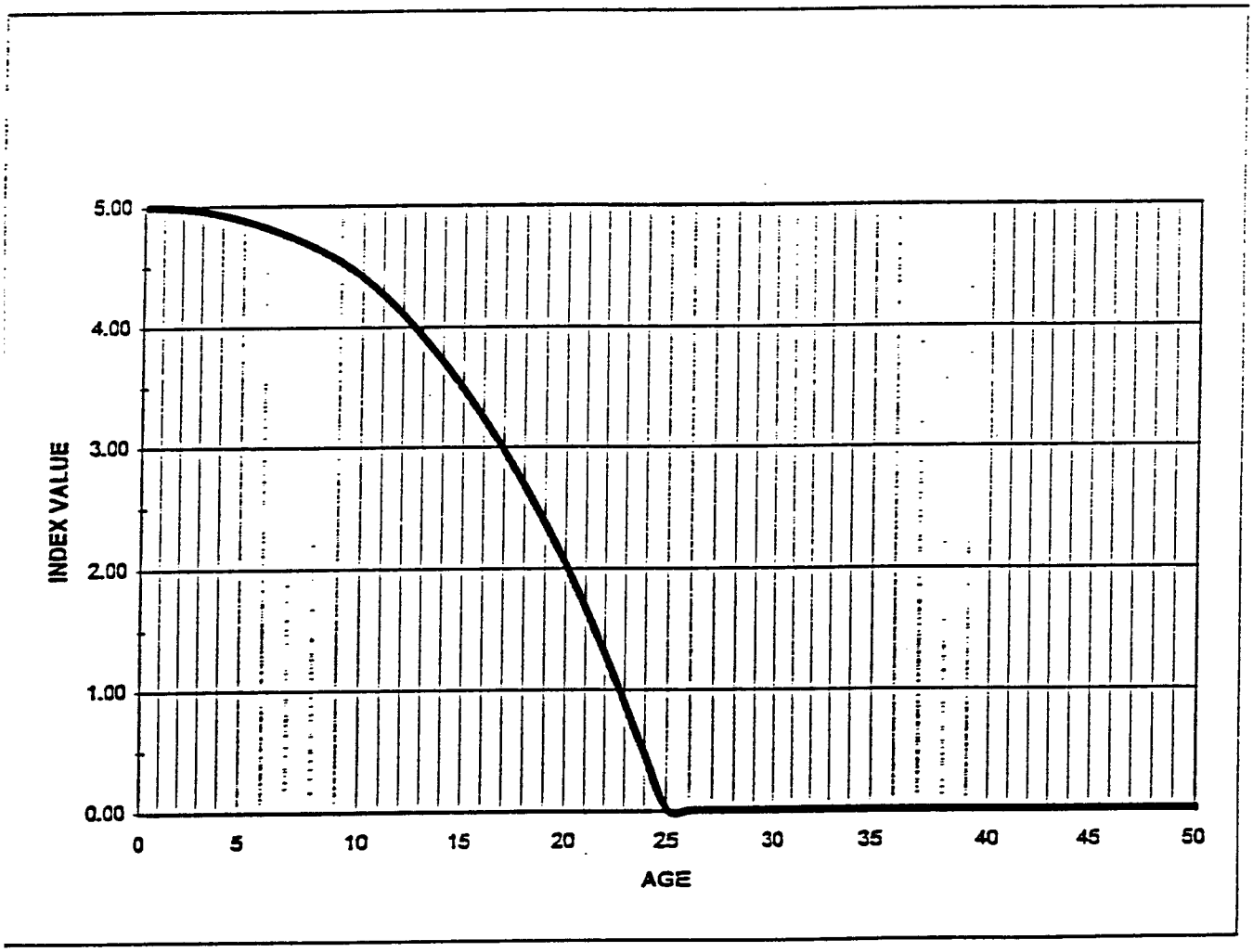
C Value: 5.00
M Value: 0.002772379
B Value: 2.33

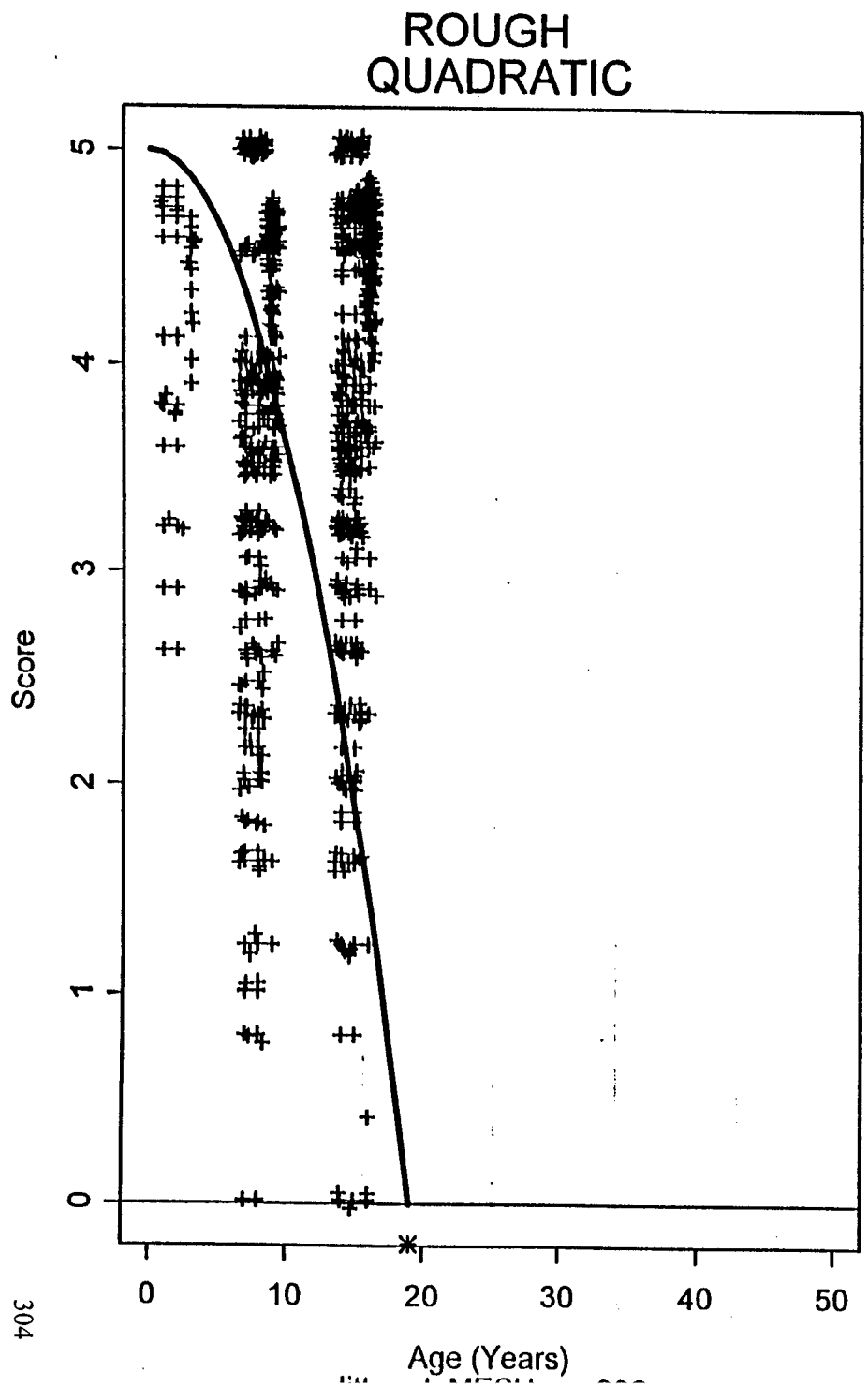
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.99	4.96	4.93	4.88	4.82	4.74	4.65	4.54	4.41

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.26	4.09	3.91	3.70	3.48	3.23	2.96	2.67	2.36	2.02	1.66

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.28	0.87	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:18:59 1998
Family: MESH
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 19

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0	0.152	0	1

R-Squared = 0

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.182	0.143	1.274	0.239

R-Squared = 0.169

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.314	0.149	2.101	0.069

R-Squared = 0.356

APPENDIX F2.3

PERFORMANCE MODELS FOR MESH - J PAVEMENT FAMILY

PAVEMENT FAMILY: MESH – J [Joint & Spall Repair]

Number of data points available for regression of performance curves : 1347

Range of years of data available for the given family : 04 to 18 years

1. Corner Cracking [CRNR_CK]
   Existing Expert Model ends at @ 28 years
   Historical data forced to end at 28 years has a R^2 value of : 0.744 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

2. D-Cracking/ASR [DASR]
   Existing Expert Model ends at @ 15 years
   Historical data forced to end at 15 years has a R^2 value of : 0.338
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.534 ✓

3. Faulting [FAULT]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the expert curve of the Mesh-G Family use endpoint of 29 years
   Historical data forced to end at 29 years has a R^2 value of : 0.510 ✓

4. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the model for the Mesh-G Family use endpoint of 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.003 ✓

5. Joint Spalling [JNT_SPL]
   Existing Expert Model ends at @ 15 years
   Historical data forced to end at 15 years has a R^2 value of : 0.121 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   Existing Expert Model ends at @ 17 years
   Historical data forced to end at 17 years has a R^2 value of : 0.013 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

CORNER CRACKING ON MESH AFTER PAVEMENT RESTORATION 2

INDEX = C - M * AGE ^ B

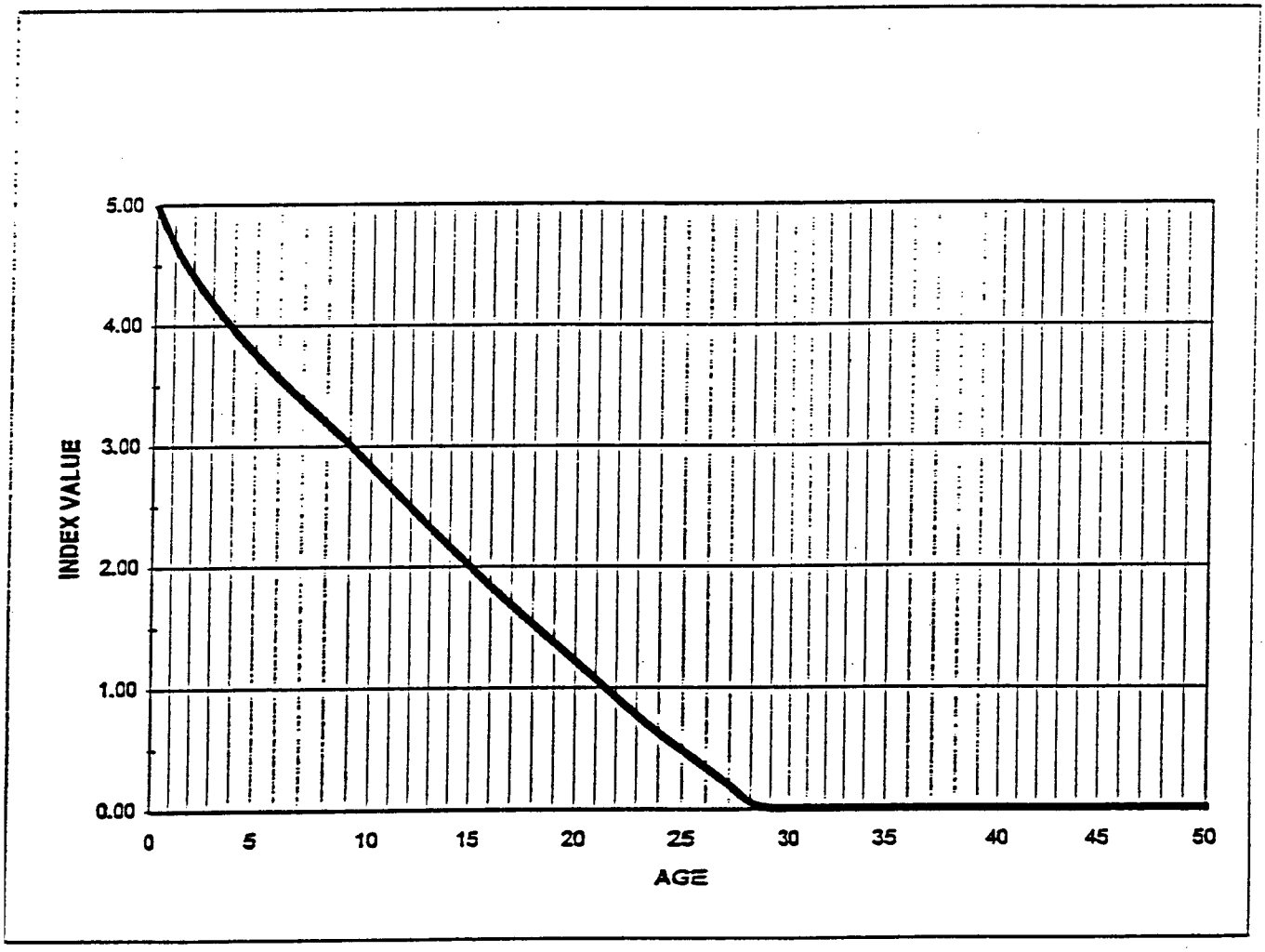
C Value: 5.00
M Value: 0.3449923
B Value: 0.80

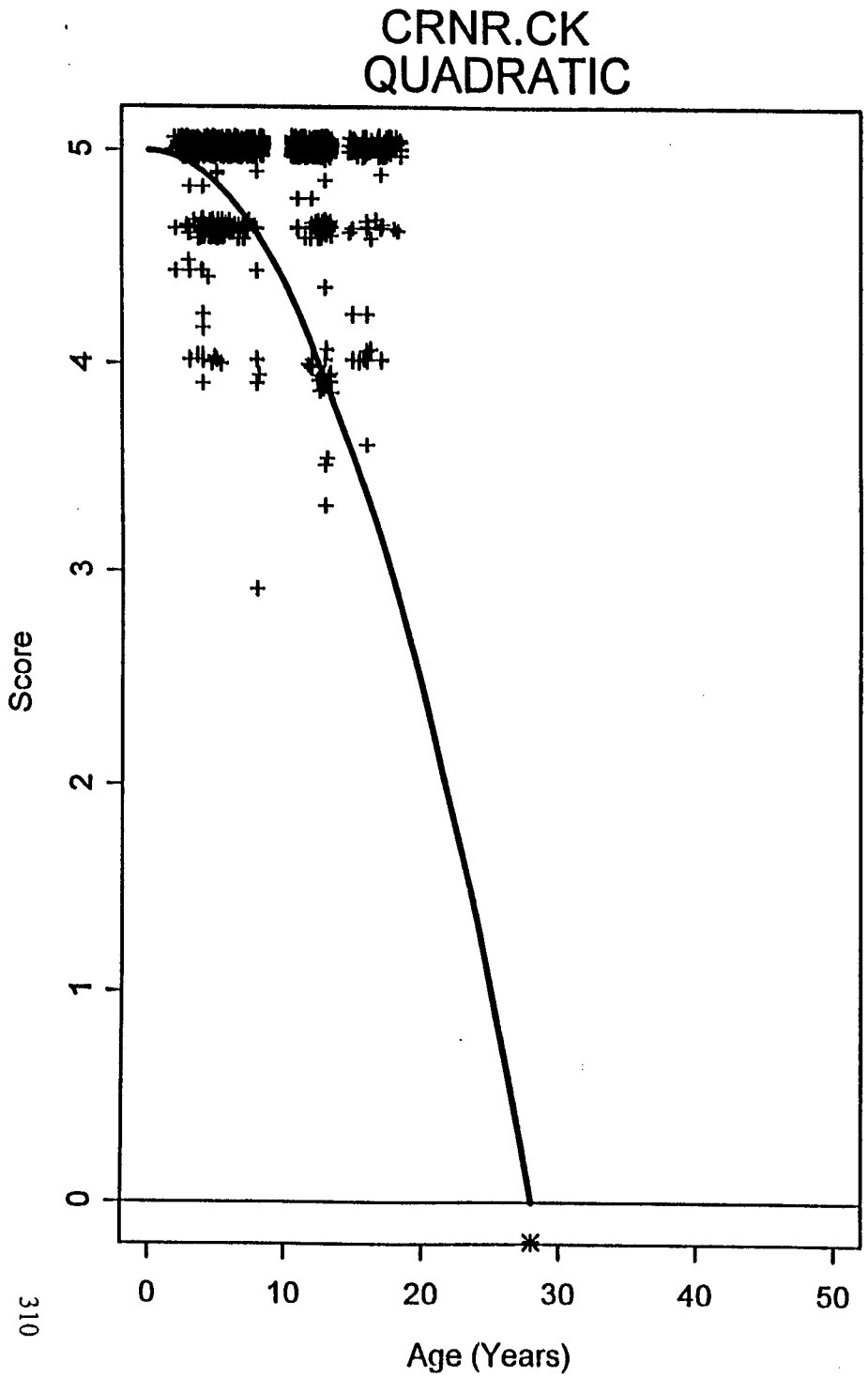
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.66	4.40	4.17	3.95	3.75	3.55	3.36	3.18	3.00	2.82

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.65	2.48	2.31	2.15	1.99	1.83	1.67	1.52	1.36	1.21	1.06

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.91	0.76	0.61	0.47	0.32	0.18	0.04	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:35:04 1998
Family: MESH
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 28

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.096	0.021	4.667	0

R-Squared = 0.626

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.118	0.019	6.139	0

R-Squared = 0.744

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.118	0.019	6.139	0

R-Squared = 0.744

D-CRACKING/ASR ON MESH AFTER PAVEMENT RESTORATION 2

INDEX = C - M * AGE ^ B

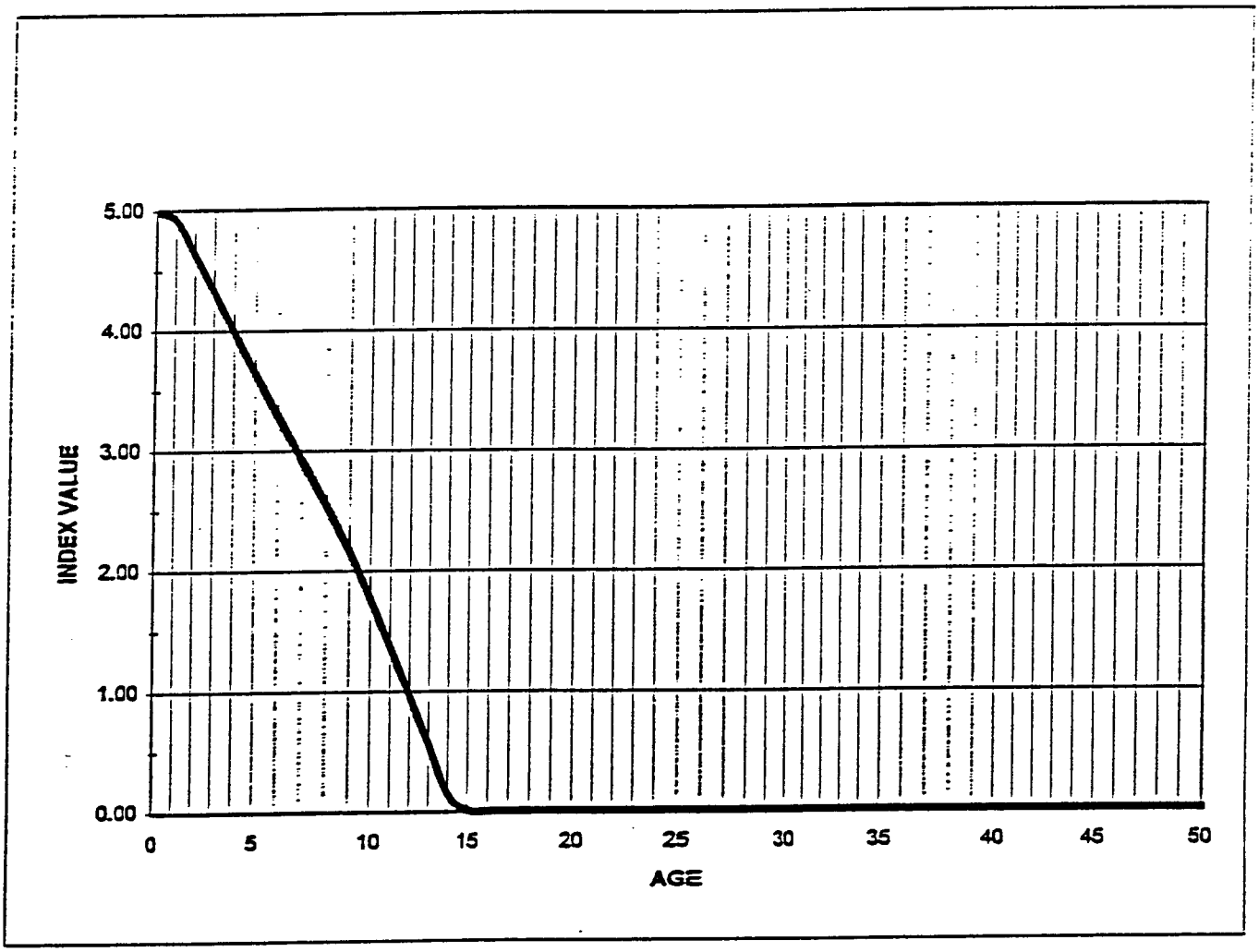
C Value: 5.15
M Value: 0.2352972
B Value: 1.16

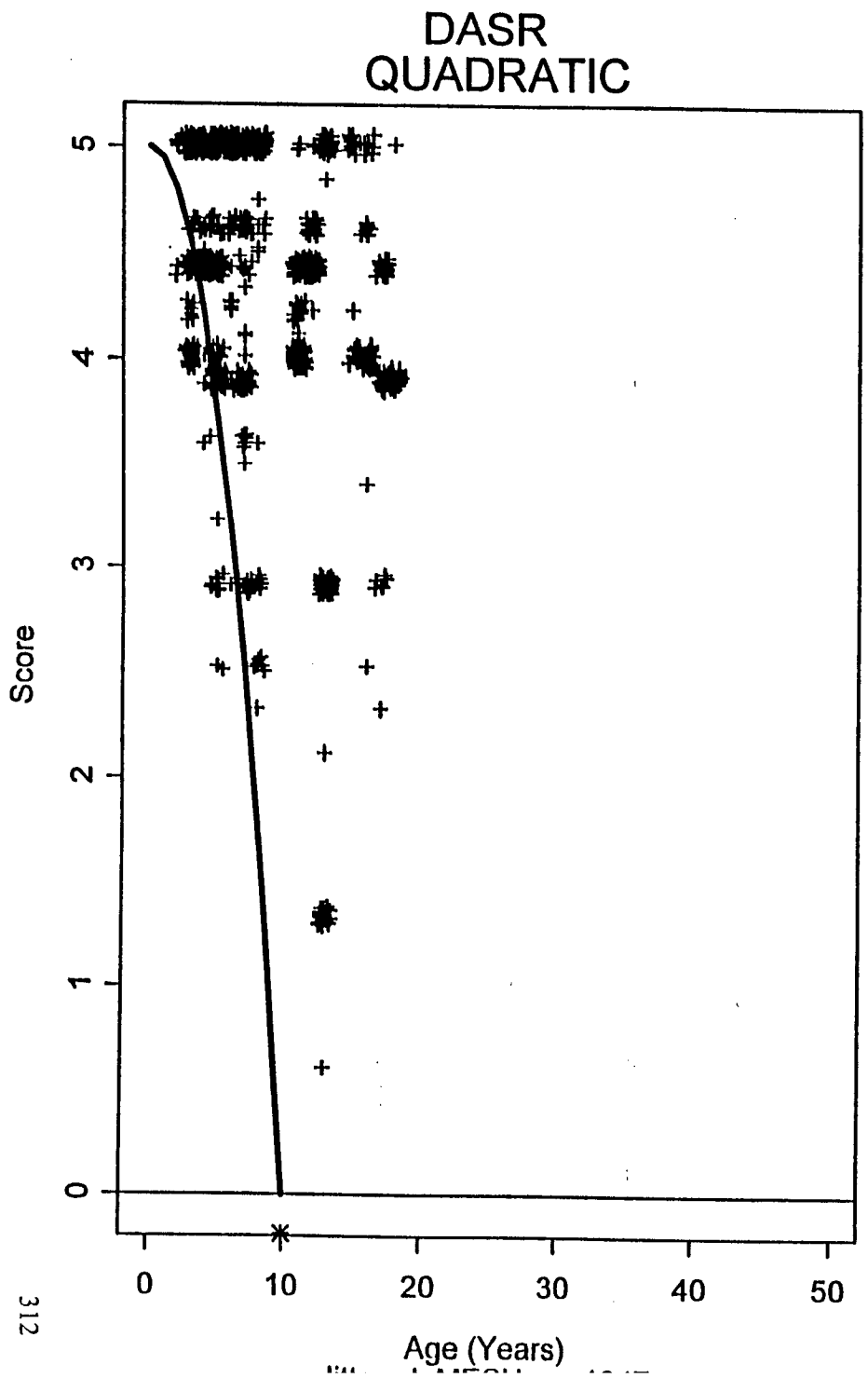
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.91	4.62	4.31	3.98	3.63	3.27	2.90	2.52	2.14	1.75

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.35	0.95	0.54	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:31:59 1998
Family: MESH
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.341	0.181	1.888	0.108

R-Squared = 0.373

50TH PERCENTILE
Coefficient Estimates:

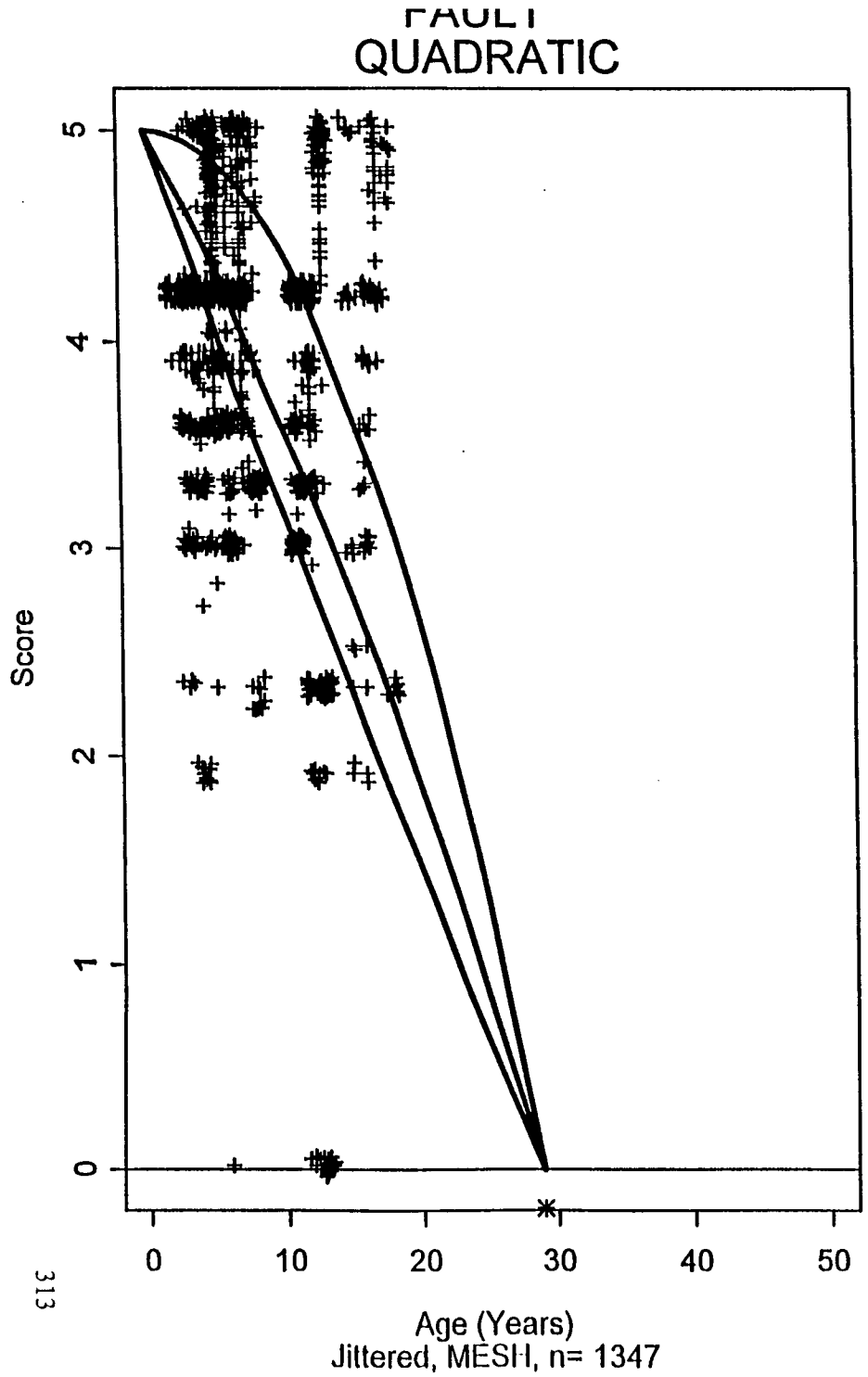
	Value	Std. Error	t value	Pr(>|t|)
1	0.49	0.187	2.622	0.039

R-Squared = 0.534

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.632	0.171	3.706	0.01

R-Squared = 0.696



Date of Analysis: Thu May 7 19:36:25 1998
Family: MESH
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 29

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.189	0.035	-5.456	0

R-Squared = 0.696

50TH PERCENTILE
Coefficient Estimates:

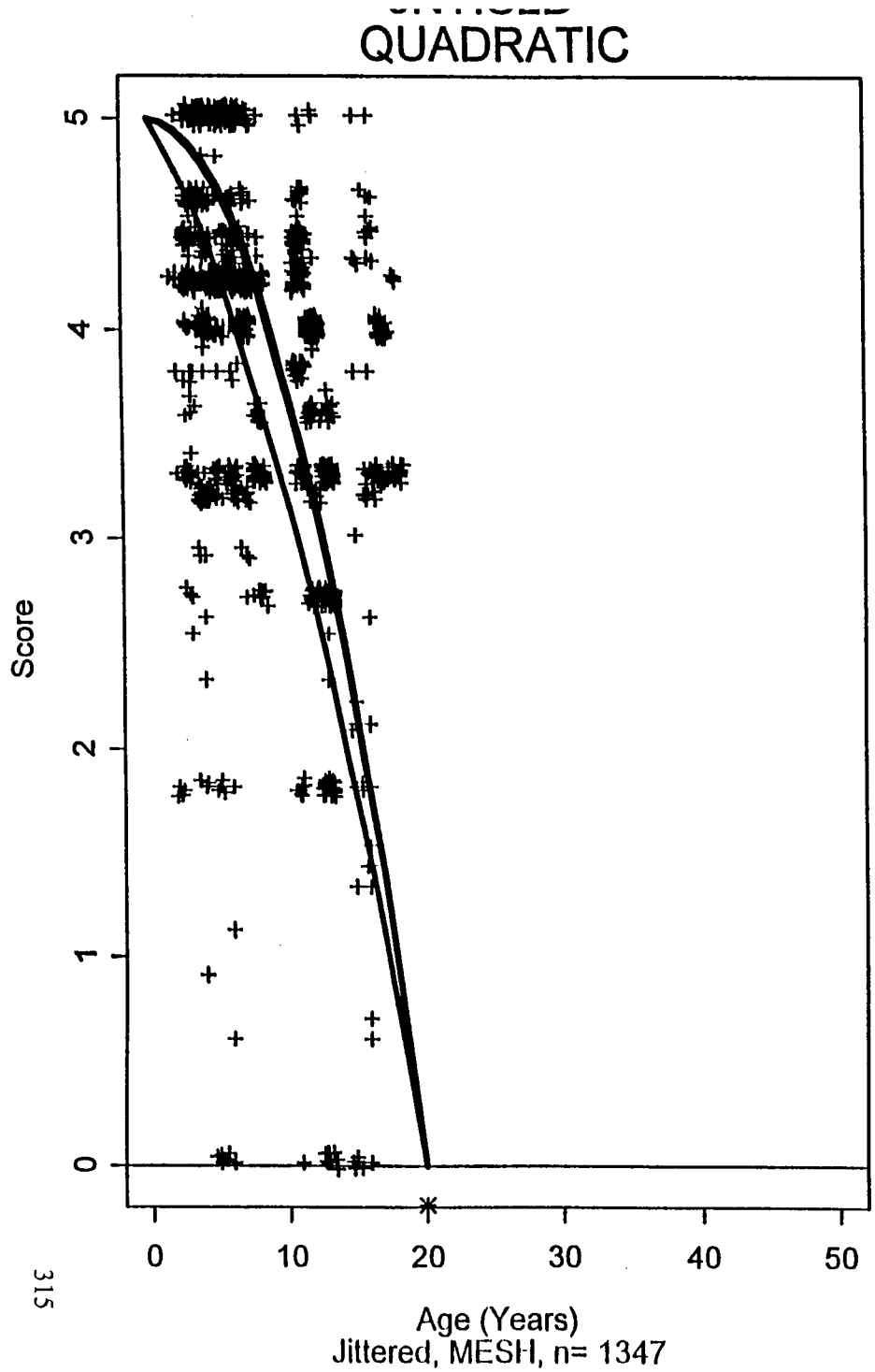
	Value	Std. Error	t value	Pr(>|t|)
1	-0.125	0.034	-3.676	0.003

R-Squared = 0.51

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.005	0.032	0.155	0.879

R-Squared = 0.002



Date of Analysis: Thu May 7 19:37:55 1998
Family: MESH
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.111	0.057	-1.953	0.073

R-Squared = 0.227

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.011	0.053	-0.2	0.845

R-Squared = 0.003

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.096	0.049	1.956	0.072

R-Squared = 0.227

JOINT SPALLING ON MESH AFTER PAVEMENT RESTORATION 2

INDEX = C - M * AGE ^ B

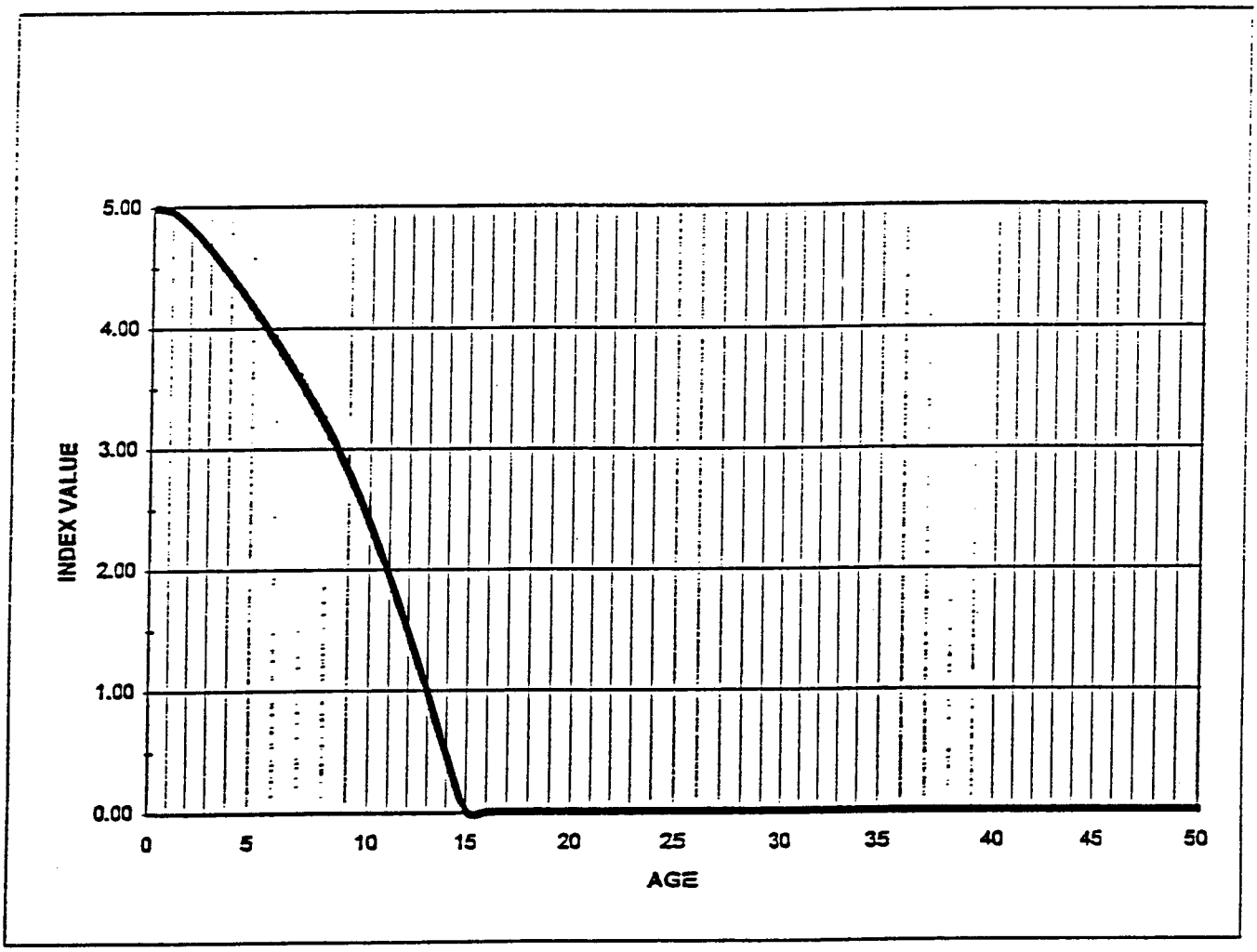
C Value: 5.02
M Value: 0.06359965
B Value: 1.62

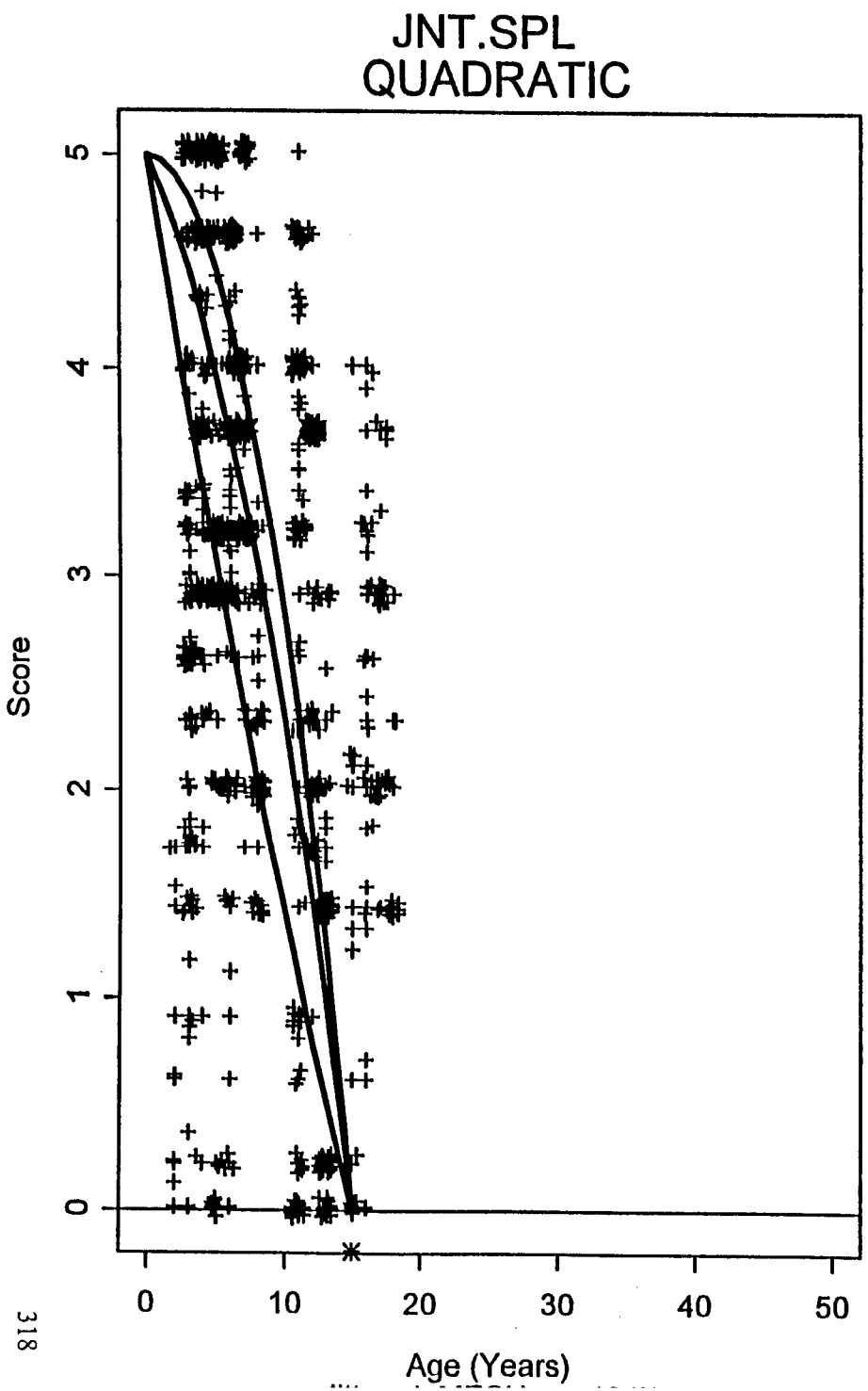
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.96	4.82	4.64	4.42	4.16	3.86	3.53	3.17	2.78	2.37

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.93	1.46	0.96	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:33:47 1998
Family: MESH
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.418	0.091	-4.593	0.001

R-Squared = 0.678

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.145	0.123	-1.173	0.268

R-Squared = 0.121

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.091	0.105	0.86	0.41

R-Squared = 0.069

ROUGHNESS ON MESH AFTER PAVEMENT RESTORATION 2

INDEX = C - M * AGE ^ B

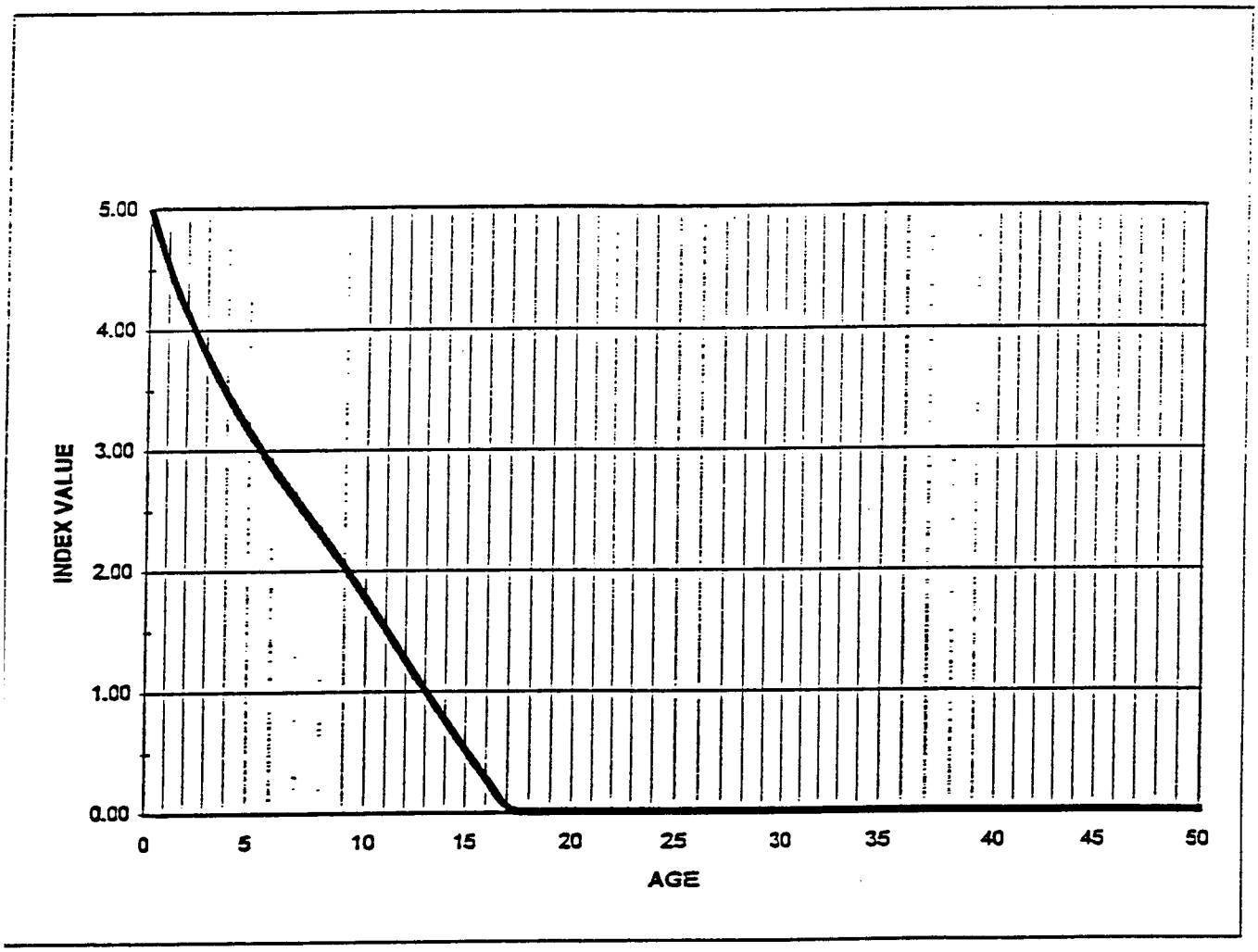
C Value: 5.02
M Value: 0.5172489
B Value: 0.80

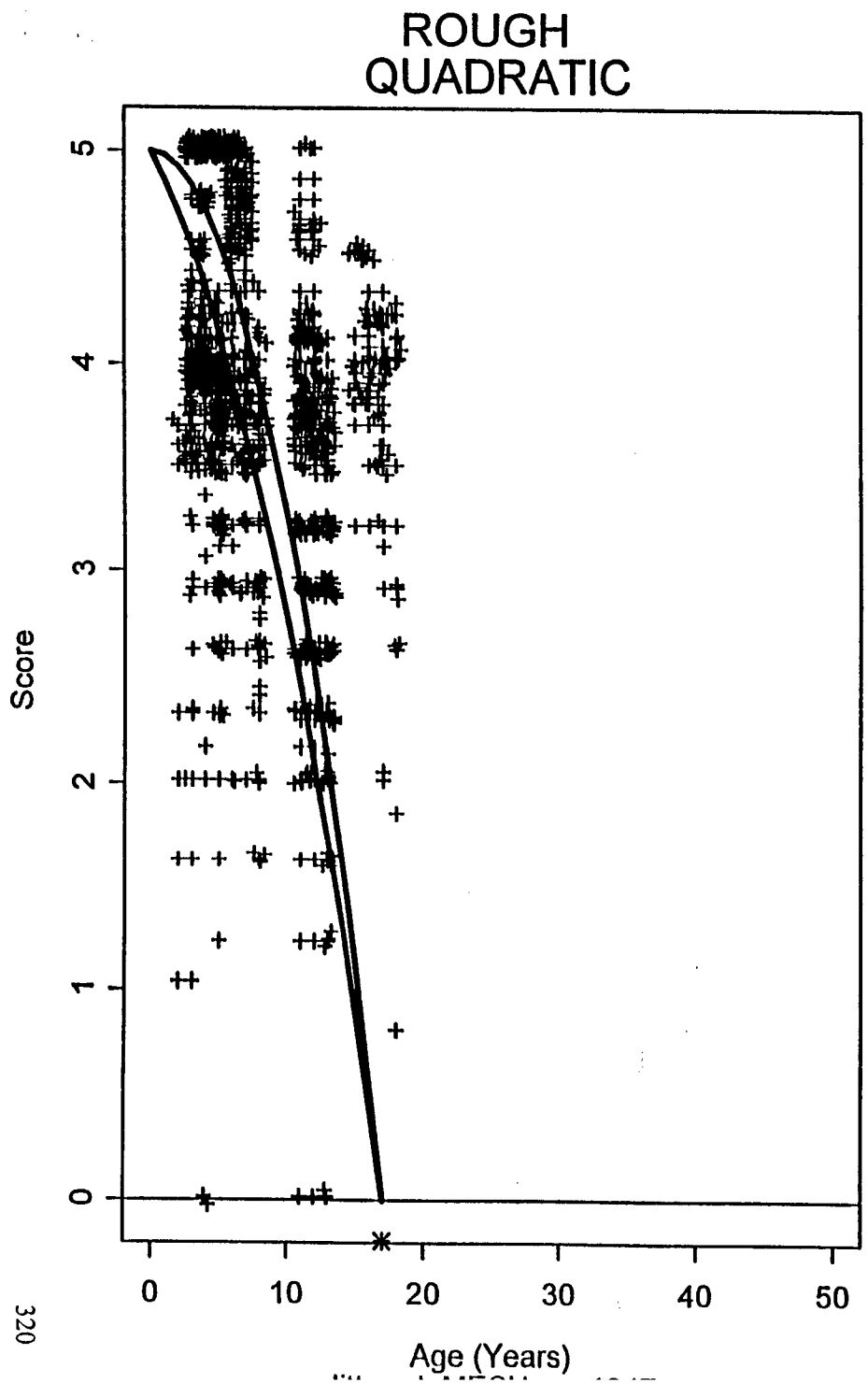
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.50	4.12	3.77	3.45	3.15	2.85	2.57	2.29	2.02	1.76

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	1.50	1.24	0.99	0.75	0.51	0.27	0.03	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Thu May 7 19:30:26 1998
Family: MESH
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 17

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.122	0.09	-1.356	0.2

R-Squared = 0.133

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.038	0.097	0.392	0.702

R-Squared = 0.013

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.207	0.094	2.206	0.048

R-Squared = 0.288

APPENDIX F3

PERFORMANCE MODELS FOR TKSJ PAVEMENT FAMILY

APPENDIX F3.1

PERFORMANCE MODELS FOR TKSJ - O PAVEMENT FAMILY

PAVEMENT FAMILY: TKSJ – Original

Number of data points available for regression of performance curves : 2988

Range of years of data available for the given family : 08 to 45 years

1. Corner Cracking [CRNR_CK]
   Existing Expert Model ends at @ 28 years
   Historical data forced to end at 28 years has a R^2 value of : 0.788
   Optimum forced end point is obtained at 40 years with a R^2 value of : 0.855 ✓

2. D-Cracking/ASR [DASR]
   Existing Expert Model ends at @ 33 years
   Historical data forced to end at 33 years has a R^2 value of : 0.827
   Optimum forced end point is obtained at 40 years with a R^2 value of : 0.876 ✓

3. Faulting [FAULT]
   Existing Expert Model ends at @ 21 years
   Historical data forced to end at 21 years has a R^2 value of : 0.451
   Optimum forced end point is obtained at 24 years with a R^2 value of : 0.517 ✓

4. Joint Seal Damage [JNT_SLD]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.483
   Optimum forced end point is obtained at 28 years with a R^2 value of : 0.691 ✓

5. Joint Spalling [JNT_SPL]
   Existing Expert Model ends at @ 33 years
   Historical data forced to end at 33 years has a R^2 value of : 0.093
   Regression analysis provides inconclusive results so use the existing expert model.

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   Existing Expert Model ends at @ 30 years
   Historical data forced to end at 30 years has a R^2 value of : 0.335
   Optimum forced end point is obtained at 24 years with a R^2 value of : 0.492 ✓

CORNER CRACKING ON TKSJ

IDEX = C - M * AGE ^ B

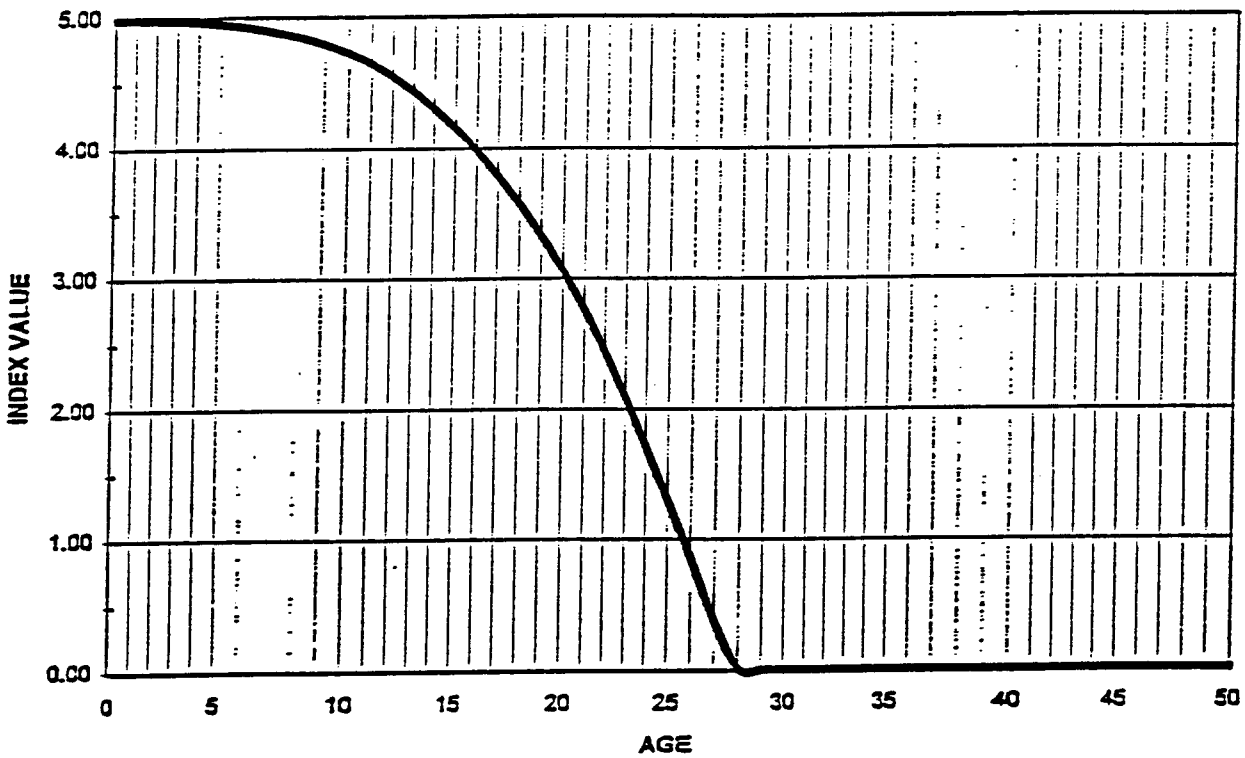
; Value: 4.99
1 Value: 0.0003388
| Value: 2.89

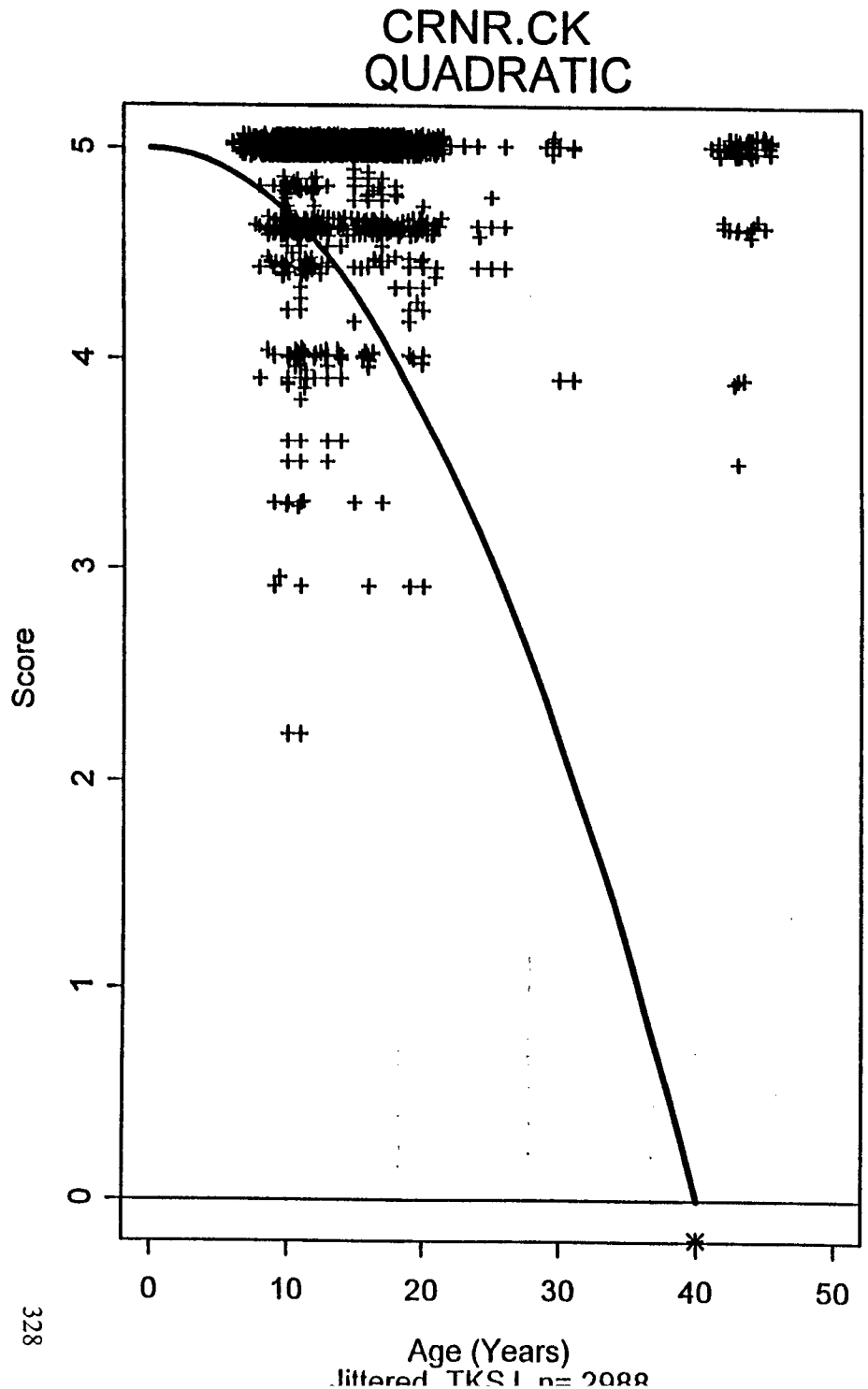
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.99	4.99	4.99	4.98	4.97	4.95	4.93	4.90	4.85	4.80	4.73

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.64	4.54	4.43	4.29	4.14	3.97	3.77	3.55	3.31	3.04	2.75

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	2.42	2.07	1.69	1.27	0.83	0.35	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:21:03 1998
Family: TKSJ
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 40

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.071	0.006	12.65	0

R-Squared = 0.874

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.074	0.006	11.643	0

R-Squared = 0.855

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.074	0.006	11.584	0

R-Squared = 0.854

D-CRACKING/ASR ON TKSJ

NDEX = C - M * AGE ^ B

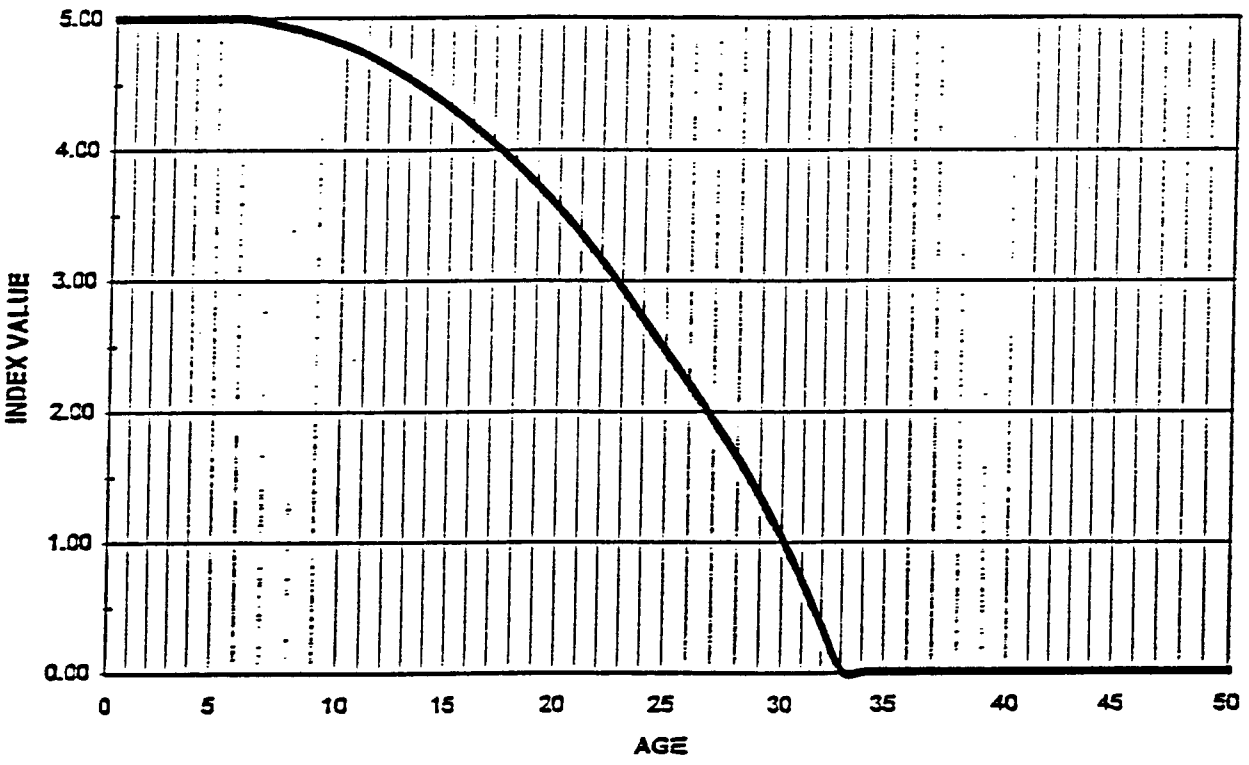
; Value: 5.09
1 Value: 0.0012434
I Value: 2.38

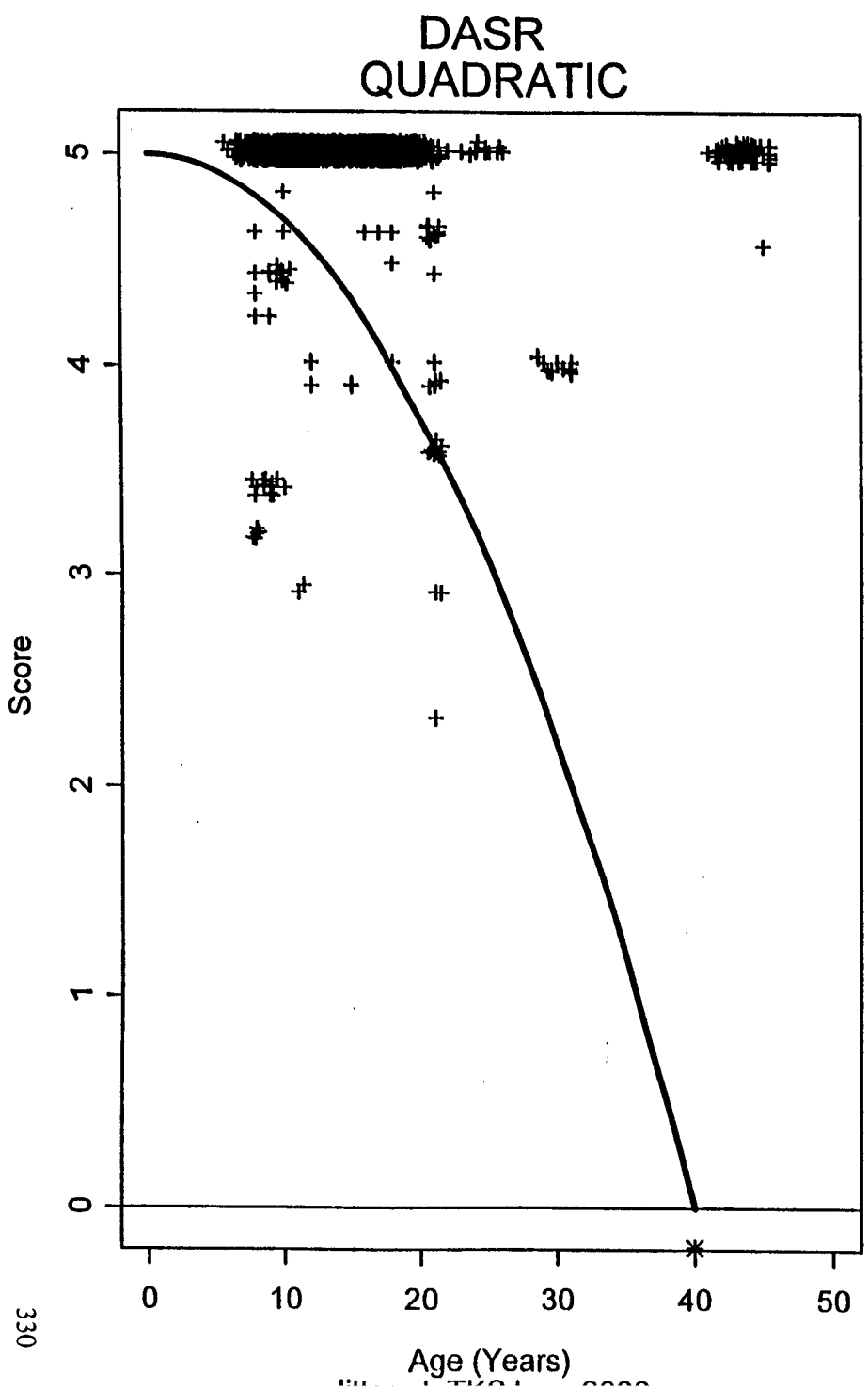
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.96	4.91	4.86	4.79

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.72	4.63	4.53	4.43	4.31	4.18	4.04	3.88	3.72	3.54	3.35

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	3.14	2.92	2.69	2.45	2.19	1.92	1.63	1.33	1.01	0.68	0.34

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:15:49 1998
Family: TKSJ
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 40

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.071	0.006	11.772	0

R-Squared = 0.858

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.073	0.006	12.746	0

R-Squared = 0.876

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.073	0.006	12.545	0

R-Squared = 0.872

FAULTING ON TKSJ

INDEX = C - M * AGE ^ B

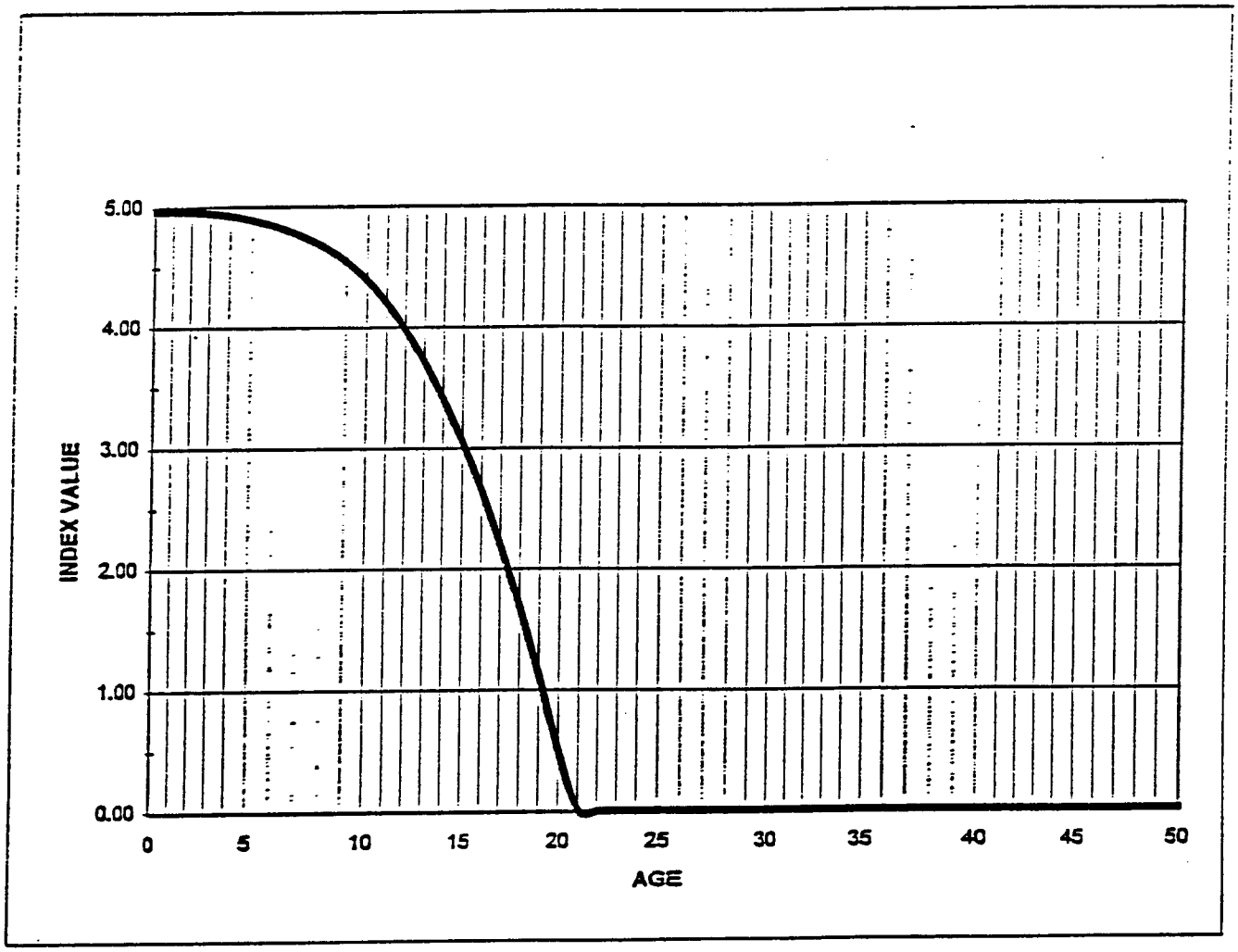
C Value: 4.97
M Value: 0.0006932
B Value: 2.93

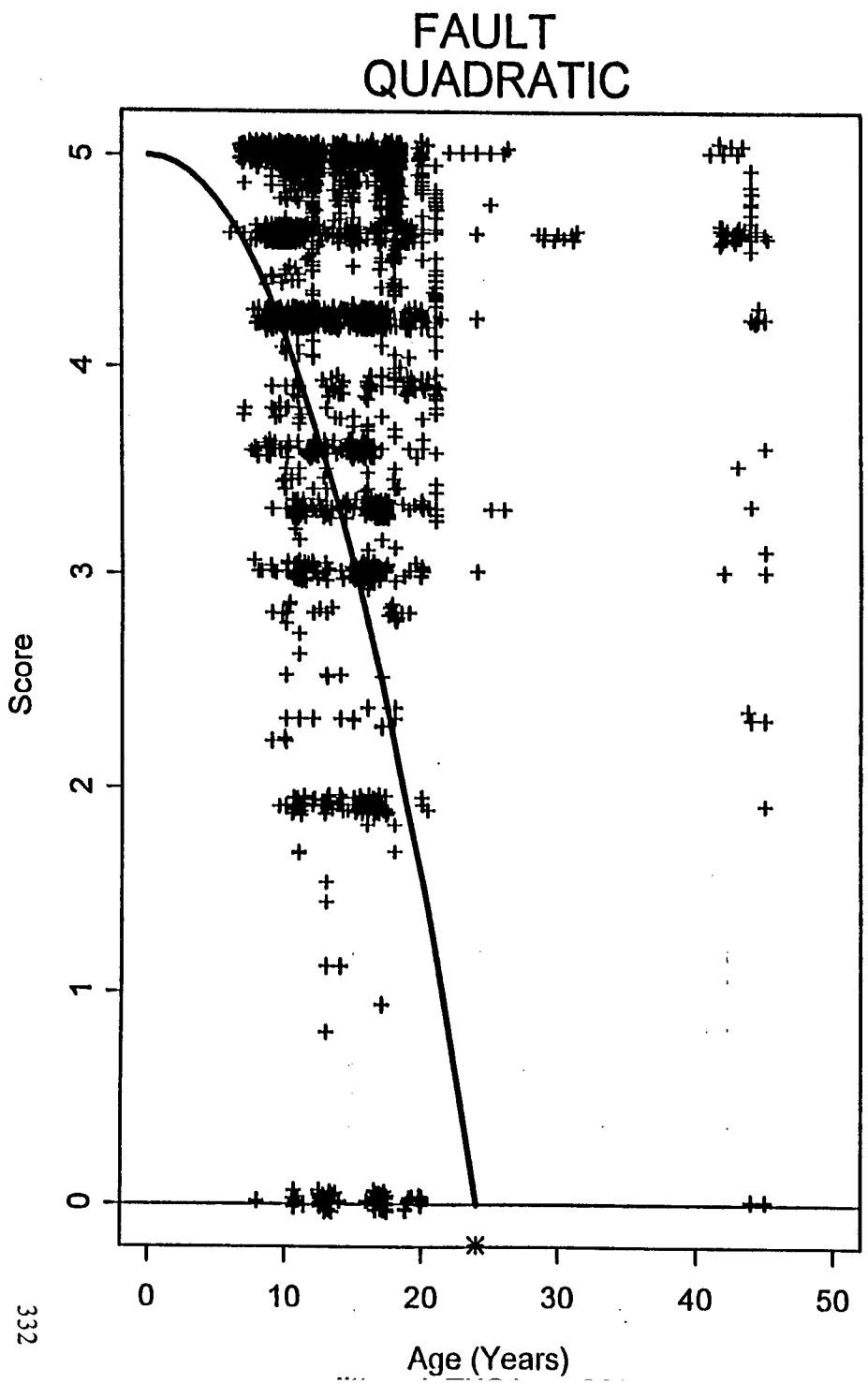
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.97	4.97	4.96	4.95	4.93	4.89	4.84	4.76	4.66	4.54	4.38

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.19	3.96	3.70	3.39	3.03	2.63	2.18	1.67	1.10	0.47	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:22:16 1998
Family: TKSJ
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 24

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.075	0.045	1.672	0.112

R-Squared = 0.134

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.179	0.041	4.386	0

R-Squared = 0.517

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.244	0.041	5.922	0

R-Squared = 0.661

JOINT SEAL DAMAGE ON TKSJ

INDEX = C - M * AGE ^ B

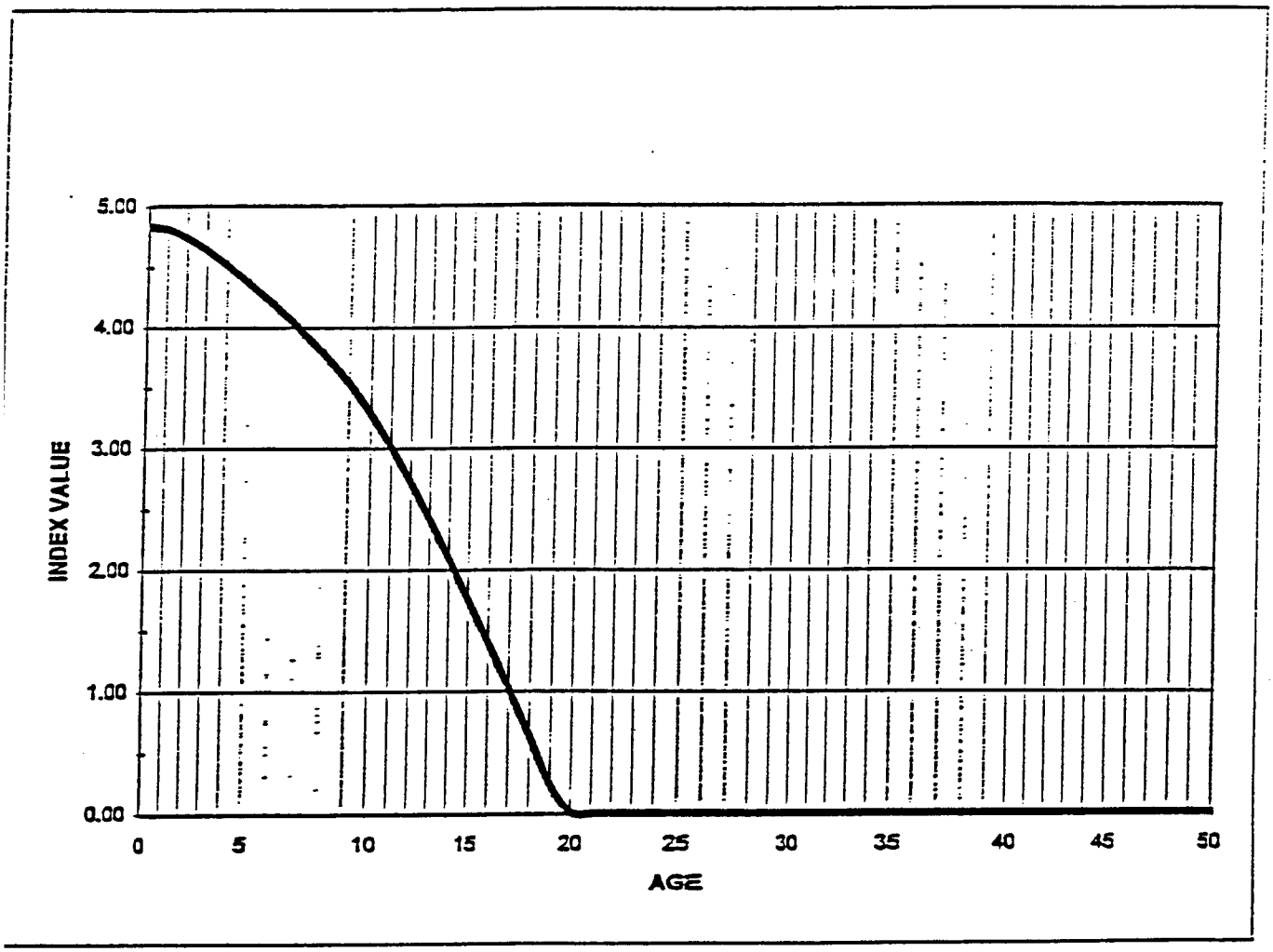
C Value: 4.84
M Value: 0.032867
B Value: 1.68

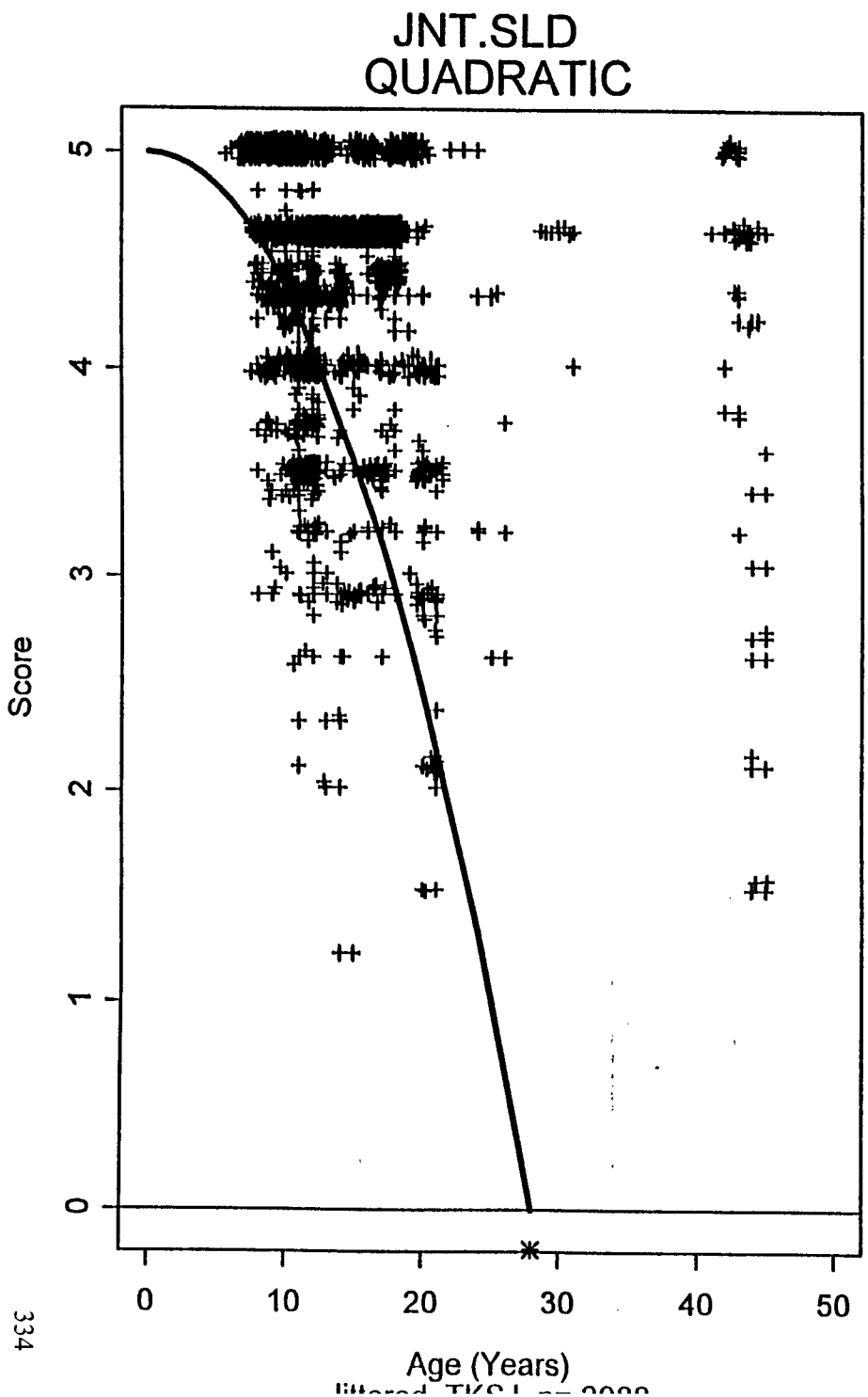
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.84	4.81	4.73	4.63	4.50	4.35	4.17	3.98	3.76	3.52	3.27

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.99	2.70	2.40	2.07	1.73	1.38	1.00	0.62	0.22	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:23:17 1998
Family: TKSJ
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 28

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.091	0.024	3.748	0.001

R-Squared = 0.413

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.126	0.019	6.684	0

R-Squared = 0.691

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.145	0.016	8.879	0

R-Squared = 0.798

JOINT SPALLING ON TKSJ

INDEX = C - M * AGE ^ B

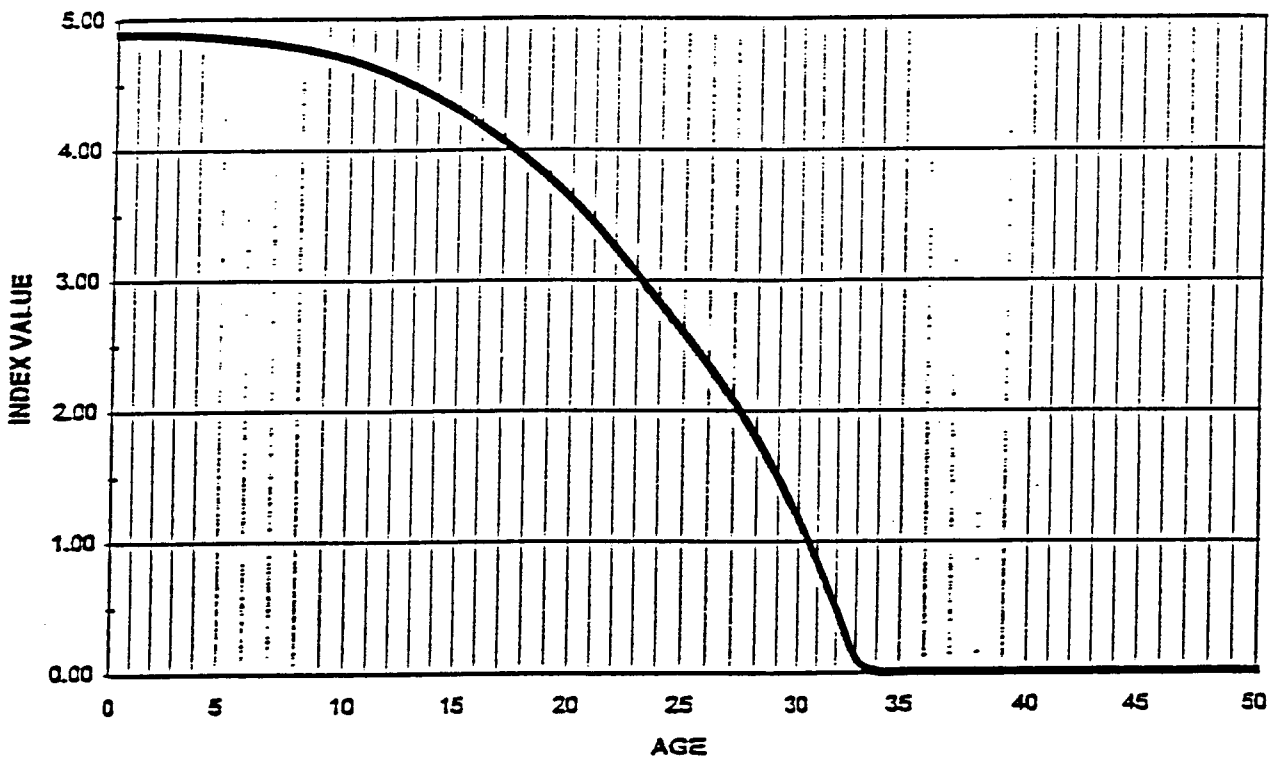
C Value: 4.89
M Value: 0.0004874
B Value: 2.53

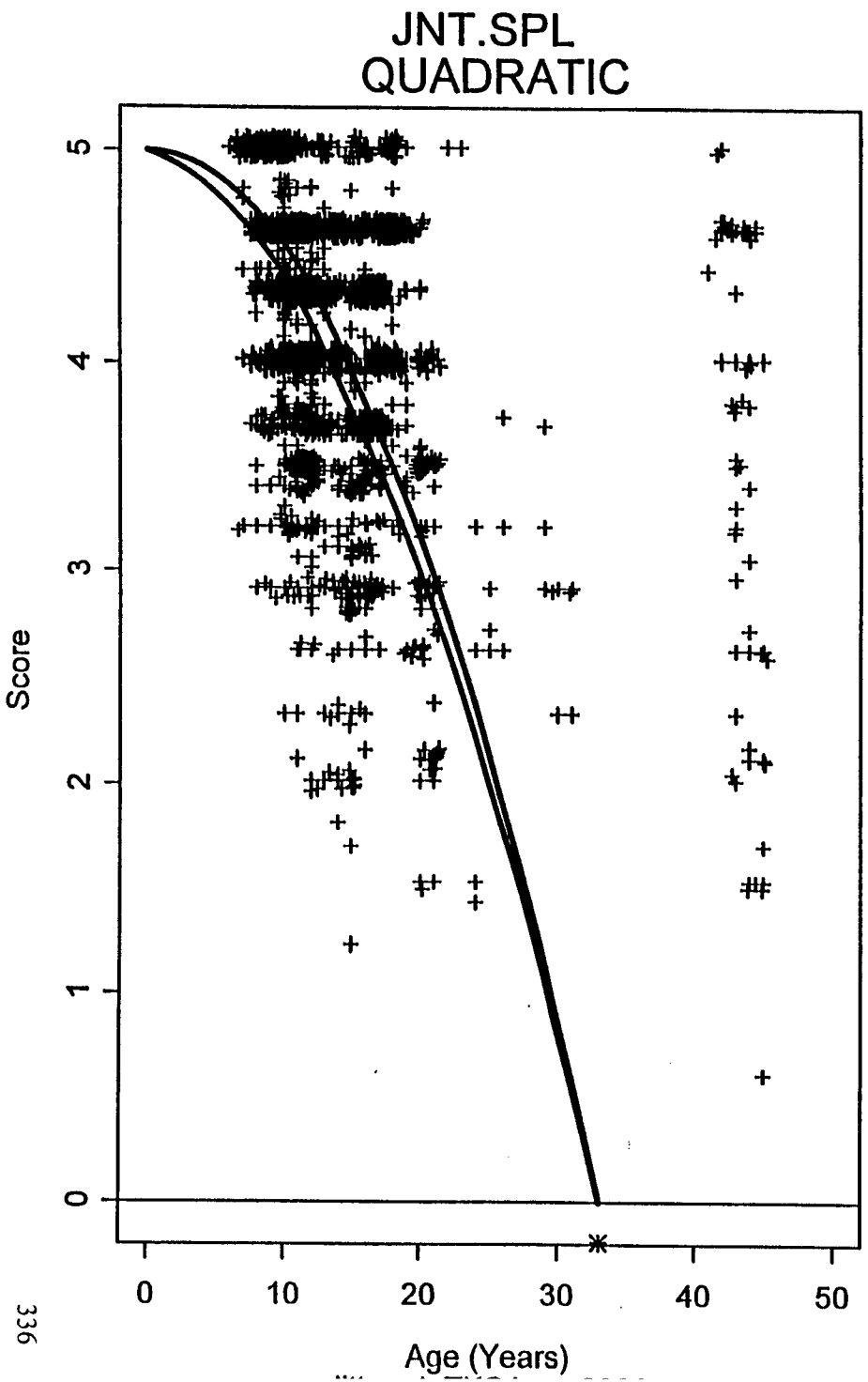
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.89	4.89	4.88	4.87	4.86	4.84	4.81	4.77	4.73	4.68

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.62	4.55	4.48	4.39	4.29	4.17	4.05	3.91	3.77	3.60	3.43

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	3.24	3.03	2.81	2.58	2.32	2.06	1.77	1.47	1.15	0.81	0.46

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:19:57 1998
Family: TKSJ
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 33

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.022	0.014	-1.552	0.134

R-Squared = 0.095

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.019	0.012	1.534	0.139

R-Squared = 0.093

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.057	0.009	6.449	0

R-Squared = 0.644

ROUGHNESS ON TKSJ

INDEX = C - M * AGE ^ B

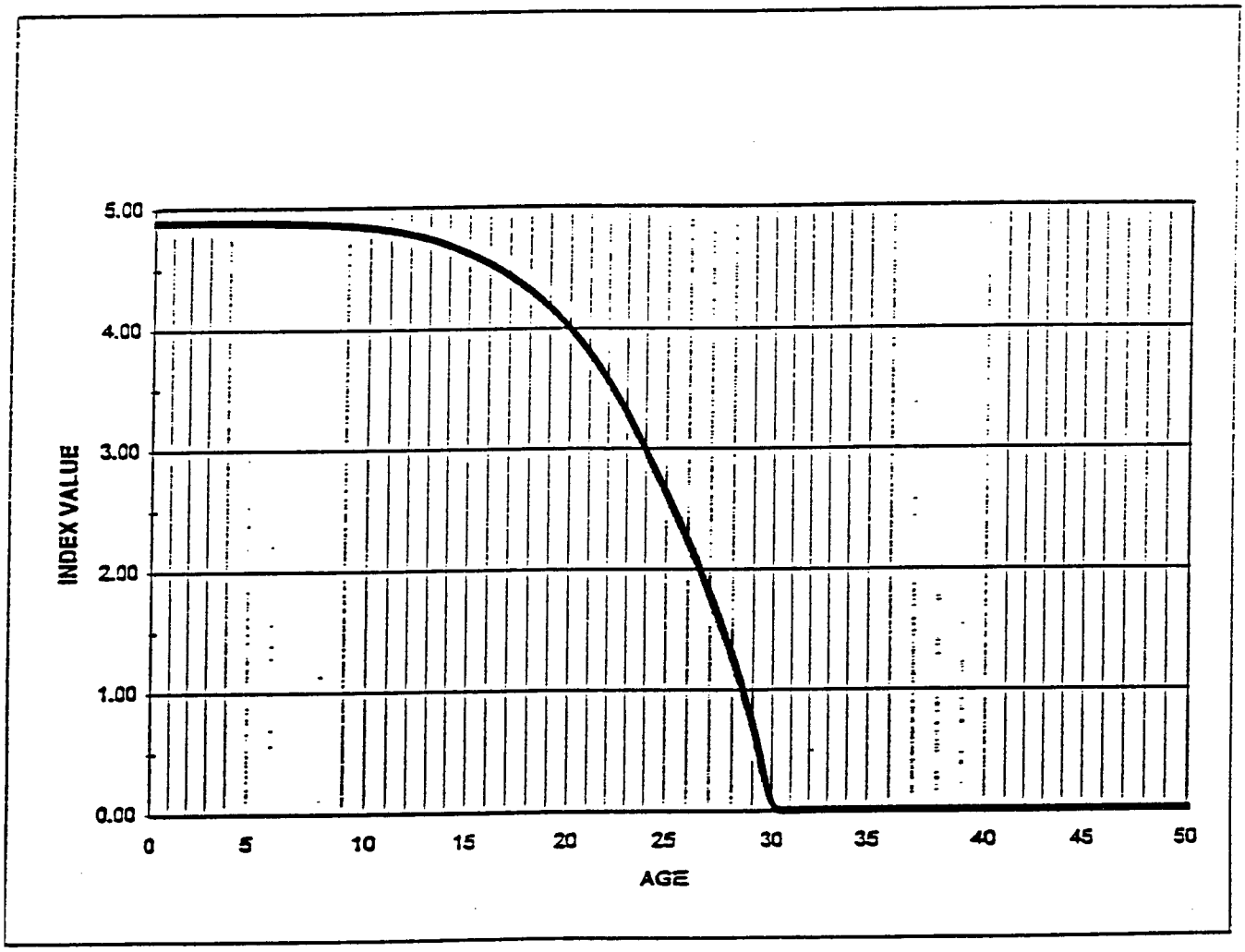
C Value: 4.89
M Value: 0.000003719
B Value: 4.14

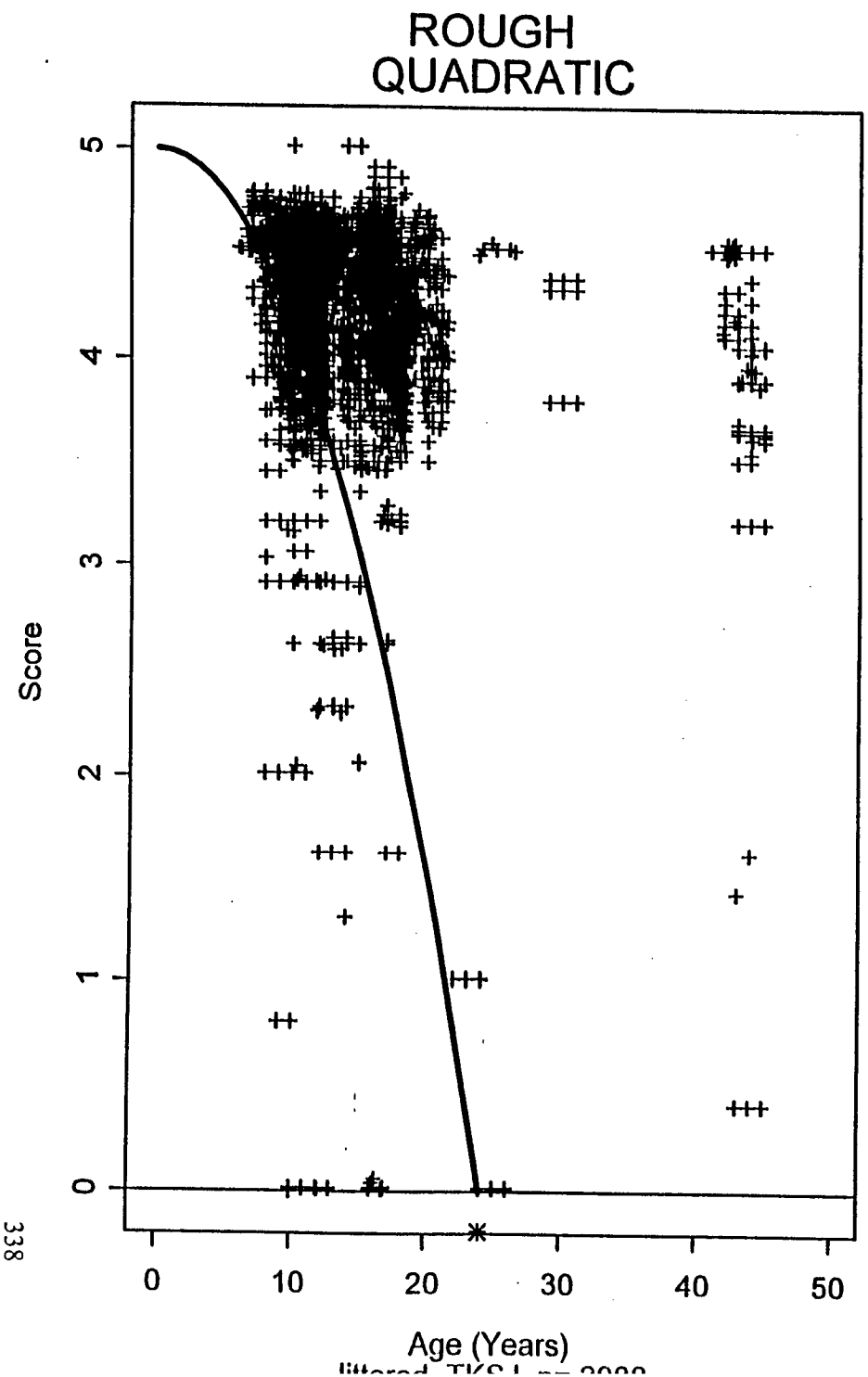
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.89	4.89	4.89	4.89	4.89	4.88	4.88	4.87	4.86	4.84

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.81	4.78	4.74	4.68	4.61	4.53	4.43	4.30	4.16	3.98	3.78

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	3.55	3.28	2.96	2.61	2.21	1.75	1.25	0.68	0.04	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:16:42 1998
Family: TKSJ
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 24

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.118	0.037	3.2	0.005

R-Squared = 0.363

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.16	0.038	4.171	0.001

R-Squared = 0.491

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.193	0.039	4.971	0

R-Squared = 0.579

APPENDIX F3.2

PERFORMANCE MODELS FOR TKSJ - G PAVEMENT FAMILY

PAVEMENT FAMILY: TKSJ – G [Grinding on Original]

Number of data points available for regression of performance curves : 215

Range of years of data available for the given family : 06 to 08 years

1. Corner Cracking [CRNR_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 15 years with a R^2 value of : 0.886 ✓

2. D-Cracking/ASR [DASR]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 08 years with a R^2 value of : 0.986 ✓

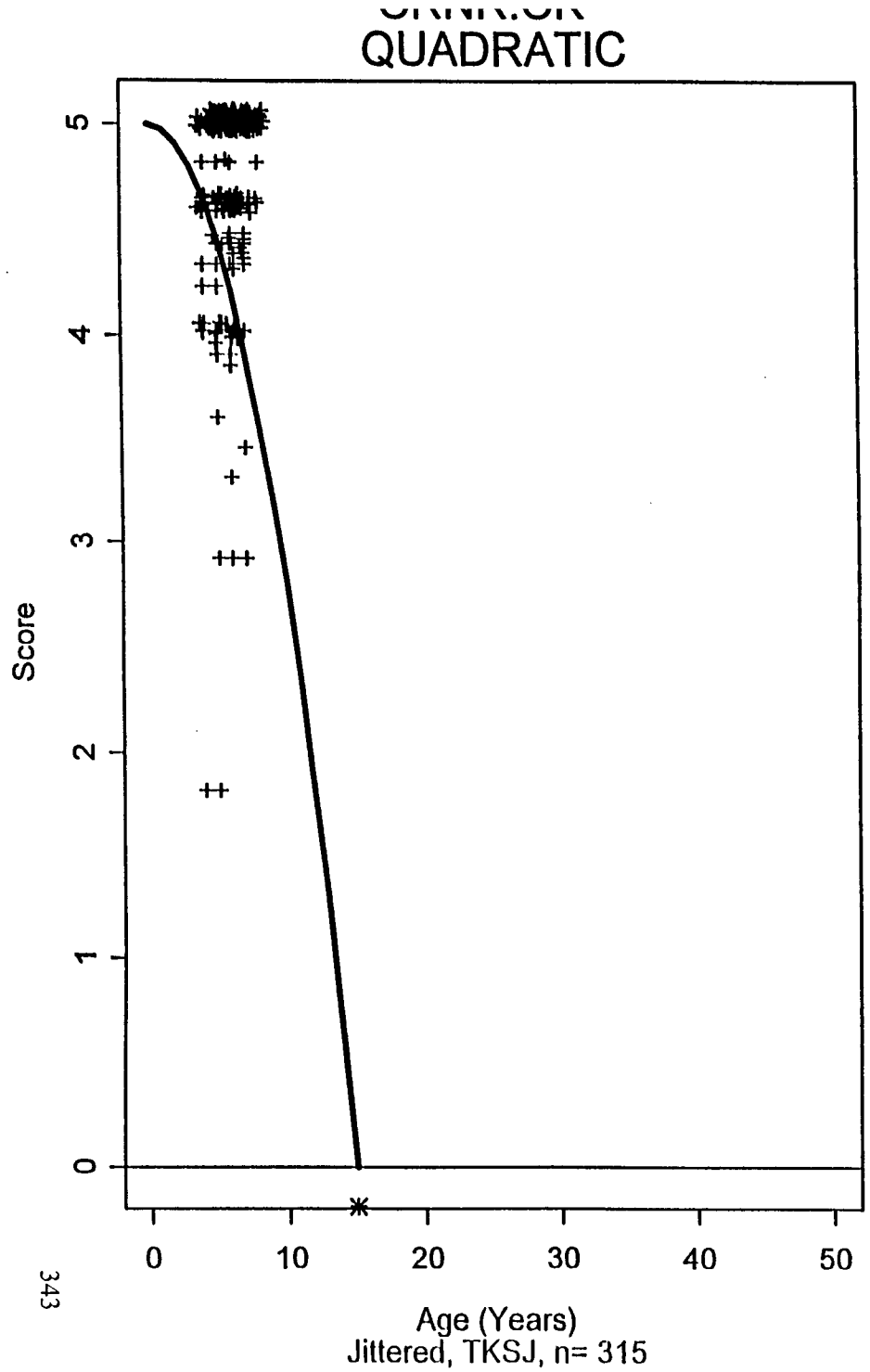
3. Faulting [FAULT]
   Existing Expert Model ends at @ 14 years
   Historical data forced to end at 14 years has a R^2 value of : 0.453
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.656 ✓

4. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 09 years with a R^2 value of : 0.527 ✓

5. Joint Spalling [JNT_SPL]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the model for the Mesh-J Family use endpoint of 13 years
   Historical data forced to end at 13 years has a R^2 value of : 0.445 ✓

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   Existing Expert Model ends at @ 20 years
   Historical data forced to end at 20 years has a R^2 value of : 0.205
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.797 ✓



Date of Analysis: Fri May 8 07:34:16 1998
Family: TKSJ
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.164	0.058	2.837	0.047

R-Squared = 0.668

50TH PERCENTILE
Coefficient Estimates:

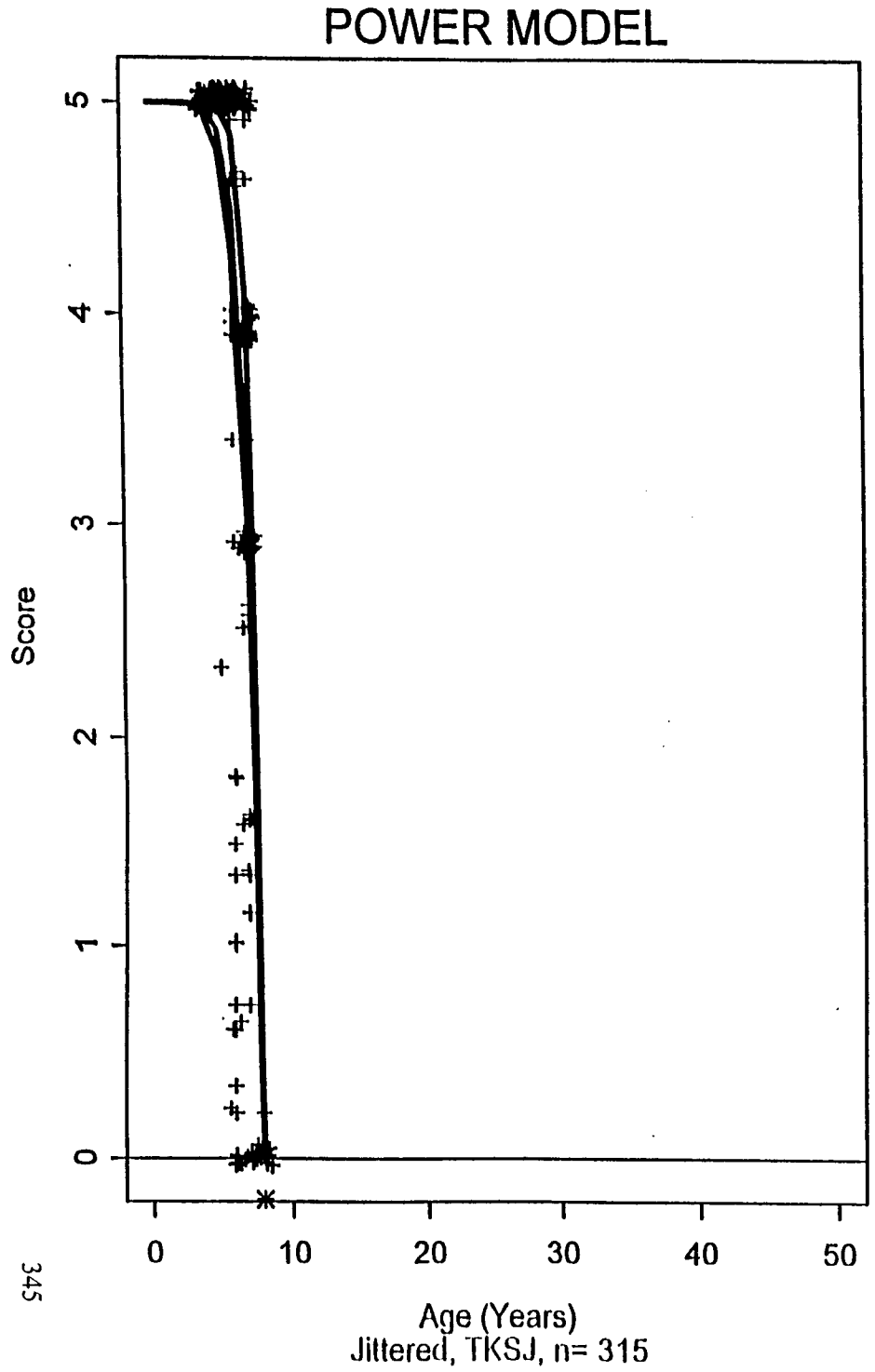
	Value	Std. Error	t value	Pr(>|t|)
1	0.227	0.041	5.586	0.005

R-Squared = 0.886

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.234	0.032	7.25	0.002

R-Squared = 0.929



Date of Analysis: Fri May 8 11:59:30 1998
Family: TKSJ
Index: DASR
Year(s): ALL
Model Type: POWER MODEL
Analysis Method: GQ
Forced Endpoint: 8

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	6.596	0.755	8.737

R-Squared = 0.99

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	7.902	1.135	6.961

R-Squared = 0.986

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value
b1	12.236	0.571	21.434

R-Squared = 0.999

FAULTING ON TKSJ AFTER GRINDING

INDEX = C - M * AGE ^ B

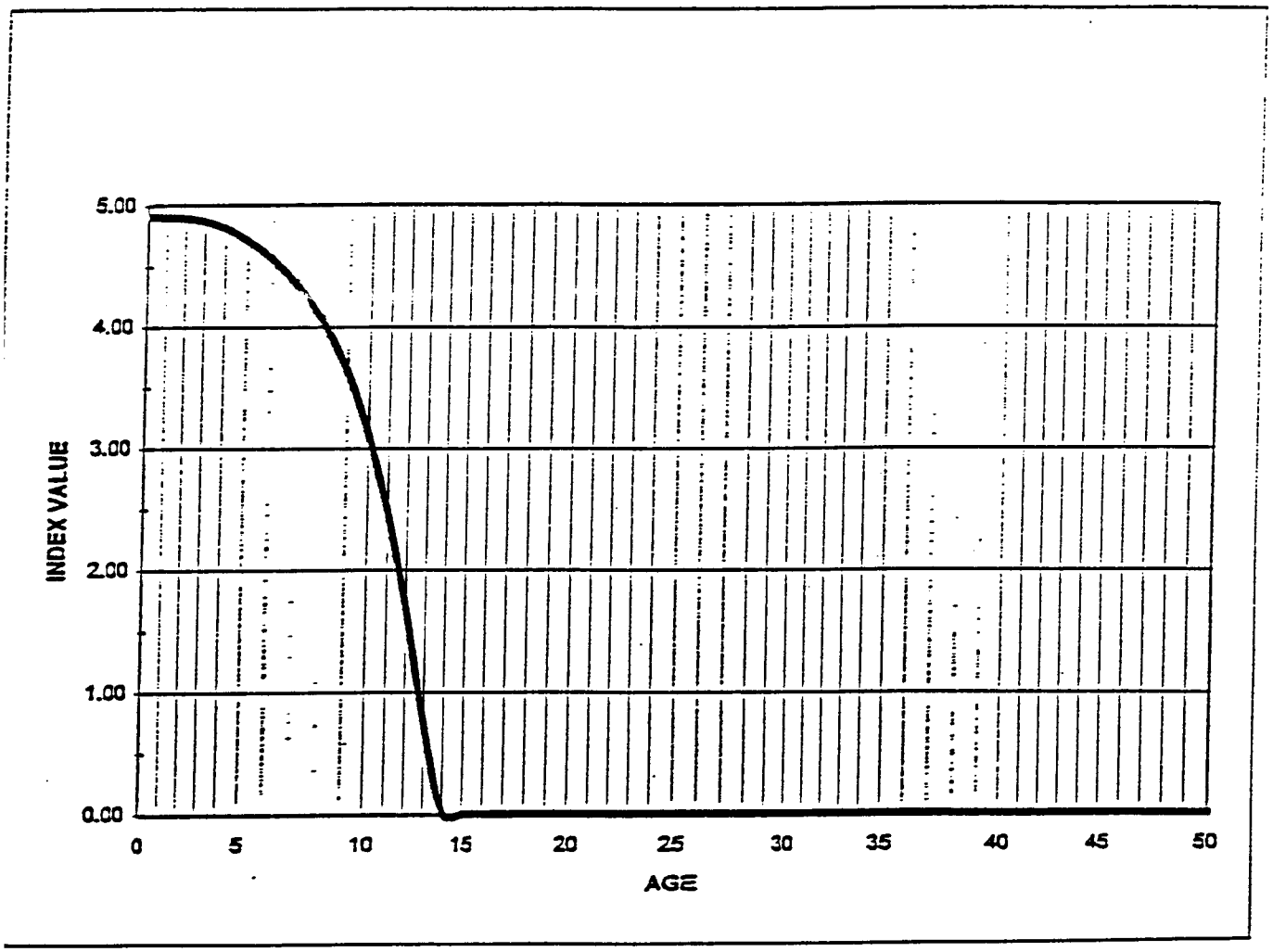
C Value: 4.91
M Value: 0.00123925
B Value: 3.17

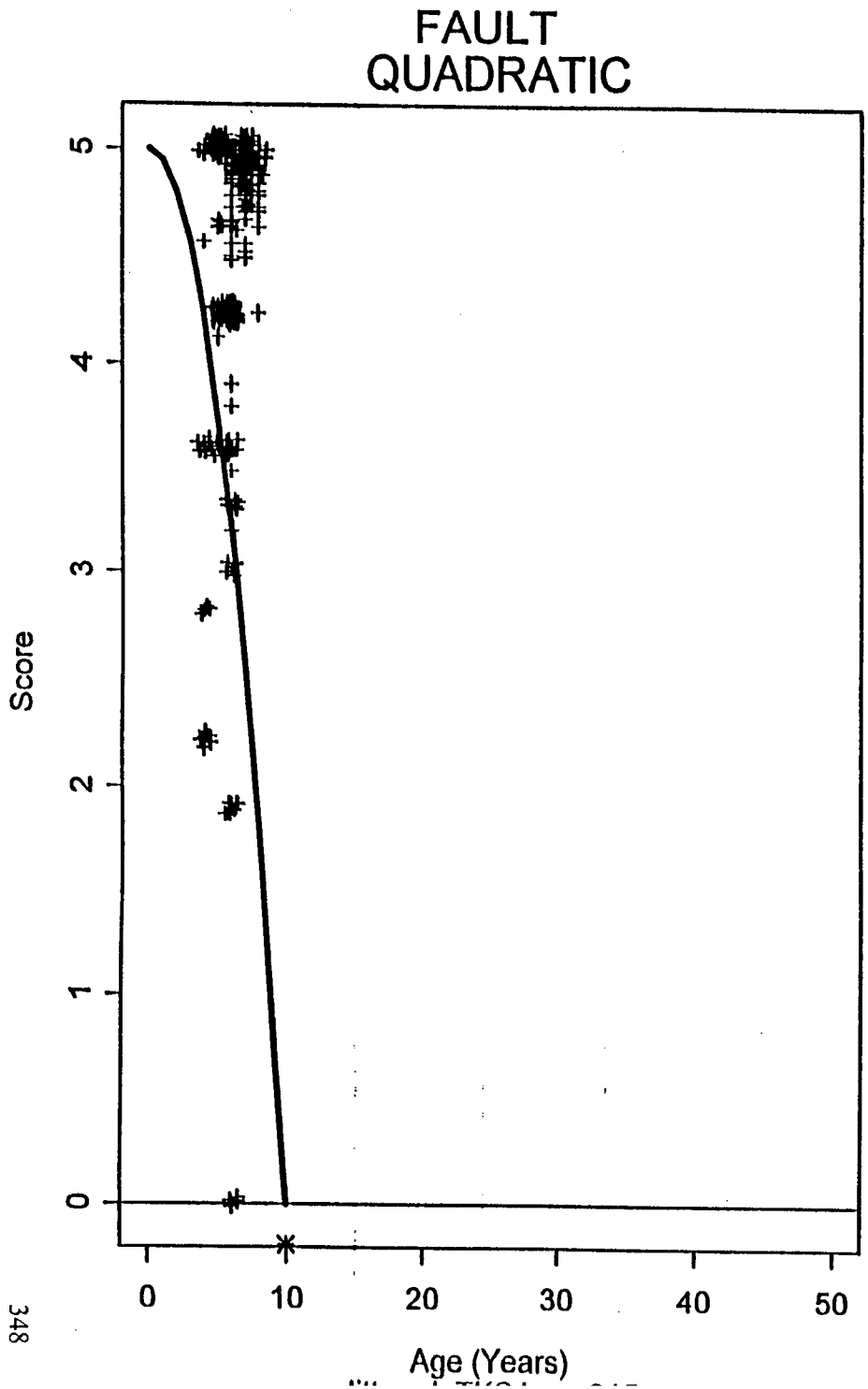
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.91	4.91	4.90	4.87	4.81	4.71	4.55	4.32	4.01	3.60	3.08

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.43	1.64	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:35:37 1998
Family: TKSJ
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.395	0.286	1.378	0.24

R-Squared = 0.322

50TH PERCENTILE
Coefficient Estimates:

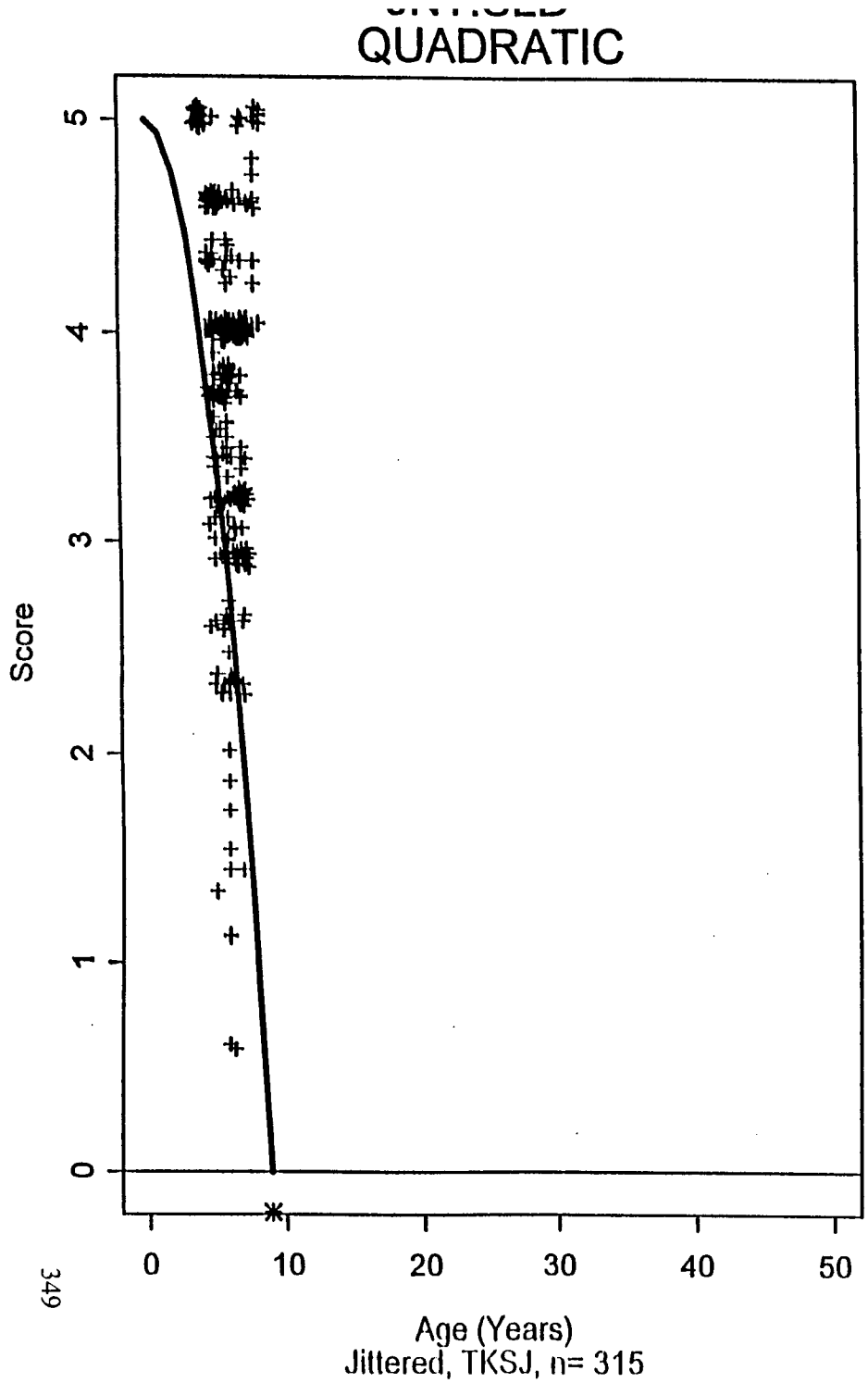
	Value	Std. Error	t value	Pr(>|t|)
1	0.583	0.211	2.764	0.051

R-Squared = 0.656

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.592	0.217	2.725	0.053

R-Squared = 0.65



Date of Analysis: Fri May 8 07:36:52 1998
Family: TKSJ
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 9

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.258	0.239	1.081	0.341

R-Squared = 0.226

50TH PERCENTILE
Coefficient Estimates:

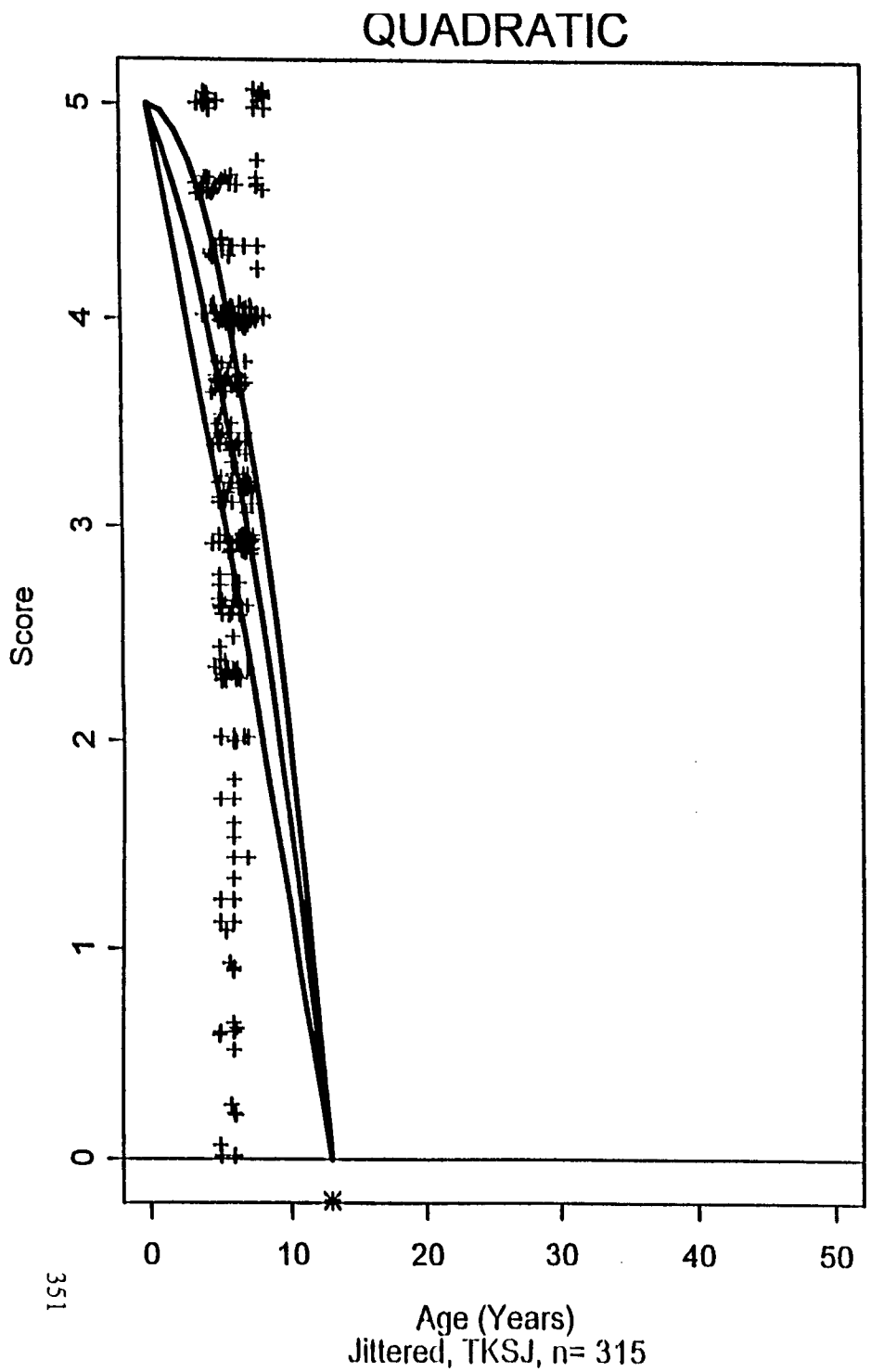
	Value	Std. Error	t value	Pr(>|t|)
1	0.497	0.236	2.109	0.103

R-Squared = 0.527

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.723	0.251	2.88	0.045

R-Squared = 0.675



Date of Analysis: Fri May 8 07:33:07 1998
Family: TKSJ
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 13

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.351	0.126	-2.78	0.05

R-Squared = 0.659

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.165	0.092	-1.792	0.148

R-Squared = 0.445

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.041	0.076	0.533	0.622

R-Squared = 0.066

ROUGHNESS ON TKSJ AFTER GRINDING

IDEX = C - M * AGE ^ B

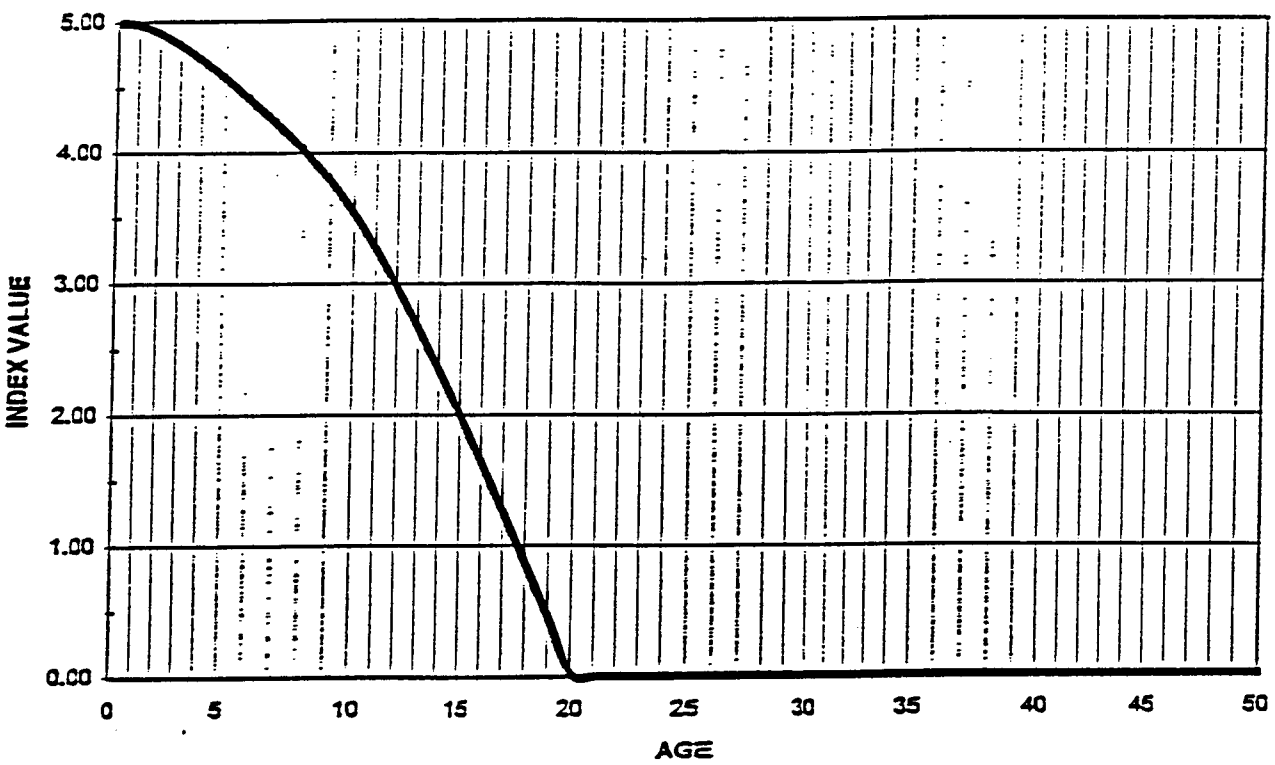
; Value: 5.00
I Value: 0.02638358
I Value: 1.75

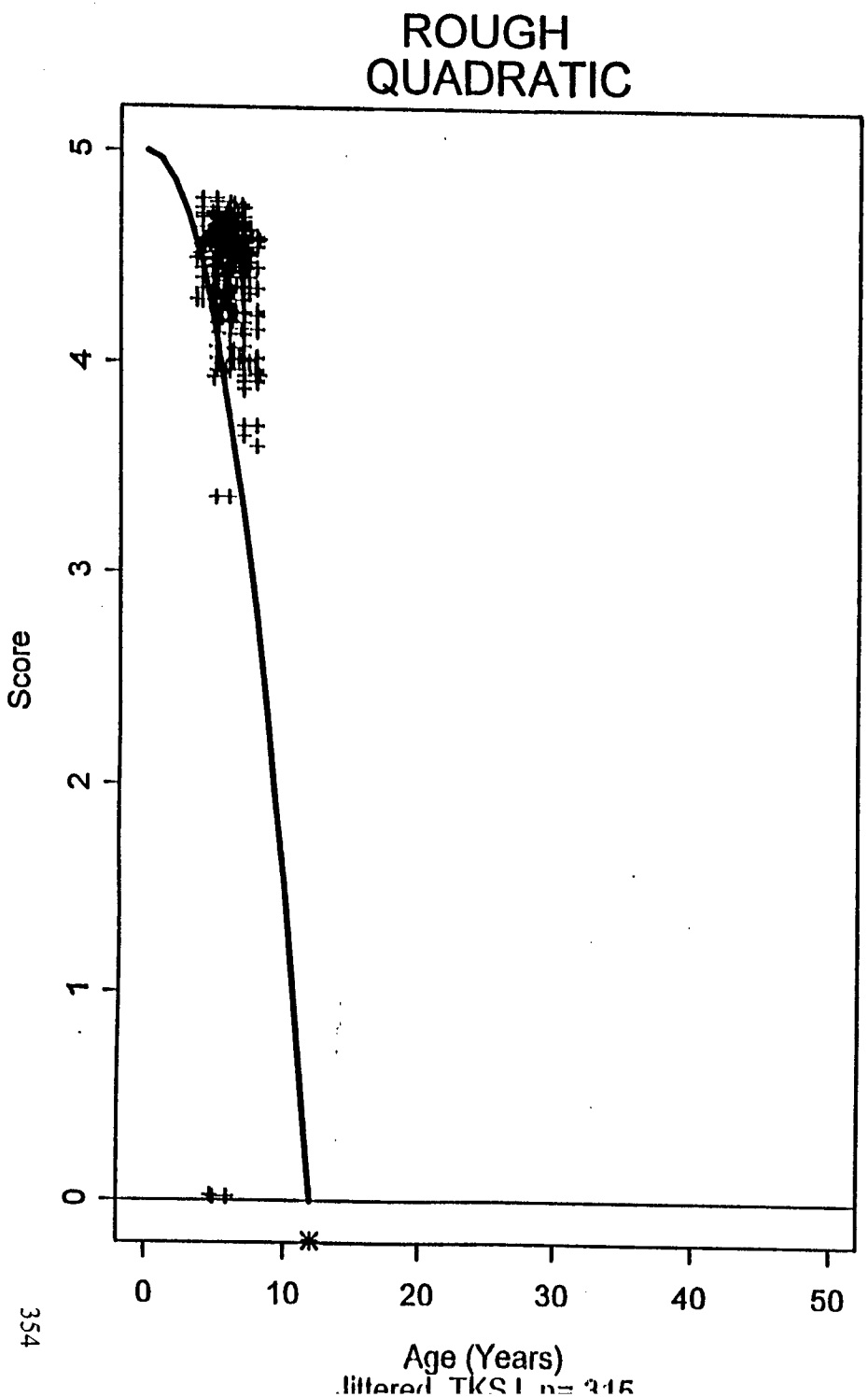
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	4.97	4.91	4.82	4.70	4.56	4.39	4.21	4.00	3.77	3.52

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.25	2.96	2.65	2.33	1.98	1.62	1.24	0.85	0.44	0.01	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 07:29:55 1998
Family: TKSJ
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.192	0.064	3.019	0.039

R-Squared = 0.695

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.254	0.064	3.961	0.017

R-Squared = 0.797

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.283	0.071	3.962	0.017

R-Squared = 0.797

APPENDIX F3.3

PERFORMANCE MODELS FOR TKSJ - J PAVEMENT FAMILY

PAVEMENT FAMILY: TKSJ – J [Joint & Spall Repairs]

Number of data points available for regression of performance curves : 42

Range of years of data available for the given family : 05 to 24 years

1. Corner Cracking [CRNR_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 39 years with a R^2 value of : 0.808 ✓

2. D-Cracking/ASR [DASR]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 34 years with a R^2 value of : 0.454 ✓

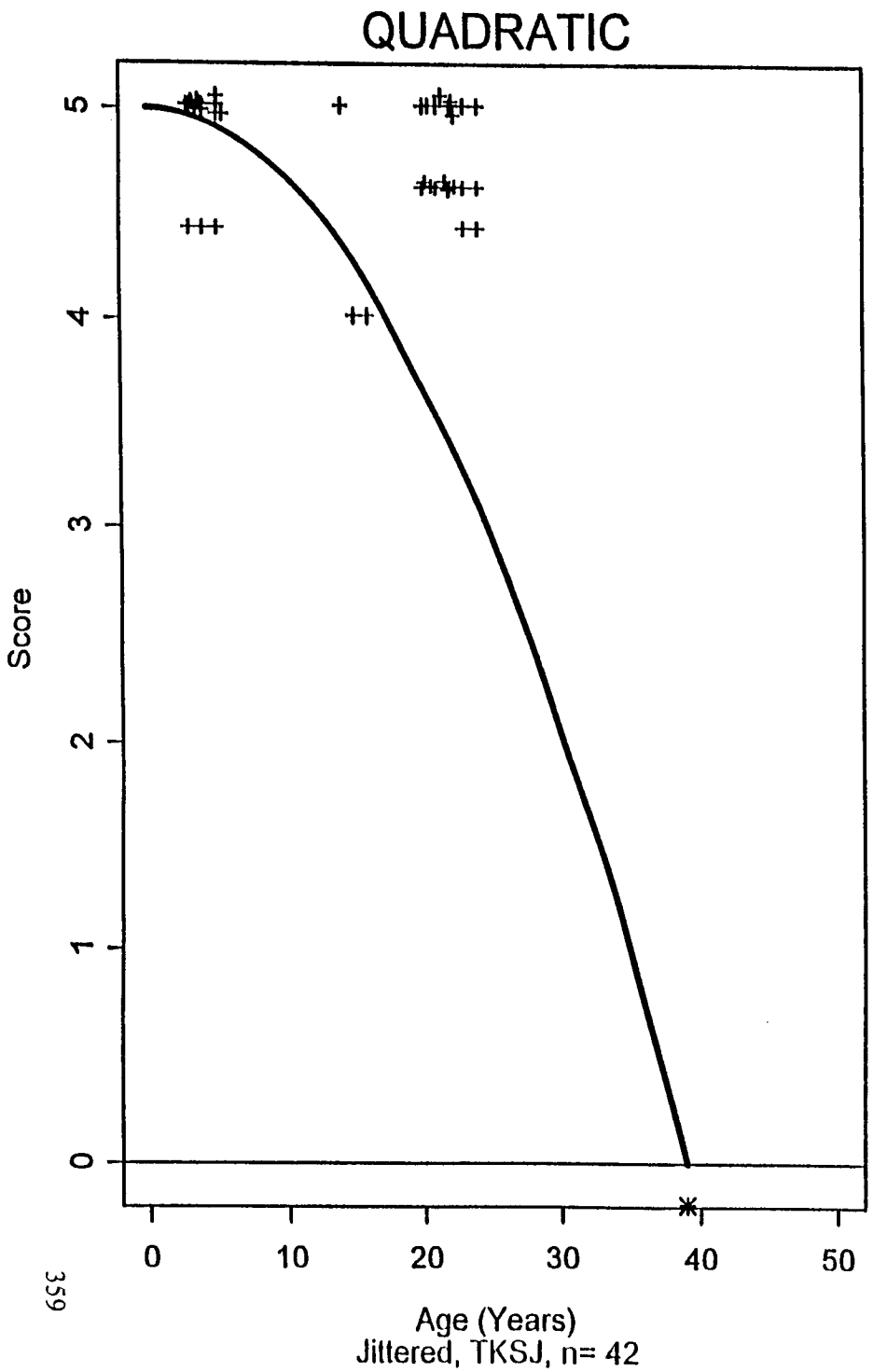
3. Faulting [FAULT]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 13 years with a R^2 value of : 0.983 ✓

4. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 13 years with a R^2 value of : 0.867 ✓

5. Joint Spalling [JNT_SPL]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 13 years with a R^2 value of : 0.991 ✓

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the model for the Original Family use endpoint of 24 years
   Historical data forced to end at 24 years has a R^2 value of : 0.163 ✓



Date of Analysis: Fri May 8 07:52:01 1998
Family: TKSJ
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 39

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.098	0.015	6.358	0

R-Squared = 0.802

50TH PERCENTILE
Coefficient Estimates:

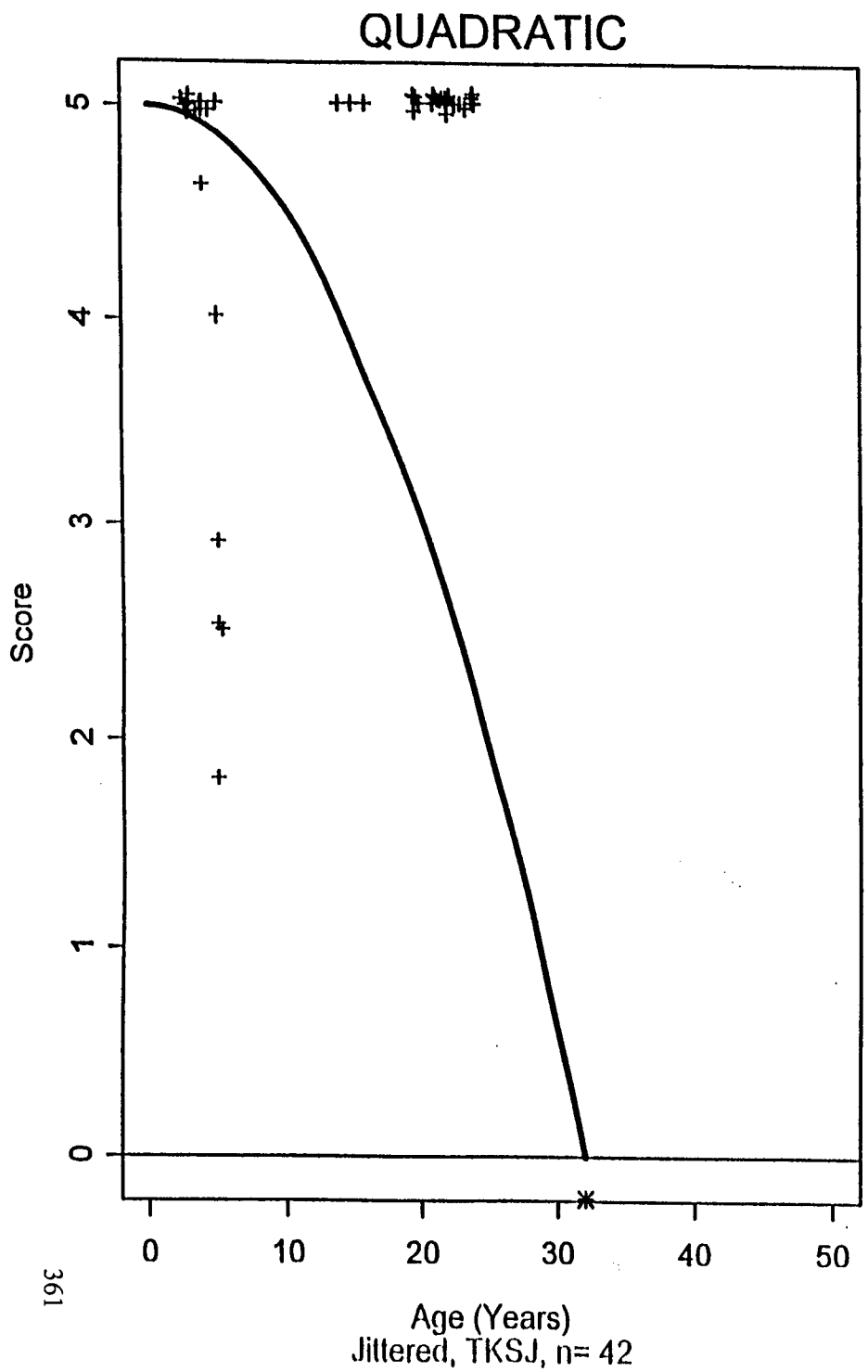
	Value	Std. Error	t value	Pr(>|t|)
1	0.106	0.016	6.493	0

R-Squared = 0.808

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.129	0.02	6.509	0

R-Squared = 0.809



Date of Analysis: Fri May 8 07:49:20 1998
Family: TKSJ
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 32

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.215	0.079	2.71	0.022

R-Squared = 0.423

50TH PERCENTILE
Coefficient Estimates:

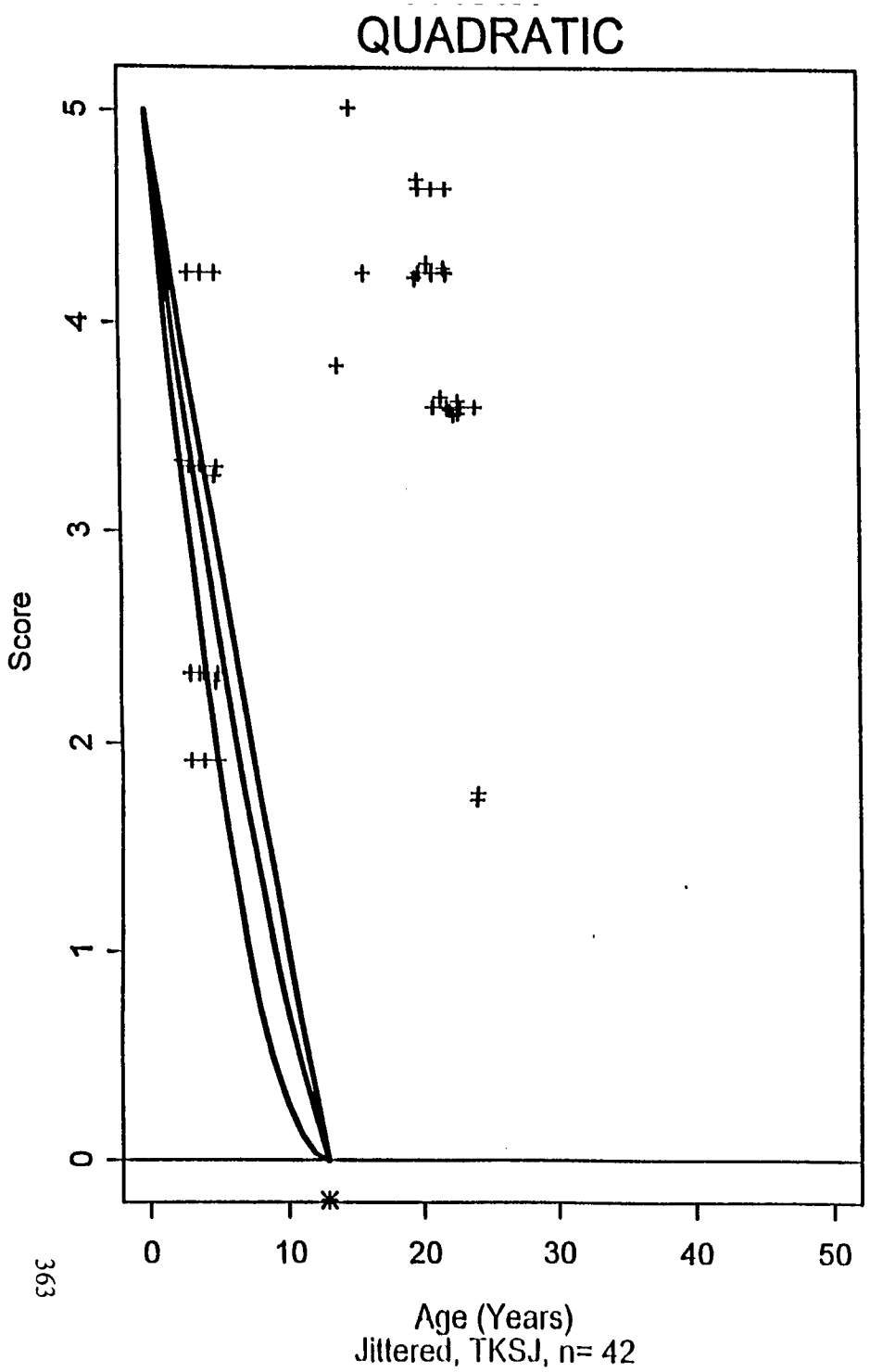
	Value	Std. Error	t value	Pr(>|t|)
1	0.219	0.076	2.882	0.016

R-Squared = 0.454

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.237	0.059	4.024	0.002

R-Squared = 0.618



Date of Analysis: Fri May 8 07:53:24 1998
Family: TKSJ
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 13

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.767	0.087	-8.803	0.013

R-Squared = 0.975

50TH PERCENTILE
Coefficient Estimates:

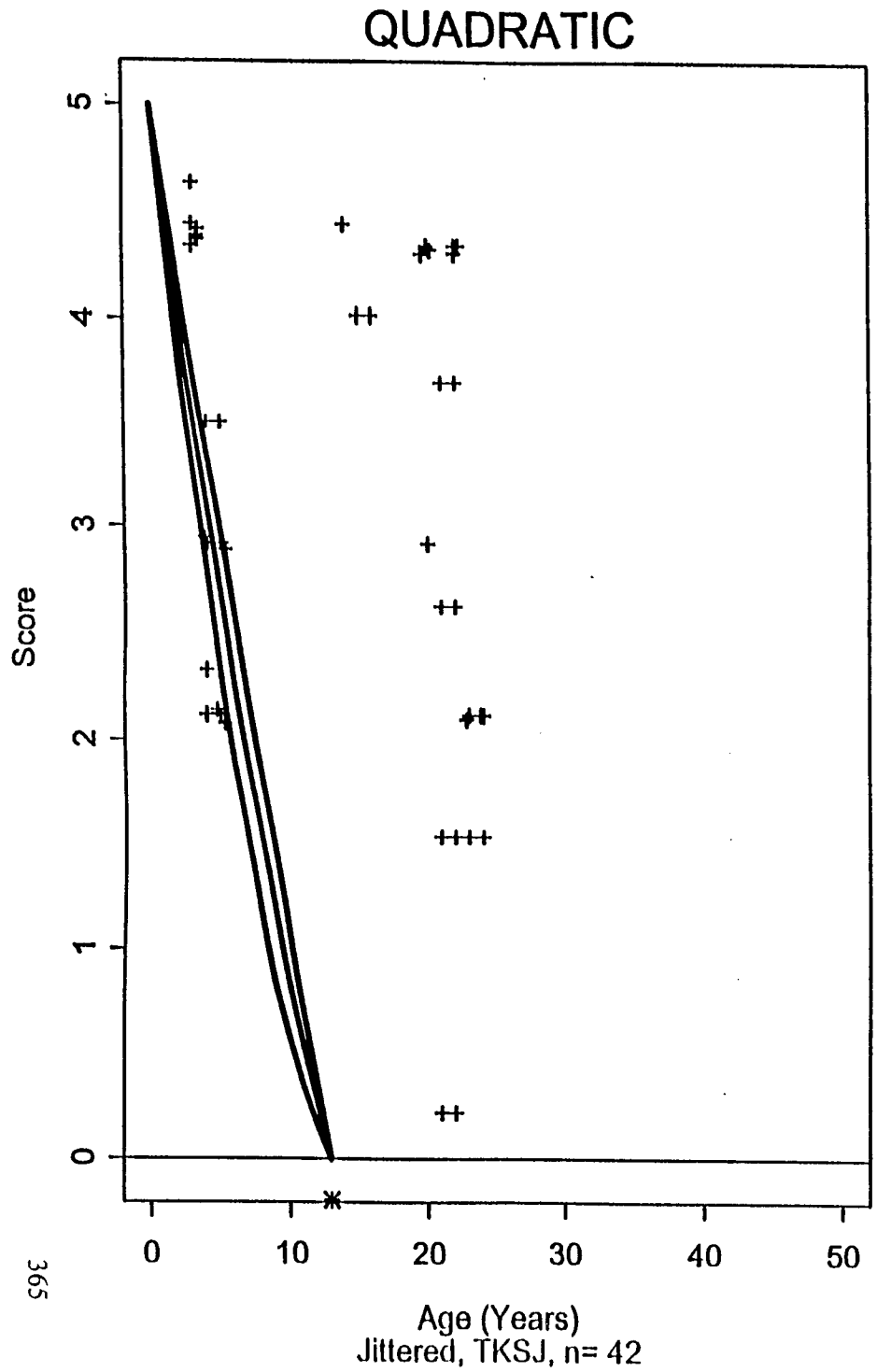
	Value	Std. Error	t value	Pr(>|t|)
1	-0.56	0.052	-10.842	0.008

R-Squared = 0.983

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.43	0.085	-5.036	0.037

R-Squared = 0.927



Date of Analysis: Sun May 10 15:07:44 1998
Family: TKSJ
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 13

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.634	0.182	-3.48	0.074

R-Squared = 0.858

50TH PERCENTILE
Coefficient Estimates:

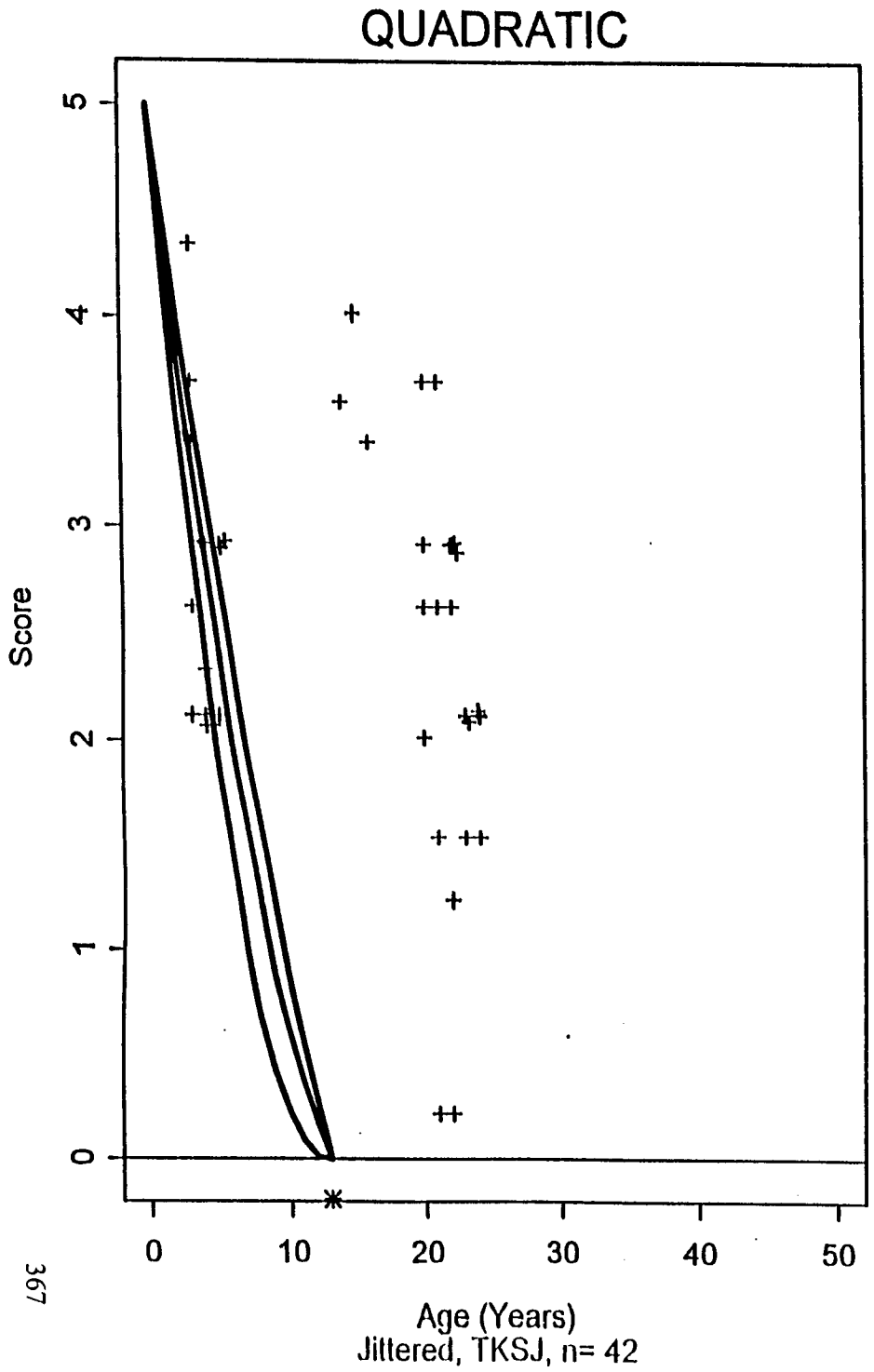
	Value	Std. Error	t value	Pr(>|t|)
1	-0.518	0.144	-3.603	0.069

R-Squared = 0.867

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.421	0.118	-3.576	0.07

R-Squared = 0.865



Date of Analysis: Fri May 8 07:50:43 1998
Family: TKSJ
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 13

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.788	0.052	-15.18	0.004

R-Squared = 0.991

50TH PERCENTILE
Coefficient Estimates:

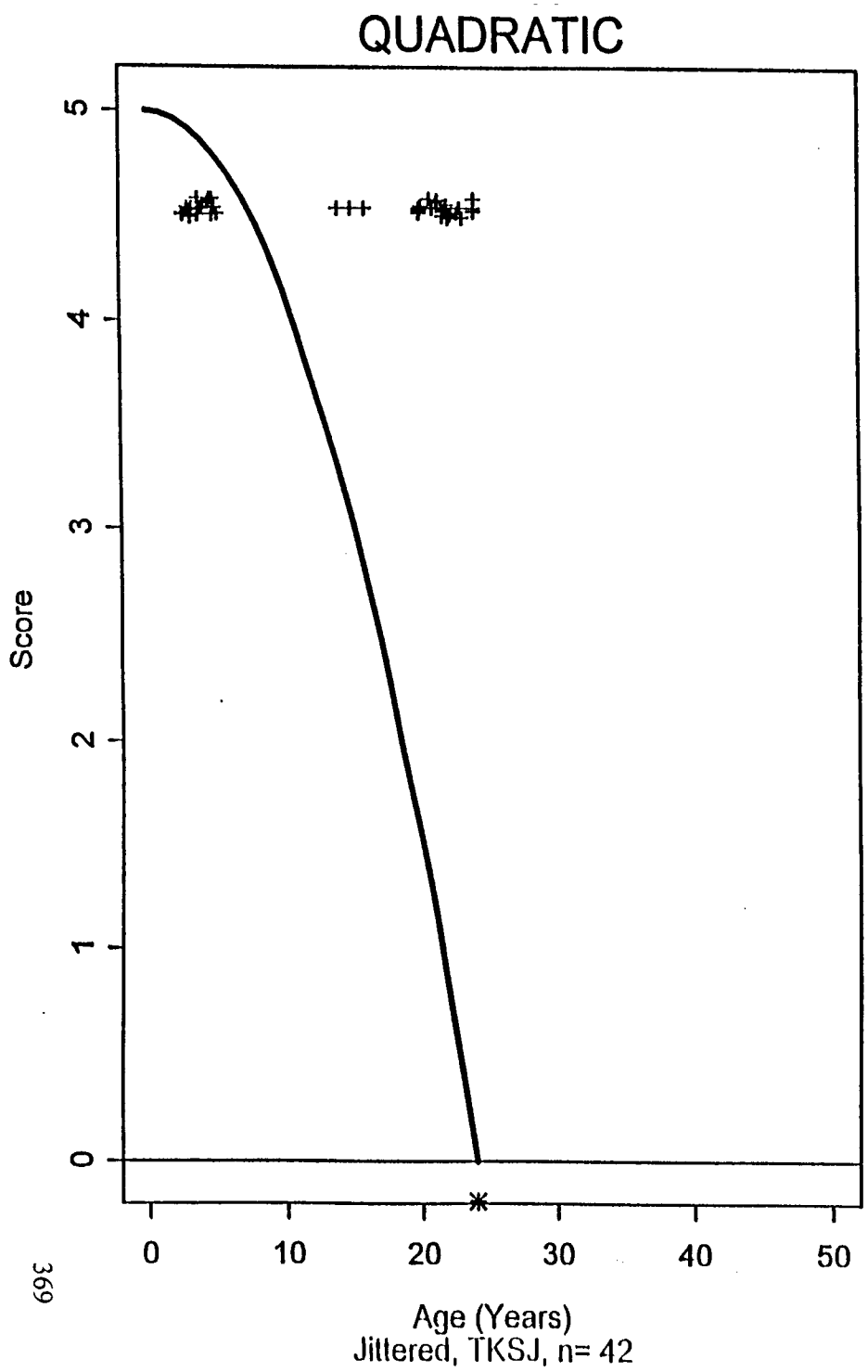
	Value	Std. Error	t value	Pr(>|t|)
1	-0.616	0.041	-15.1	0.004

R-Squared = 0.991

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.501	0.045	-11.048	0.008

R-Squared = 0.984



Date of Analysis: Fri May 8 07:48:08 1998
Family: TKSJ
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 24

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.349	0.25	1.393	0.194

R-Squared = 0.163

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.349	0.25	1.393	0.194

R-Squared = 0.163

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.349	0.25	1.393	0.194

R-Squared = 0.163

APPENDIX F3.4

PERFORMANCE MODELS FOR TKSJ - U PAVEMENT FAMILY

PAVEMENT FAMILY: TKSJ – U [Undersealing on Original]

Number of data points available for regression of performance curves : 1128

Range of years of data available for the given family : 03 to 07 years

1. Corner Cracking [CRNR_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Regression analysis provides inconclusive results so develop an expert model.
   Adjusting from the model for the TKSJ-J Family use endpoint of 39 years
   Historical data forced to end at 39 years has a R^2 value of : 0.925 ✓

2. D-Cracking/ASR [DASR]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 15 years with a R^2 value of : 0.906 ✓

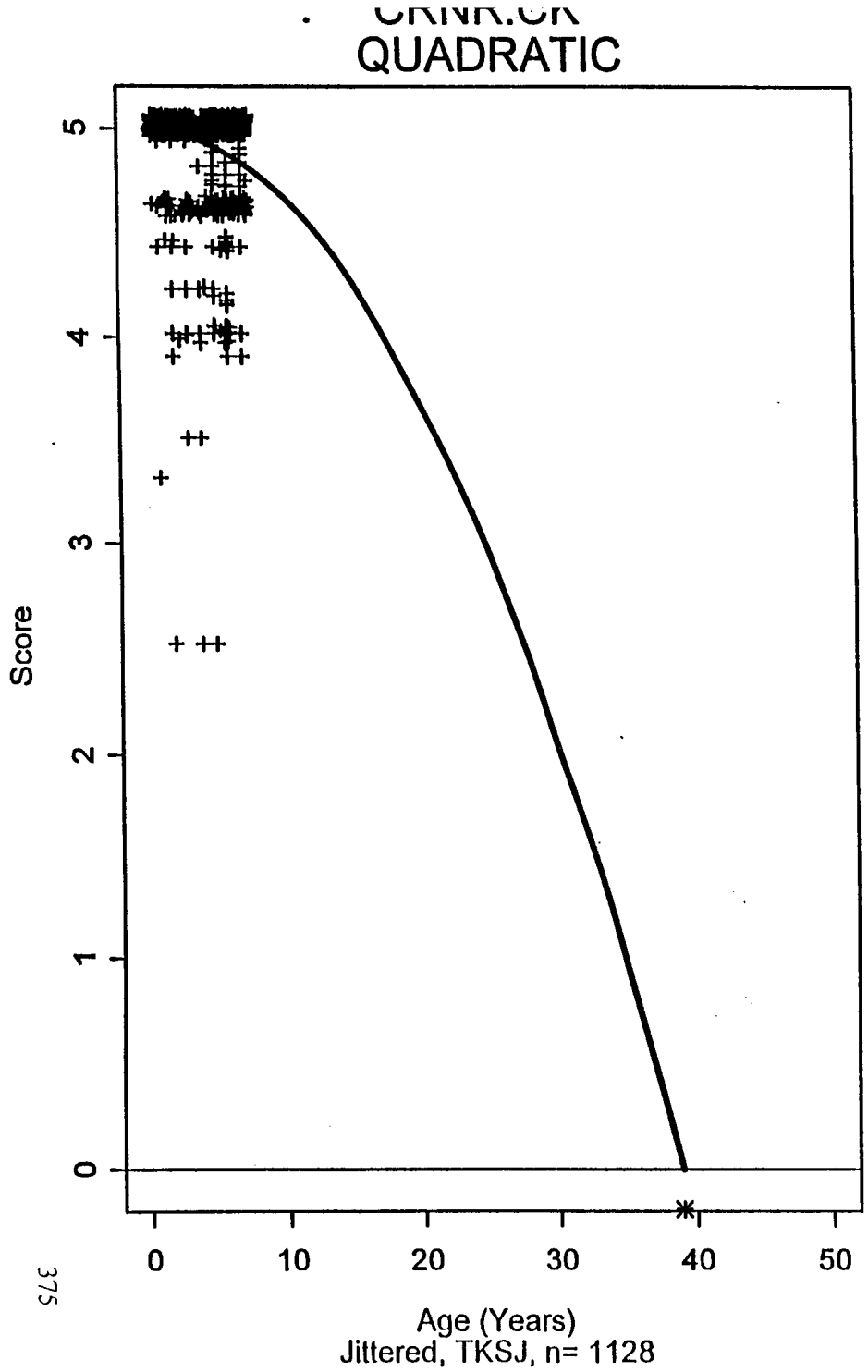
3. Faulting [FAULT]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 09 years with a R^2 value of : 0.202 ✓

4. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.529 ✓

5. Joint Spalling [JNT_SPL]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 09 years with a R^2 value of : 0.343 ✓

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 13 years with a R^2 value of : 0.742 ✓



Date of Analysis: Fri May 8 08:23:40 1998
Family: TKSJ
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 39

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.003	0.011	0.292	0.78

R-Squared = 0.014

50TH PERCENTILE
Coefficient Estimates:

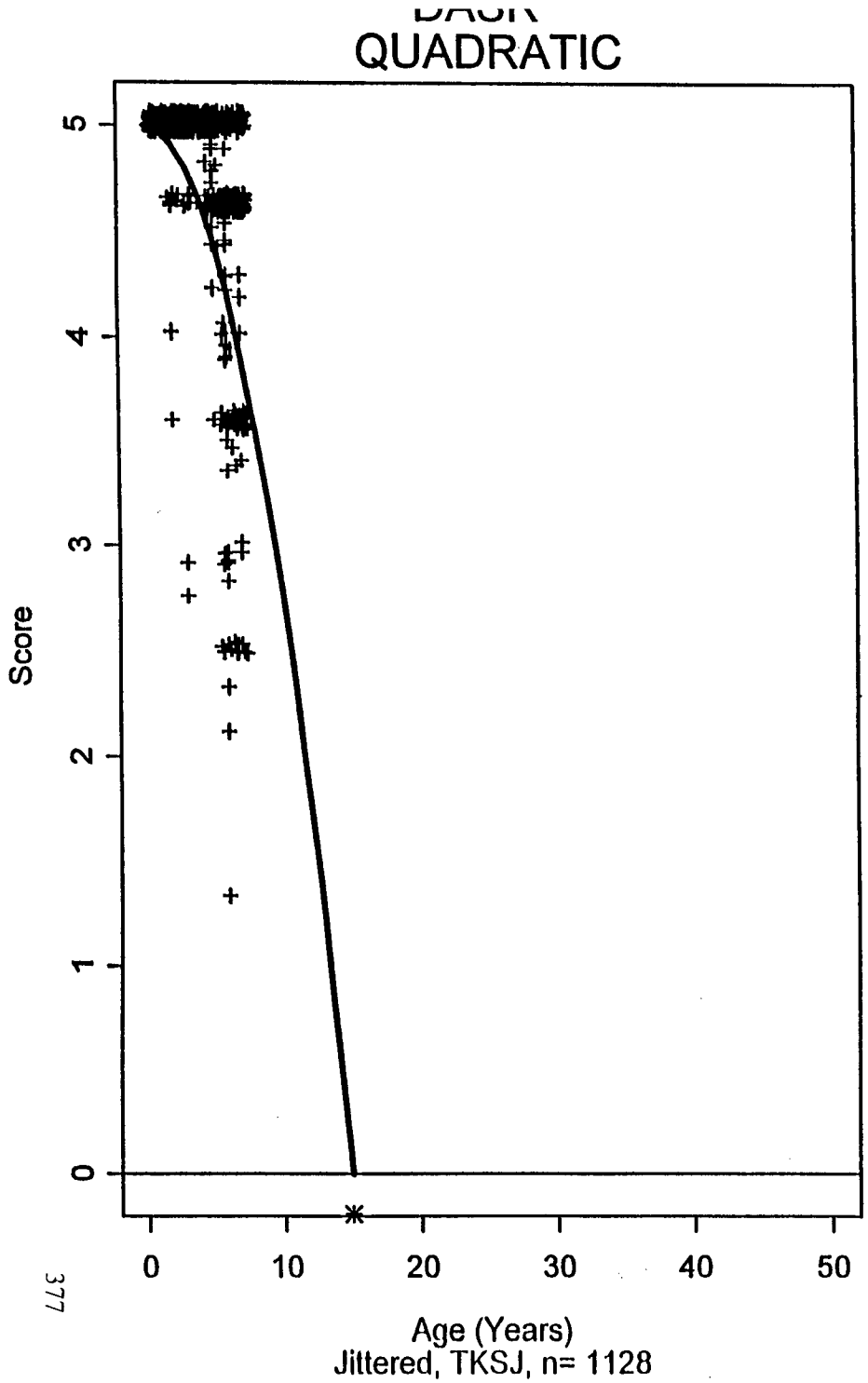
	Value	Std. Error	t value	Pr(>|t|)
1	0.022	0.003	8.587	0

R-Squared = 0.925

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.022	0.003	8.587	0

R-Squared = 0.925



Date of Analysis: Fri May 8 08:21:35 1998
Family: TKSJ
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.135	0.018	7.618	0

R-Squared = 0.906

50TH PERCENTILE
Coefficient Estimates:

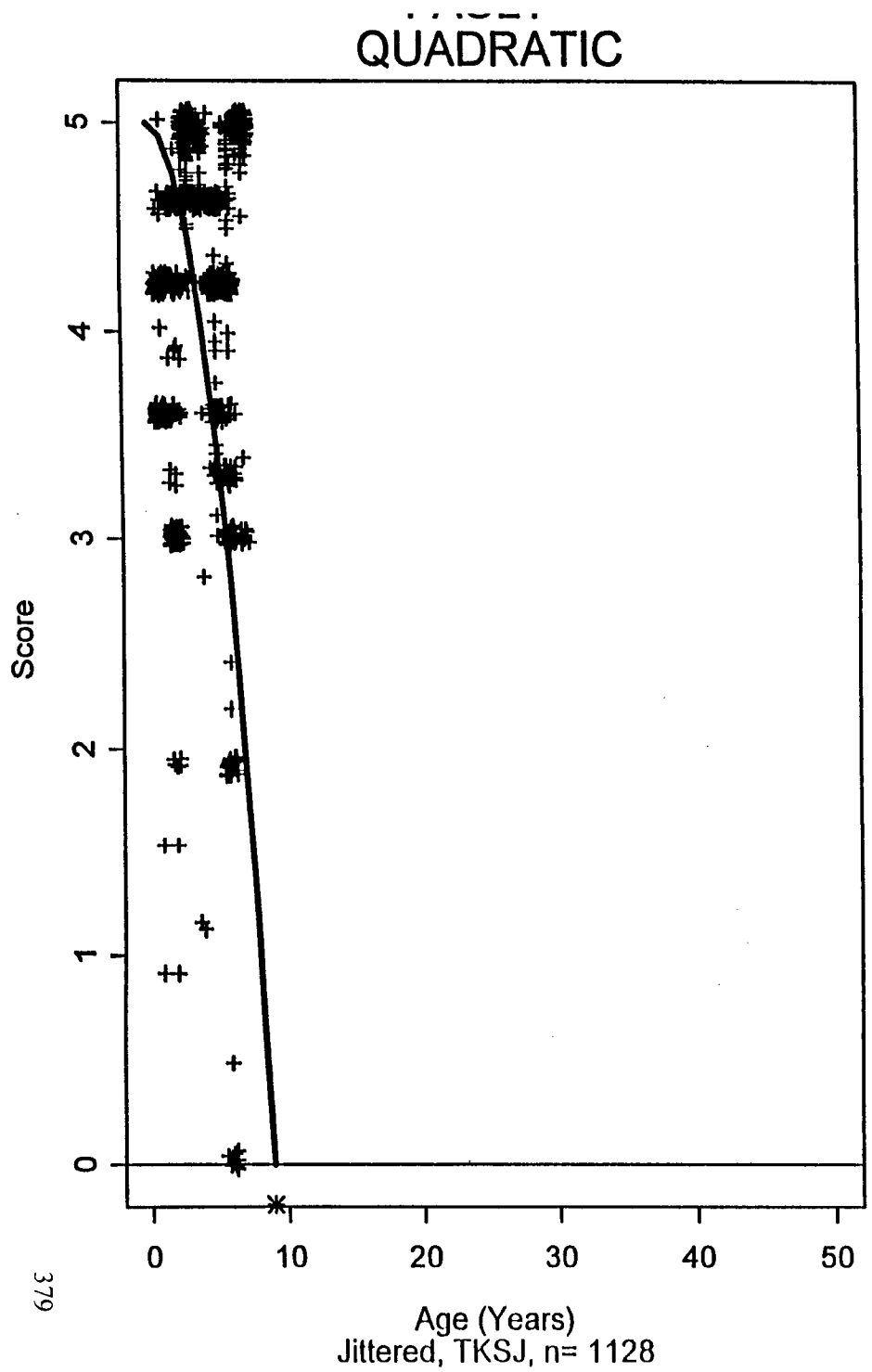
	Value	Std. Error	t value	Pr(>|t|)
1	0.135	0.018	7.618	0

R-Squared = 0.906

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.135	0.018	7.618	0

R-Squared = 0.906



Date of Analysis: Fri May 8 08:24:59 1998
Family: TKSJ
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 9

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.198	0.323	0.614	0.562

R-Squared = 0.059

50TH PERCENTILE
Coefficient Estimates:

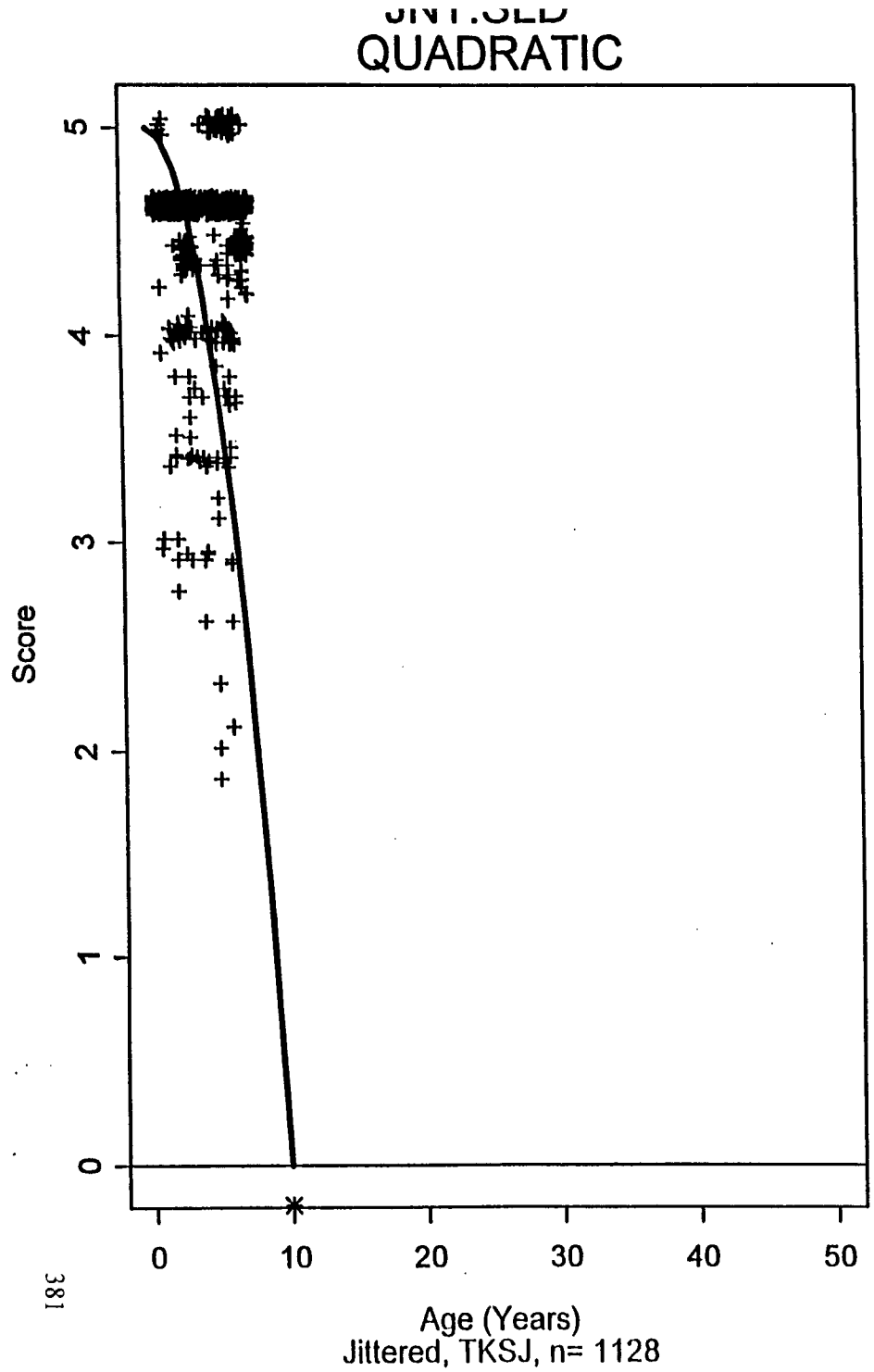
	Value	Std. Error	t value	Pr(>|t|)
1	0.336	0.273	1.233	0.264

R-Squared = 0.202

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.543	0.239	2.273	0.063

R-Squared = 0.463



Date of Analysis: Fri May 8 08:26:17 1998
Family: TKSJ
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.328	0.145	2.257	0.065

R-Squared = 0.459

50TH PERCENTILE
Coefficient Estimates:

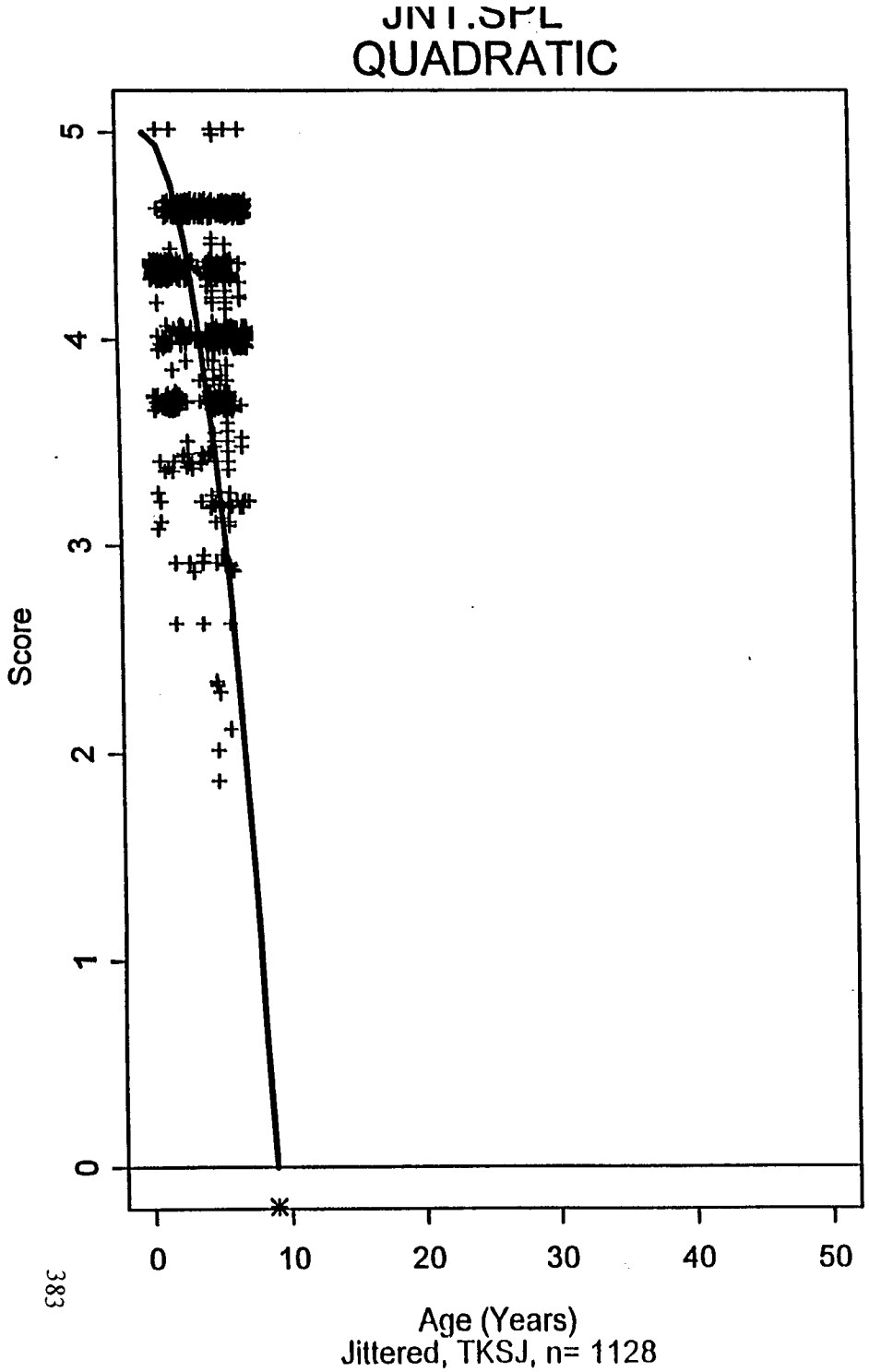
	Value	Std. Error	t value	Pr(>|t|)
1	0.353	0.136	2.594	0.041

R-Squared = 0.529

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.368	0.146	2.519	0.045

R-Squared = 0.514



Date of Analysis: Fri May 8 08:22:17 1998
Family: TKSJ
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 9

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.151	0.216	0.7	0.51

R-Squared = 0.076

50TH PERCENTILE
Coefficient Estimates:

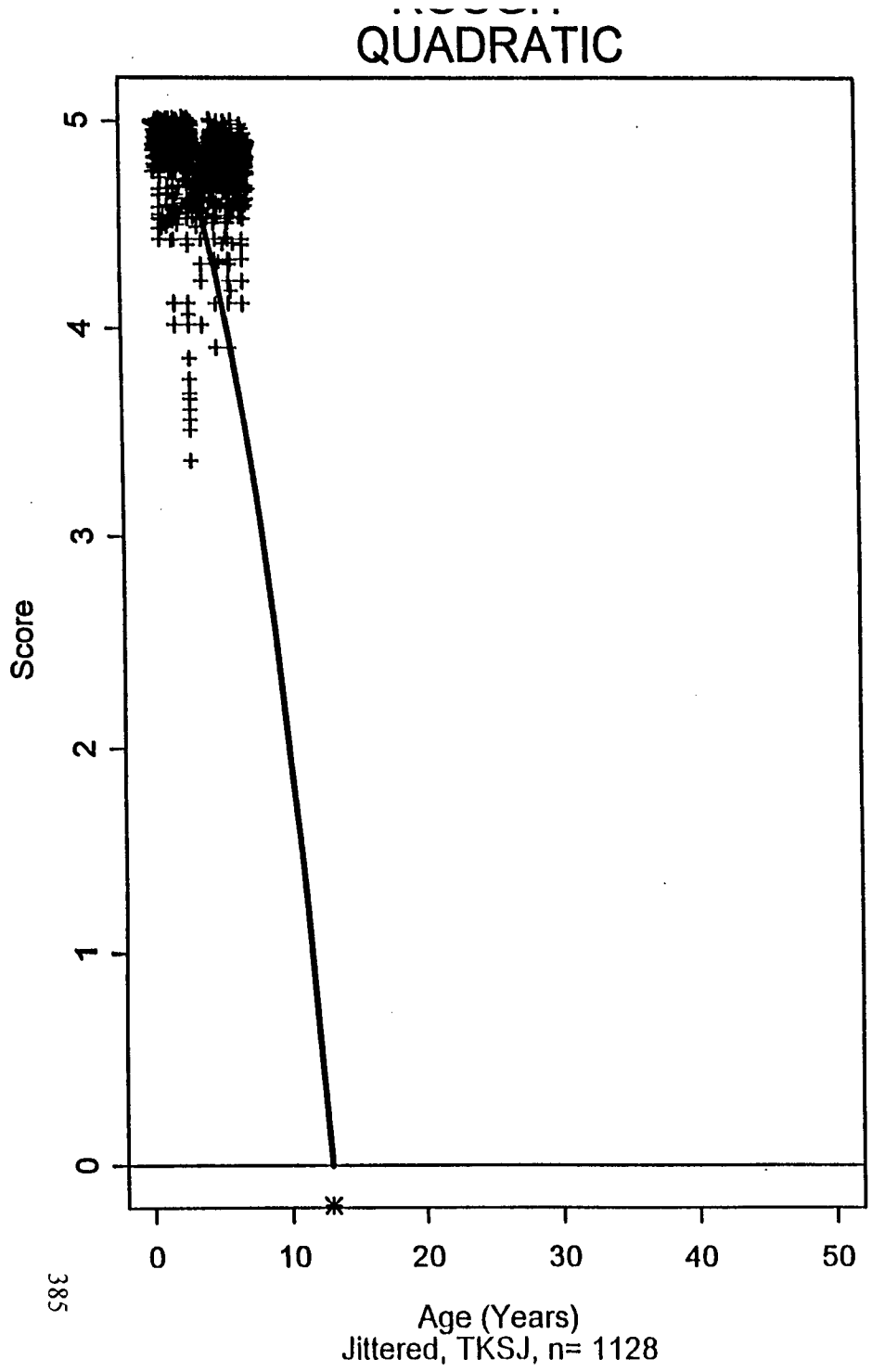
	Value	Std. Error	t value	Pr(>|t|)
1	0.332	0.188	1.77	0.127

R-Squared = 0.343

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.454	0.241	1.882	0.109

R-Squared = 0.371



Date of Analysis: Fri May 8 08:15:24 1998
Family: TKSJ
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 13

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.178	0.054	3.309	0.016

R-Squared = 0.646

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.211	0.051	4.157	0.006

R-Squared = 0.742

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.23	0.05	4.56	0.004

R-Squared = 0.776

APPENDIX F4

PERFORMANCE MODELS FOR TKSJD PAVEMENT FAMILY

APPENDIX F4.1

PERFORMANCE MODELS FOR TKSJD - O PAVEMENT FAMILY

PAVEMENT FAMILY: TKSJD – Original

Number of data points available for regression of performance curves : 3657

Range of years of data available for the given family : 03 to 10 years

1. Corner Cracking [CRNR_CK]
   Existing Expert Model ends at @ 75 years
   Historical data forced to end at 75 years has a R^2 value of : 0.921 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

2. D-Cracking/ASR [DASR]
   Existing Expert Model ends at @ 27 years
   Historical data forced to end at 27 years has a R^2 value of : 0.882 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

3. Faulting [FAULT]
   Existing Expert Model ends at @ 33 years
   Historical data forced to end at 33 years has a R^2 value of : 0.385
   Optimum forced end point is obtained at 17 years with a R^2 value of : 0.713 ✓

4. Joint Seal Damage [JNT_SLD]
   Existing Expert Model ends at @ 19 years
   Historical data forced to end at 19 years has a R^2 value of : 0.895
   Optimum forced end point is obtained at 20 years with a R^2 value of : 0.899 ✓

5. Joint Spalling [JNT_SPL]
   Existing Expert Model ends at @ 42 years
   Historical data forced to end at 42 years has a R^2 value of : 0.477 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   Existing Expert Model ends at @ 41 years
   Historical data forced to end at 41 years has a R^2 value of : 0.498 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

CORNER CRACKING ON TKSJD

IDEX = C - M * AGE ^ B

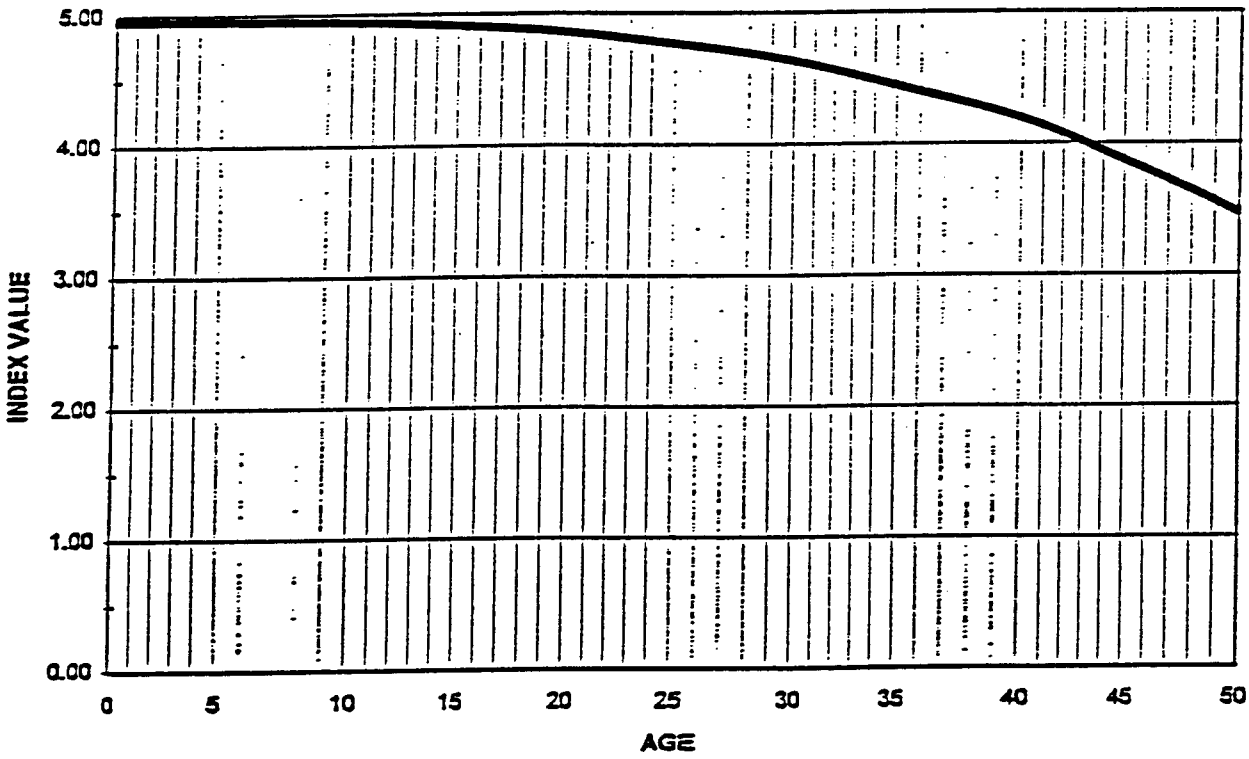
; Value: 4.96
I Value: 0.00001405
Value: 2.96

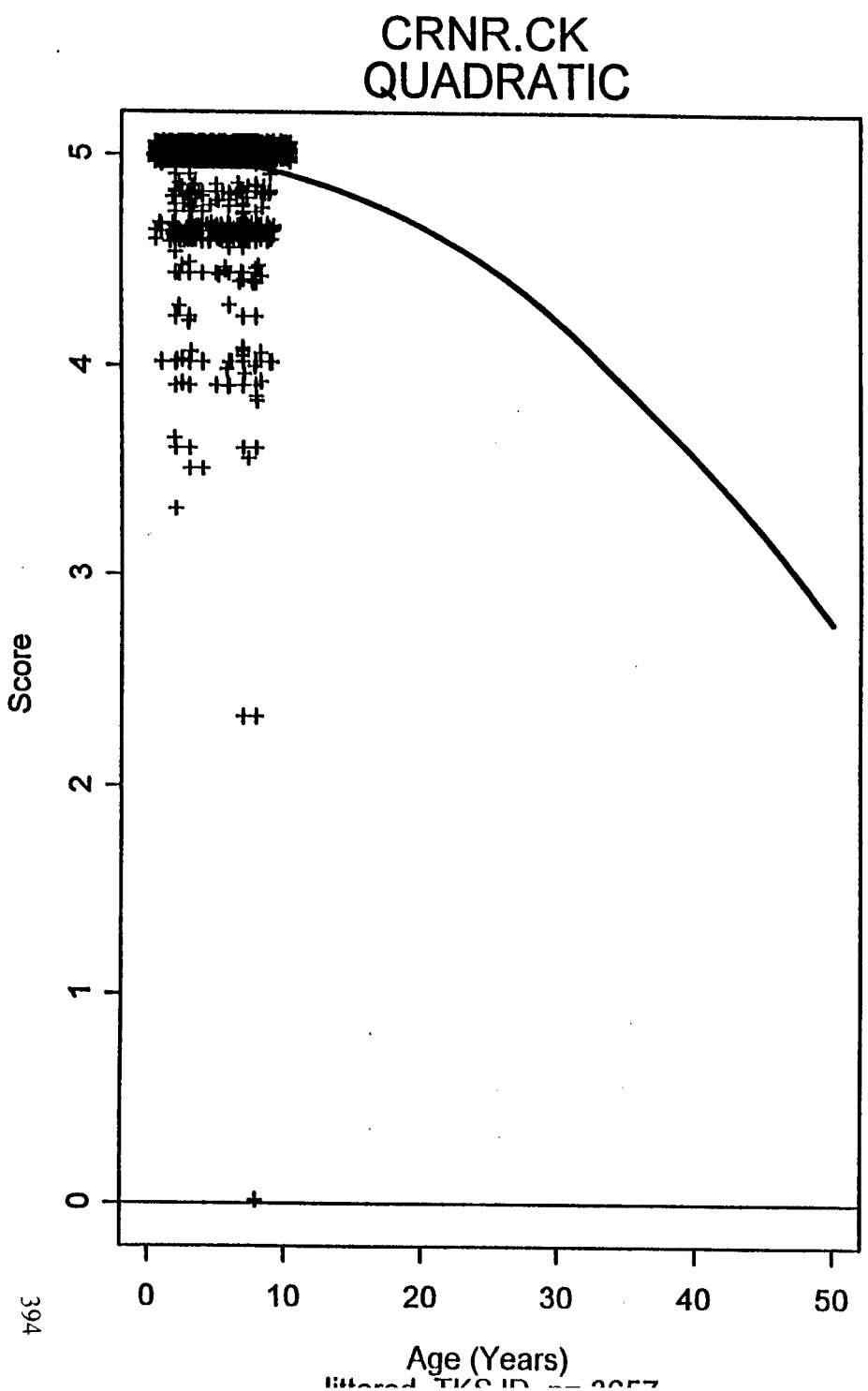
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.96	4.95	4.95	4.95

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.94	4.94	4.93	4.93	4.92	4.91	4.90	4.89	4.87	4.86	4.84

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.83	4.81	4.79	4.77	4.74	4.72	4.69	4.66	4.63	4.60	4.56

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	4.52	4.48	4.44	4.39	4.34	4.29	4.24	4.18	4.13	4.06	4.00





Date of Analysis: Fri May 8 08:34:47 1998
Family: TKSJD
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 75

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.007	0.001	10.232	0

R-Squared = 0.921

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.007	0.001	10.232	0

R-Squared = 0.921

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.007	0.001	10.232	0

R-Squared = 0.921

D-CRACKING/ASR ON TKSJD

NDEX = C - M * AGE ^ B

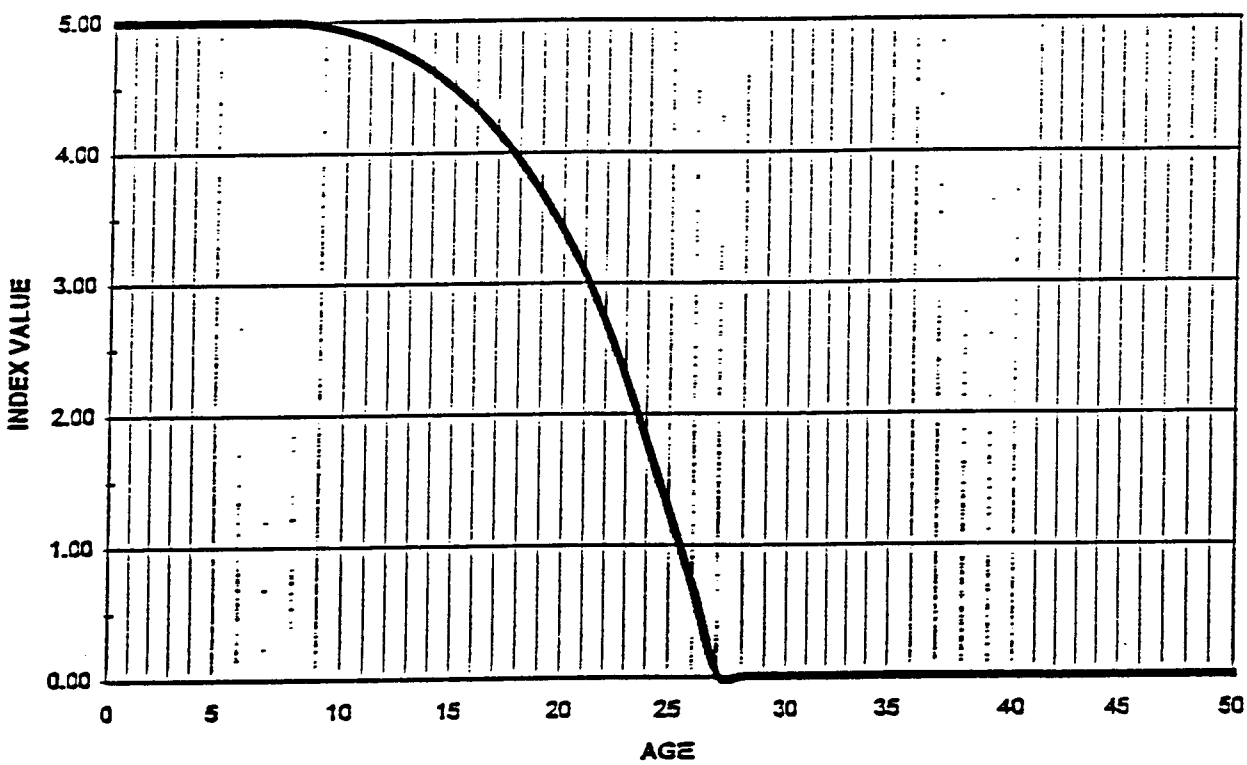
: Value: 5.05
M Value: 0.000025624
B Value: 3.70

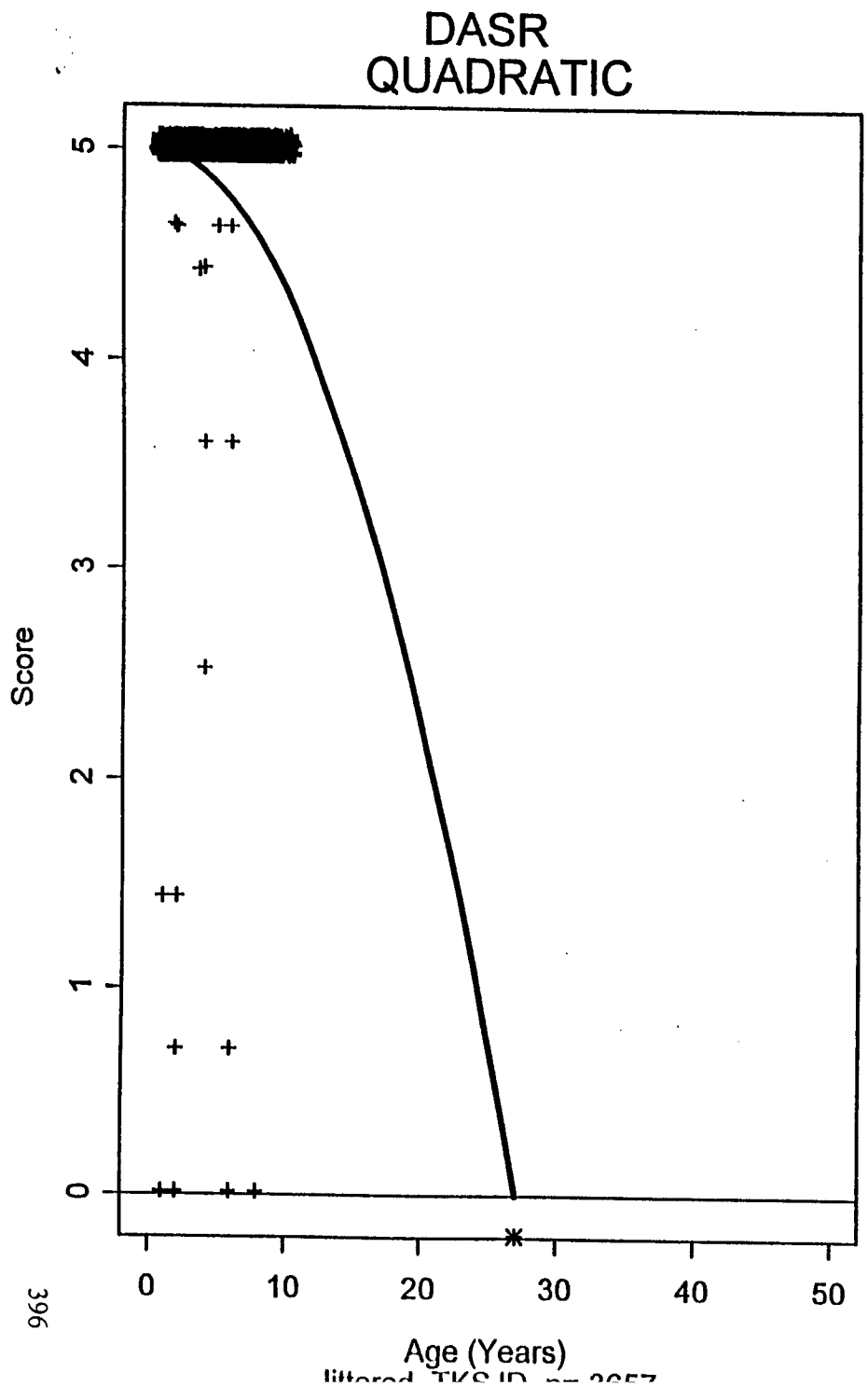
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.99	4.96	4.92

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.87	4.80	4.71	4.60	4.47	4.32	4.14	3.92	3.67	3.38	3.05

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	2.68	2.25	1.77	1.24	0.64	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 08:30:35 1998
Family: TKSJD
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 27

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.063	0.008	8.214	0

R-Squared = 0.882

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.063	0.008	8.214	0

R-Squared = 0.882

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.063	0.008	8.214	0

R-Squared = 0.882

FAULTING ON TKSJD

INDEX = C - M * AGE ^ B

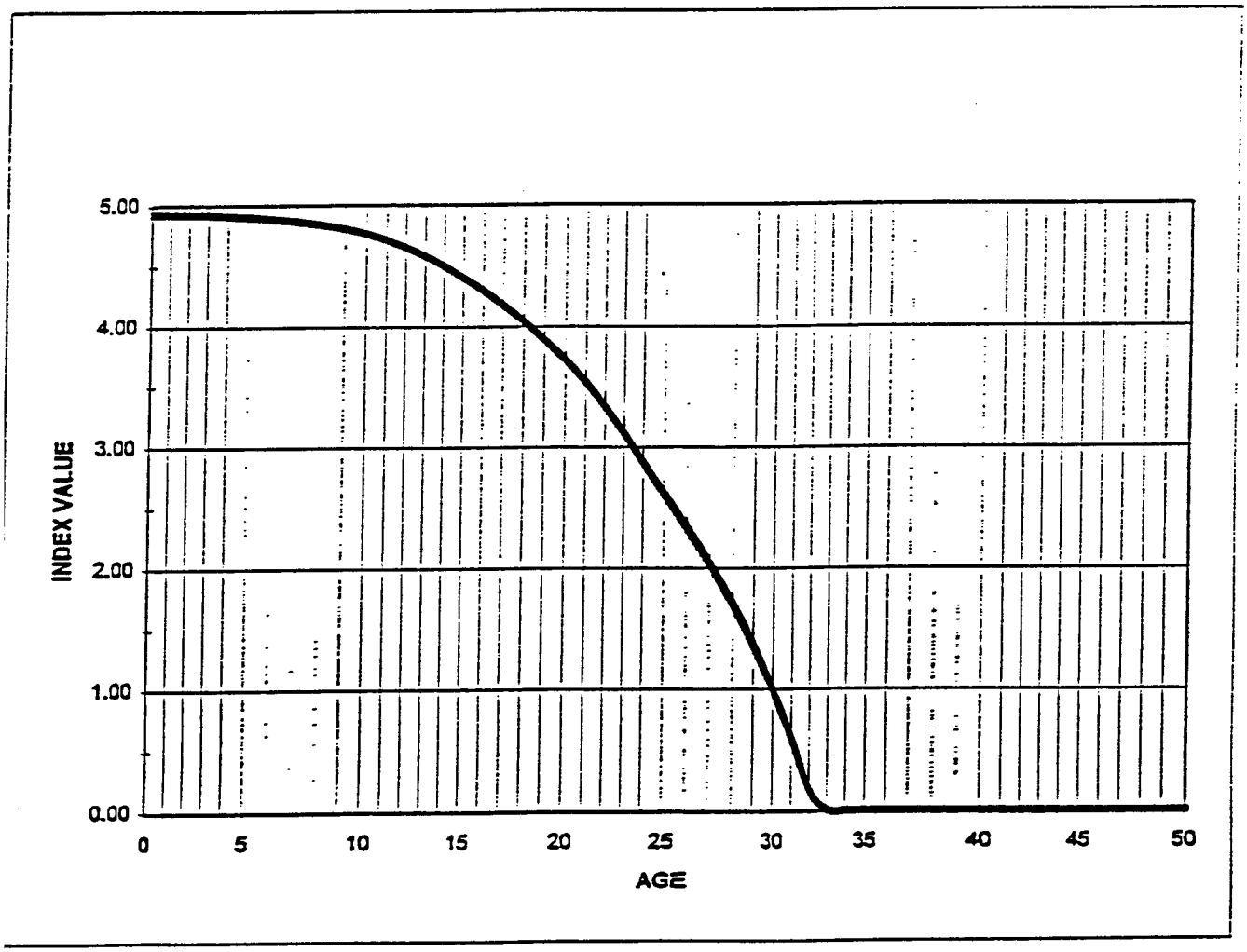
C Value: 4.93
M Value: 0.0002059
B Value: 2.90

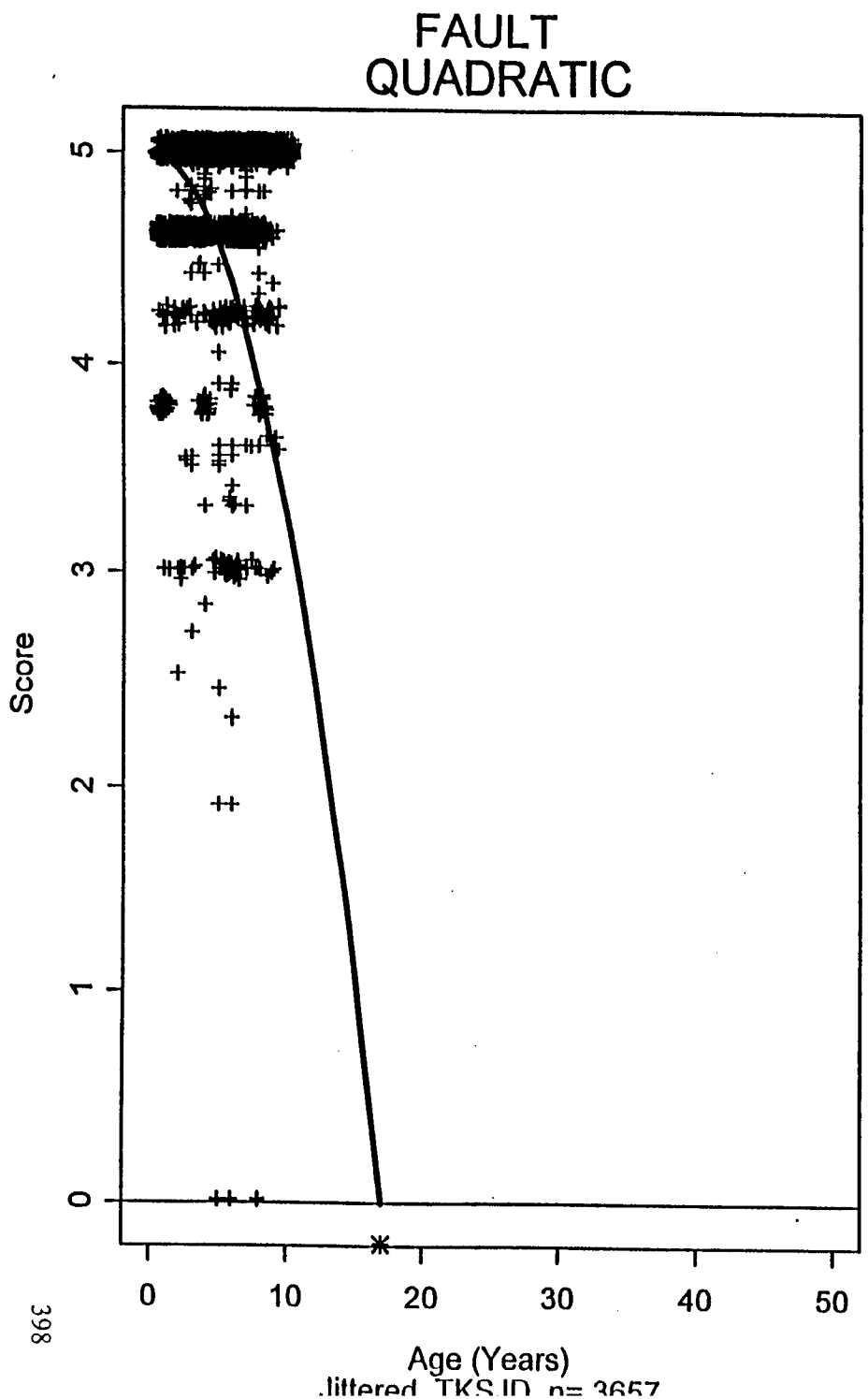
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.93	4.93	4.93	4.93	4.92	4.91	4.89	4.87	4.84	4.81	4.77

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.71	4.65	4.58	4.50	4.40	4.29	4.17	4.03	3.88	3.71	3.52

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	3.32	3.10	2.86	2.60	2.32	2.02	1.69	1.34	0.97	0.58	0.16

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 08:36:26 1998
Family: TKSJD
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 17

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.094	0.044	2.163	0.059

R-Squared = 0.342

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.18	0.038	4.725	0.001

R-Squared = 0.713

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.189	0.03	6.359	0

R-Squared = 0.818

JOINT SEAL DAMAGE ON TKSJD

NDEX = C - M * AGE ^ B

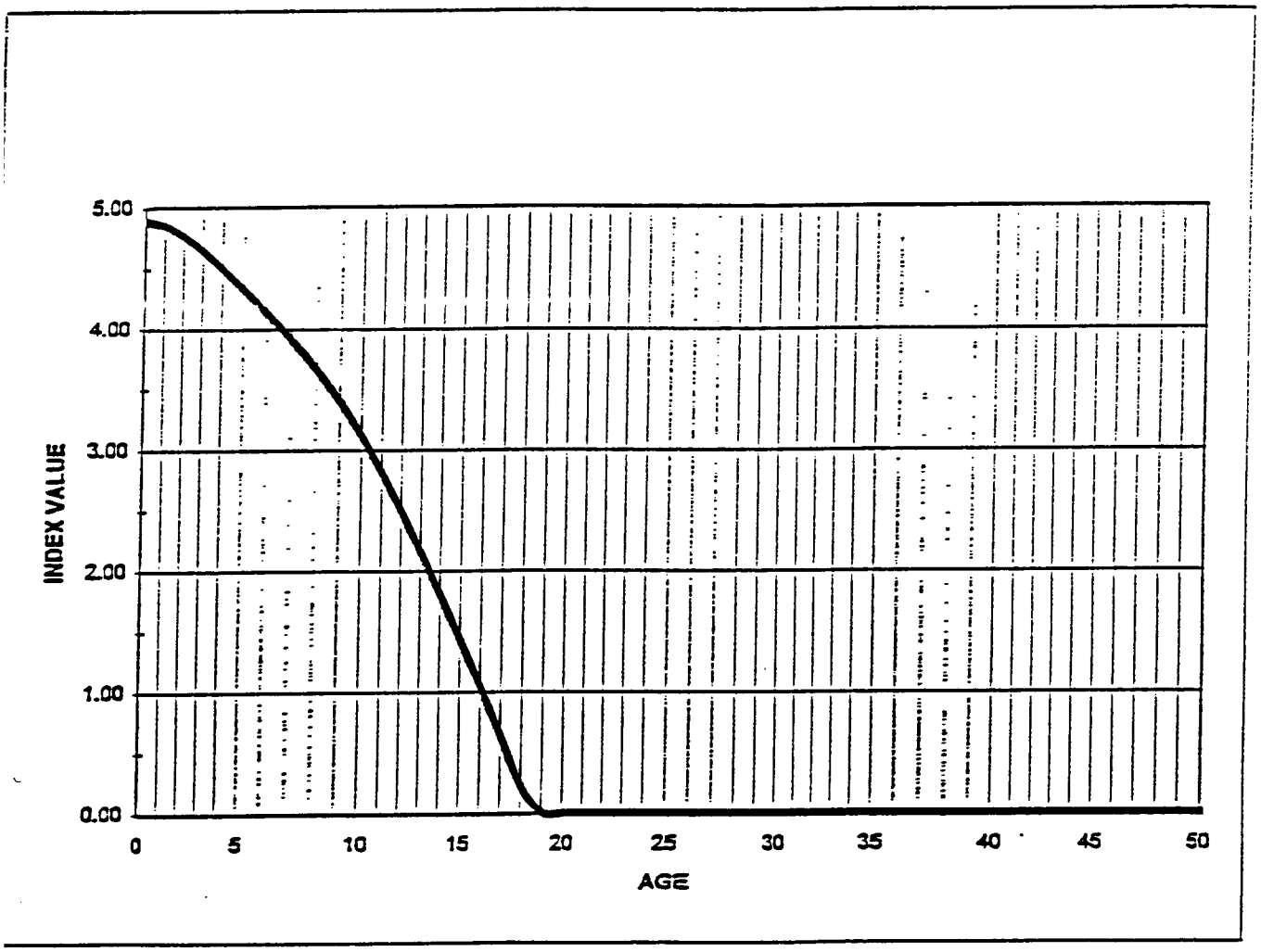
C Value: 4.89
M Value: 0.040944
B Value: 1.64

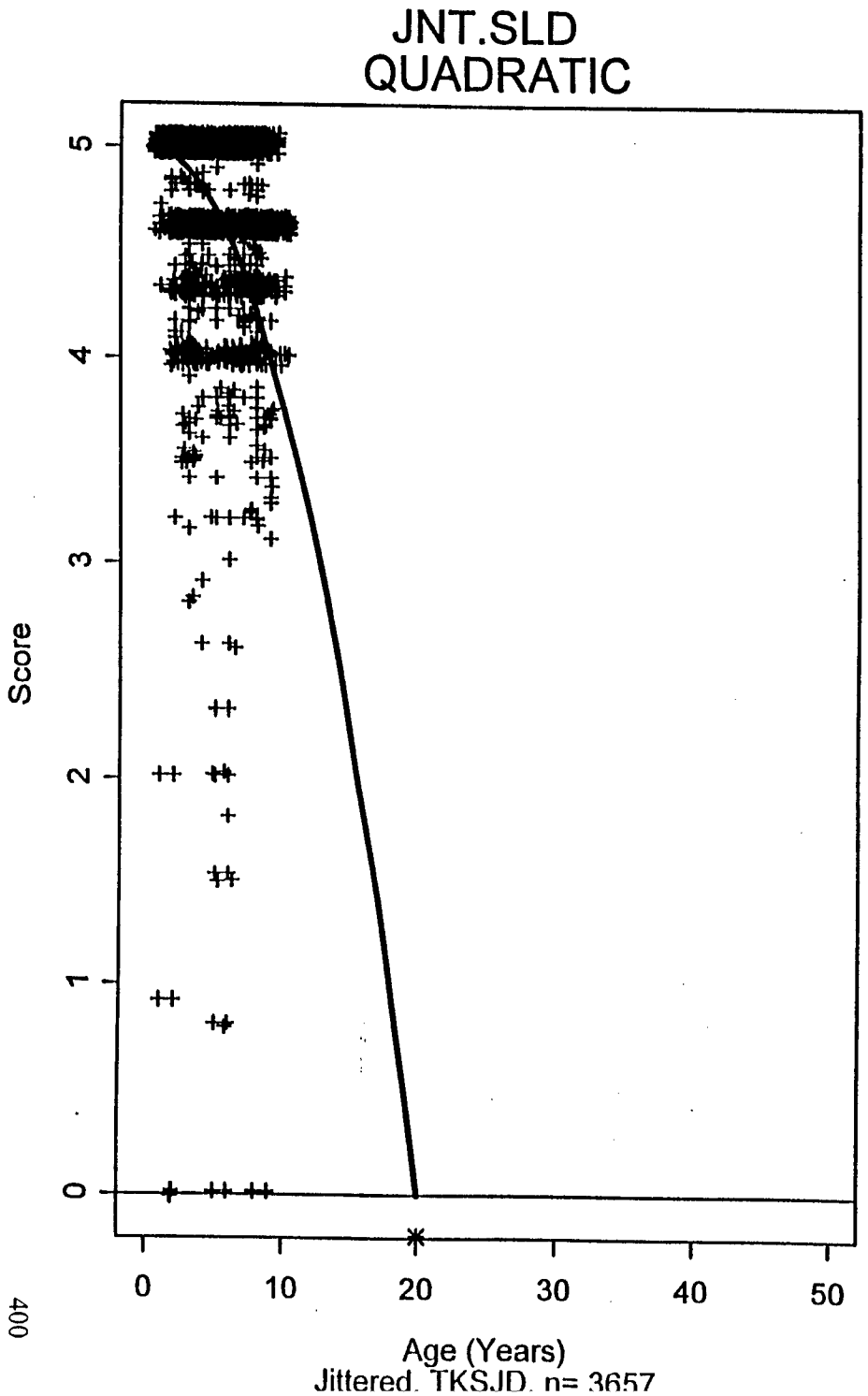
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.85	4.76	4.64	4.49	4.32	4.12	3.89	3.65	3.39	3.10

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.80	2.48	2.14	1.79	1.41	1.03	0.62	0.20	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 08:38:05 1998
Family: TKSJD
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 20

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.02	0.025	0.795	0.447

R-Squared = 0.066

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.098	0.011	8.937	0

R-Squared = 0.899

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.116	0.014	8.384	0

R-Squared = 0.886

JOINT SPALLING ON TKSJD

NDEX = C - M * AGE ^ B

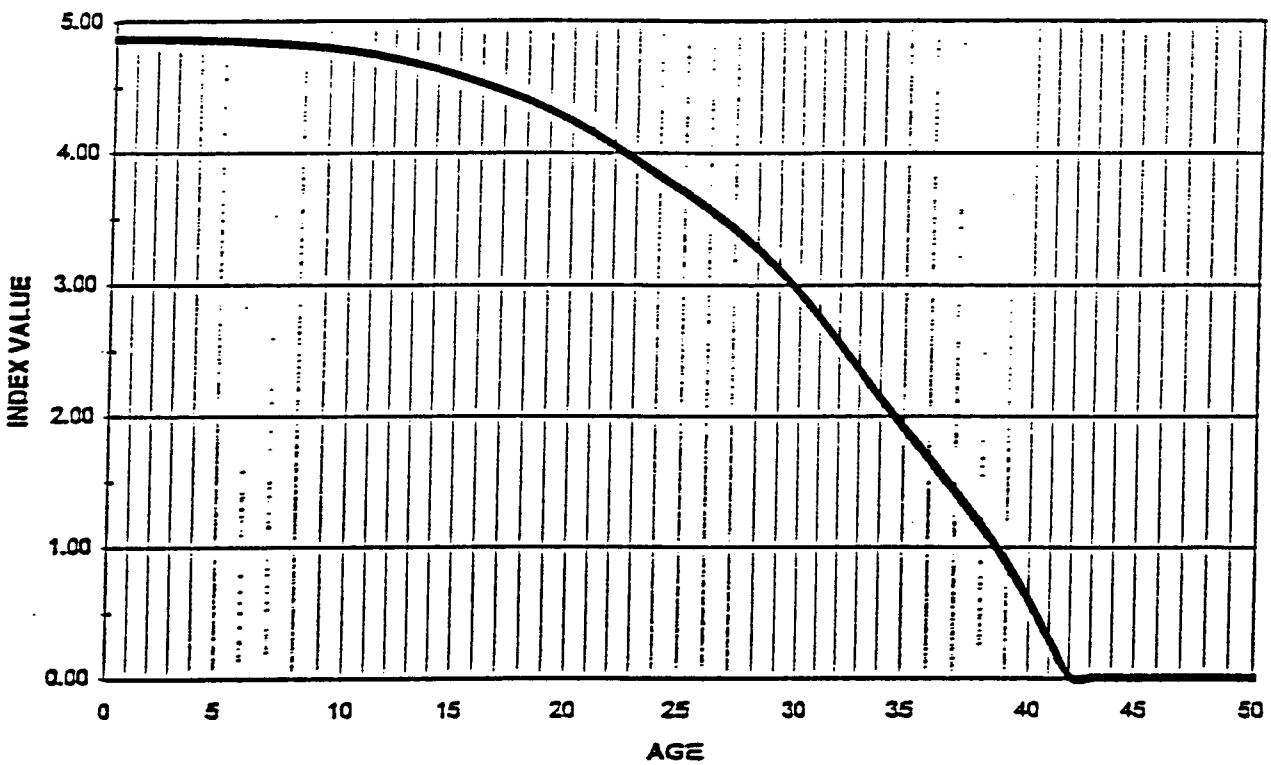
C Value: 4.87
M Value: 0.0001626
B Value: 2.75

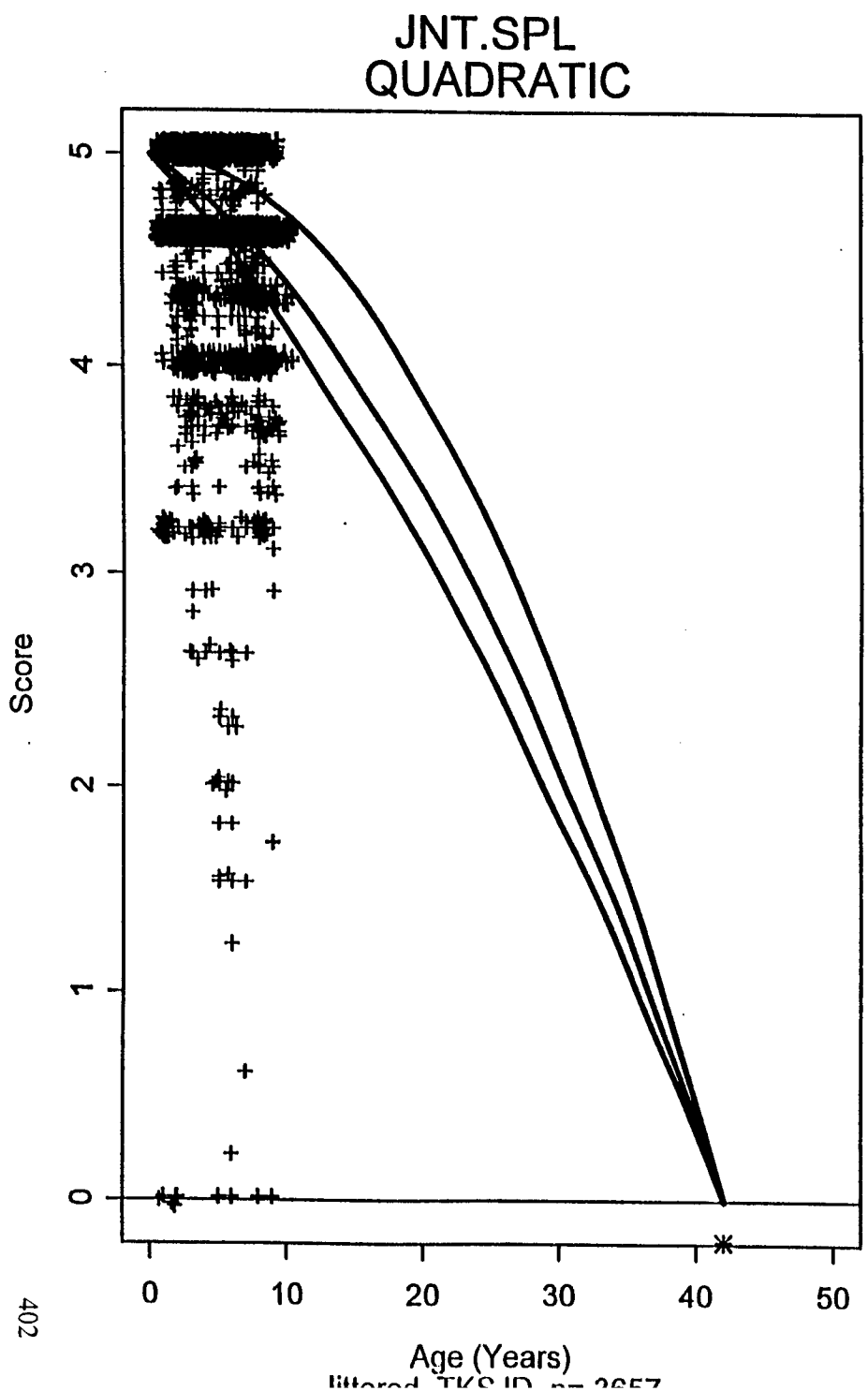
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.87	4.87	4.87	4.87	4.86	4.86	4.85	4.83	4.82	4.80	4.78

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.75	4.71	4.67	4.63	4.58	4.52	4.46	4.39	4.32	4.23	4.14

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.04	3.93	3.82	3.69	3.56	3.41	3.26	3.10	2.92	2.74	2.55

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	2.34	2.13	1.90	1.66	1.41	1.14	0.87	0.58	0.28	0.00	0.00





Date of Analysis: Fri May 8 08:32:31 1998
Family: TKSJD
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 42

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.072	0.012	-6.186	0

R-Squared = 0.81

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.045	0.016	-2.863	0.019

R-Squared = 0.477

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.001	0.008	-0.167	0.871

R-Squared = 0.003

ROUGHNESS ON TKSJD

INDEX = C - M * AGE ^ B

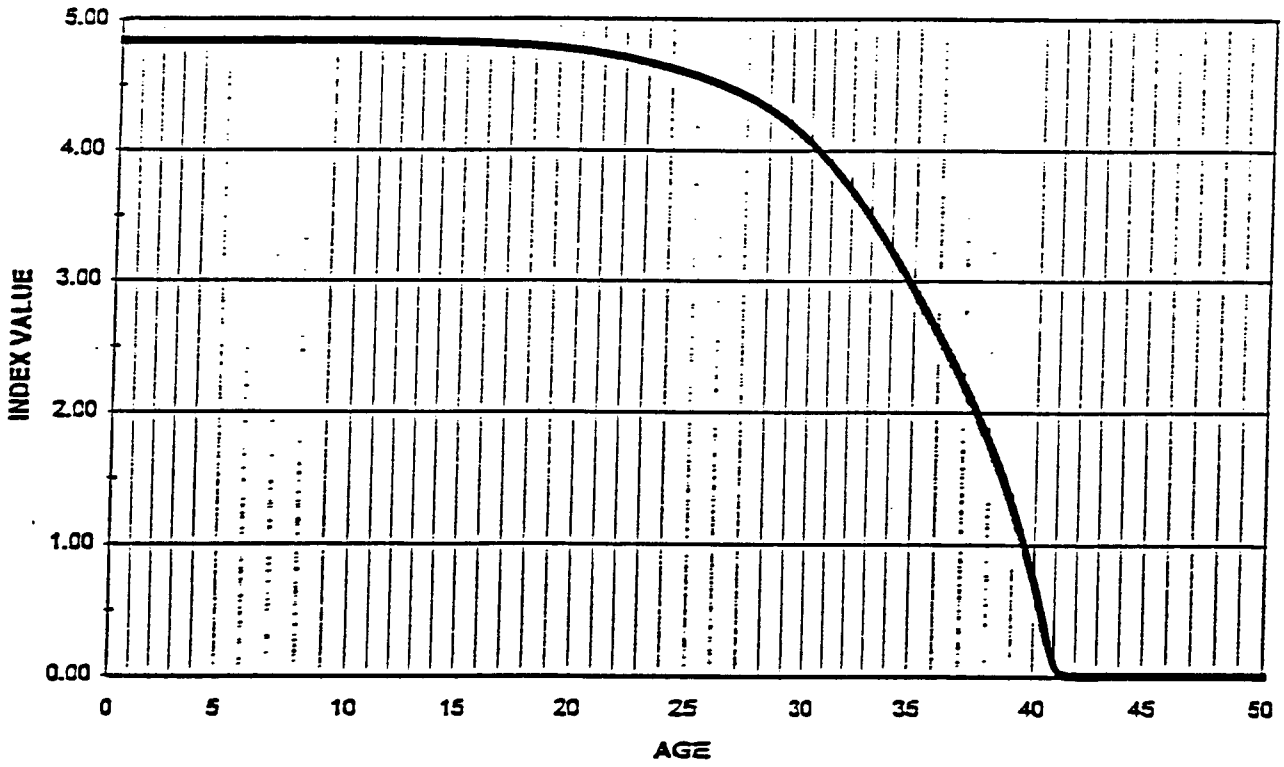
C Value: 4.84
M Value: 0.000000002742
B Value: 5.73

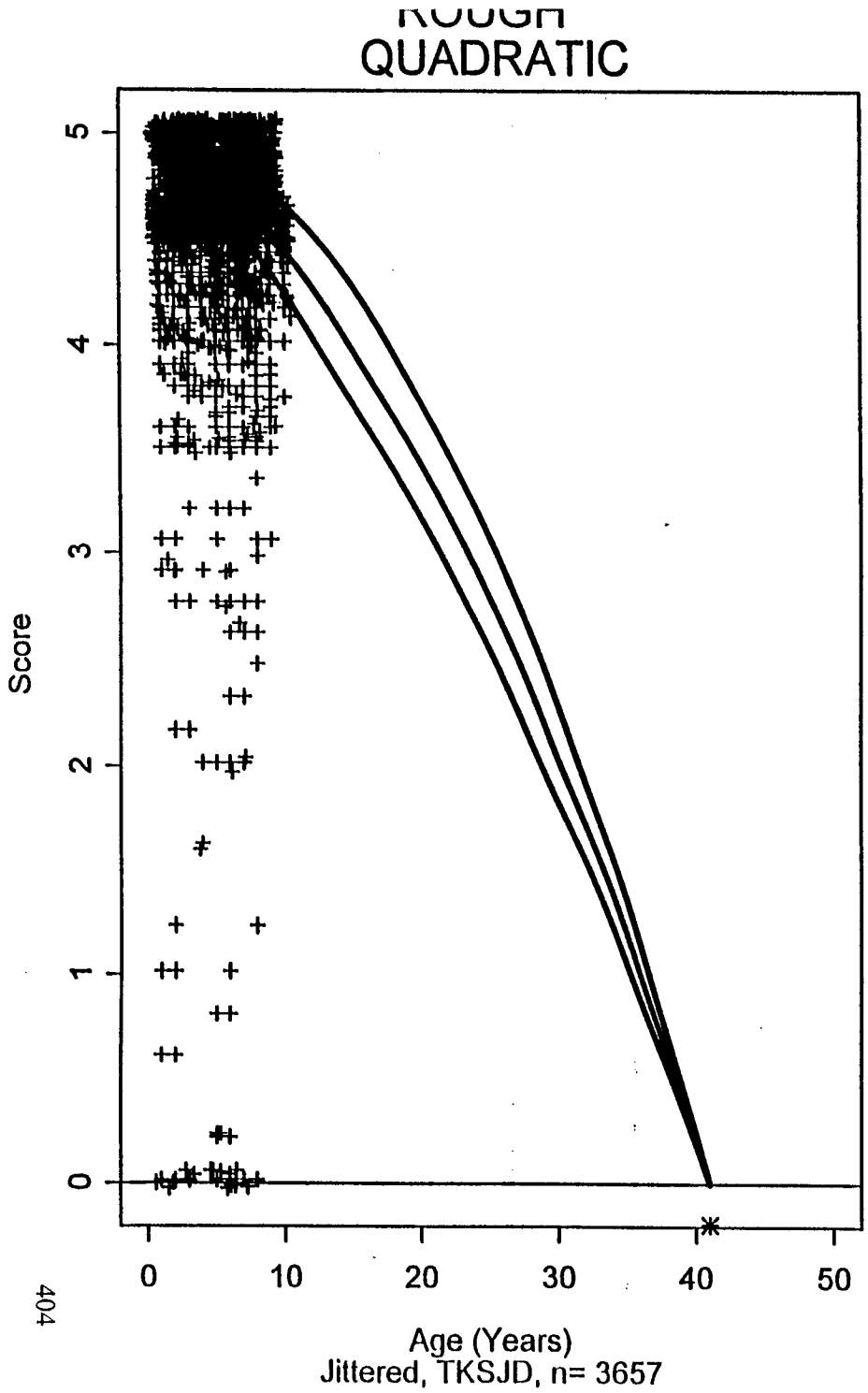
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84	4.84

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.84	4.84	4.83	4.83	4.82	4.82	4.81	4.80	4.78	4.76	4.74

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	4.71	4.67	4.62	4.56	4.49	4.40	4.30	4.18	4.04	3.88	3.69

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	3.46	3.21	2.91	2.57	2.19	1.75	1.25	0.69	0.06	0.00	0.00





Date of Analysis: Fri May 8 08:28:55 1998
Family: TKSJD
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 41

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.062	0.014	-4.327	0.002

R-Squared = 0.675

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.037	0.012	-2.987	0.015

R-Squared = 0.498

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.007	0.008	-0.855	0.415

R-Squared = 0.075

APPENDIX F5

PERFORMANCE MODELS FOR TNSJ PAVEMENT FAMILY

APPENDIX F5.1

PERFORMANCE MODELS FOR TNSJ - O PAVEMENT FAMILY

PAVEMENT FAMILY: TNSJ – Original

Number of data points available for regression of performance curves : 1170

Range of years of data available for the given family : 10 to 27 years

1. Corner Cracking [CRNR_CK]
   Existing Expert Model ends at @ 22 years
   Historical data forced to end at 22 years has a R^2 value of : 0.474
   Optimum forced end point is obtained at 34 years with a R^2 value of : 0.804 ✓

2. D-Cracking/ASR [DASR]
   Existing Expert Model ends at @ 25 years
   Historical data forced to end at 25 years has a R^2 value of : 0.647 ✓
   Regression analysis provides inconclusive results so use the existing expert model.

3. Faulting [FAULT]
   Existing Expert Model ends at @ 17 years
   Historical data forced to end at 17 years has a R^2 value of : 0.435
   Optimum forced end point is obtained at 15 years with a R^2 value of : 0.599 ✓

4. Joint Seal Damage [JNT_SLD]
   Existing Expert Model ends at @ 17 years
   Historical data forced to end at 17 years has a R^2 value of : 0.379
   Optimum forced end point is obtained at 31 years with a R^2 value of : 0.760 ✓

5. Joint Spalling [JNT_SPL]
   Existing Expert Model ends at @ 30 years
   Historical data forced to end at 30 years has a R^2 value of : 0.749
   Optimum forced end point is obtained at 29 years with a R^2 value of : 0.756 ✓

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   Existing Expert Model ends at @ 23 years
   Historical data forced to end at 23 years has a R^2 value of : 0.500
   Optimum forced end point is obtained at 33 years with a R^2 value of : 0.683 ✓

CORNER CRACKING ON TNSJ

NDEX = C - M * AGE ^ B

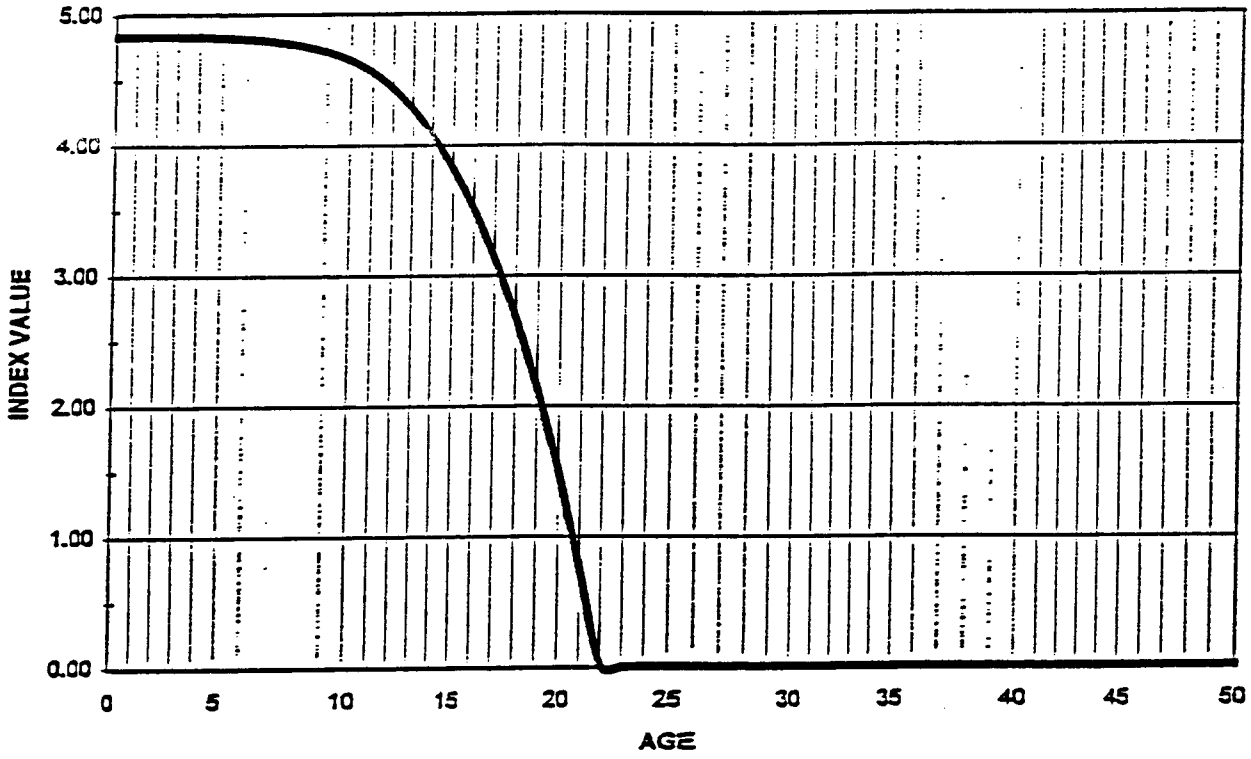
: Value: 4.84
M Value: 0.00001562
B Value: 4.10

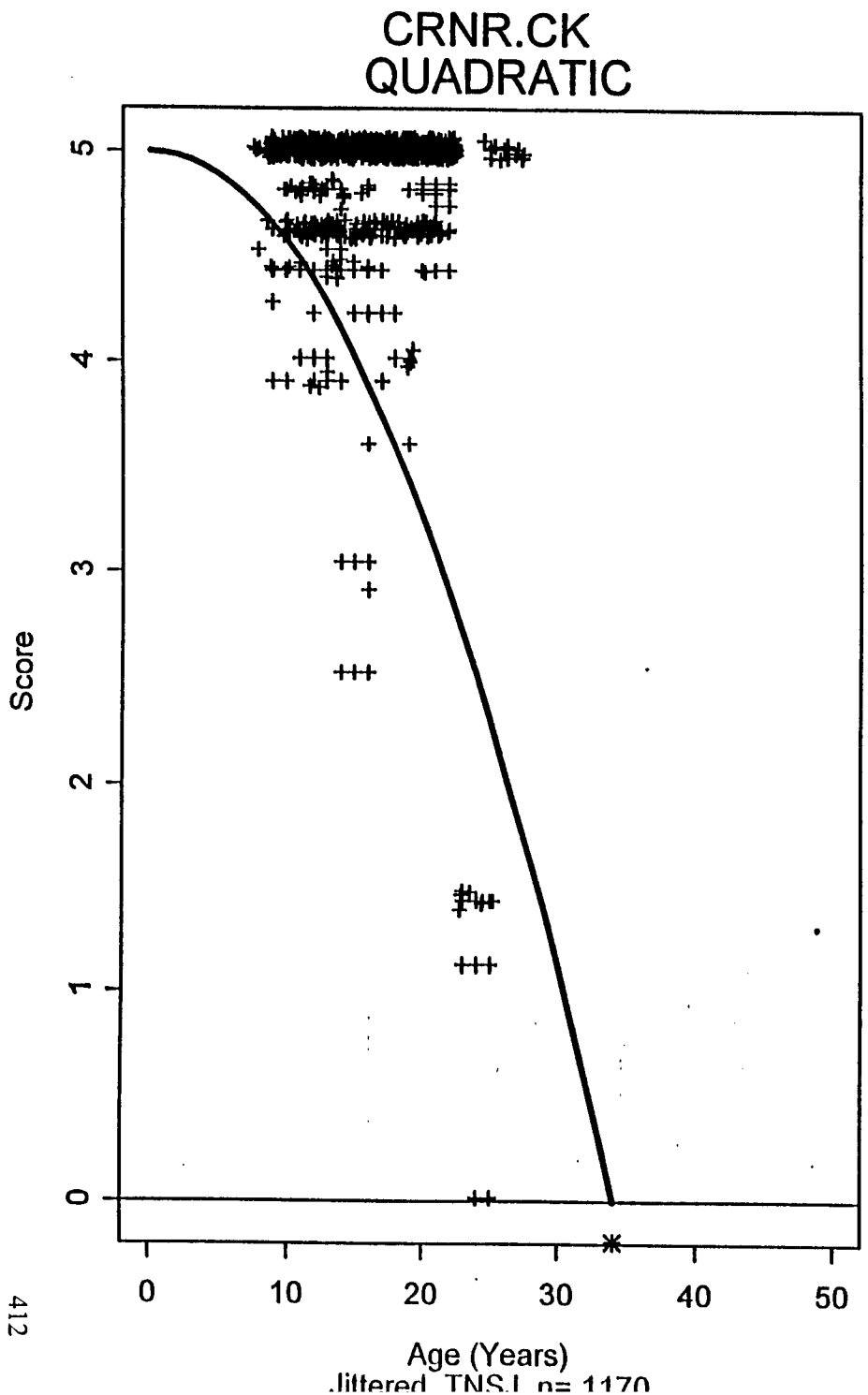
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.84	4.84	4.84	4.84	4.84	4.83	4.82	4.79	4.76	4.71	4.64

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.55	4.42	4.26	4.06	3.80	3.49	3.11	2.65	2.11	1.47	0.72

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 08:59:42 1998
Family: TNSJ
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 34

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.128	0.018	6.927	0

R-Squared = 0.716

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.141	0.016	8.838	0

R-Squared = 0.804

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.144	0.016	9.048	0

R-Squared = 0.812

D-CRACKING/ASR ON TNSJ

NDEX = C - M * AGE ^ B

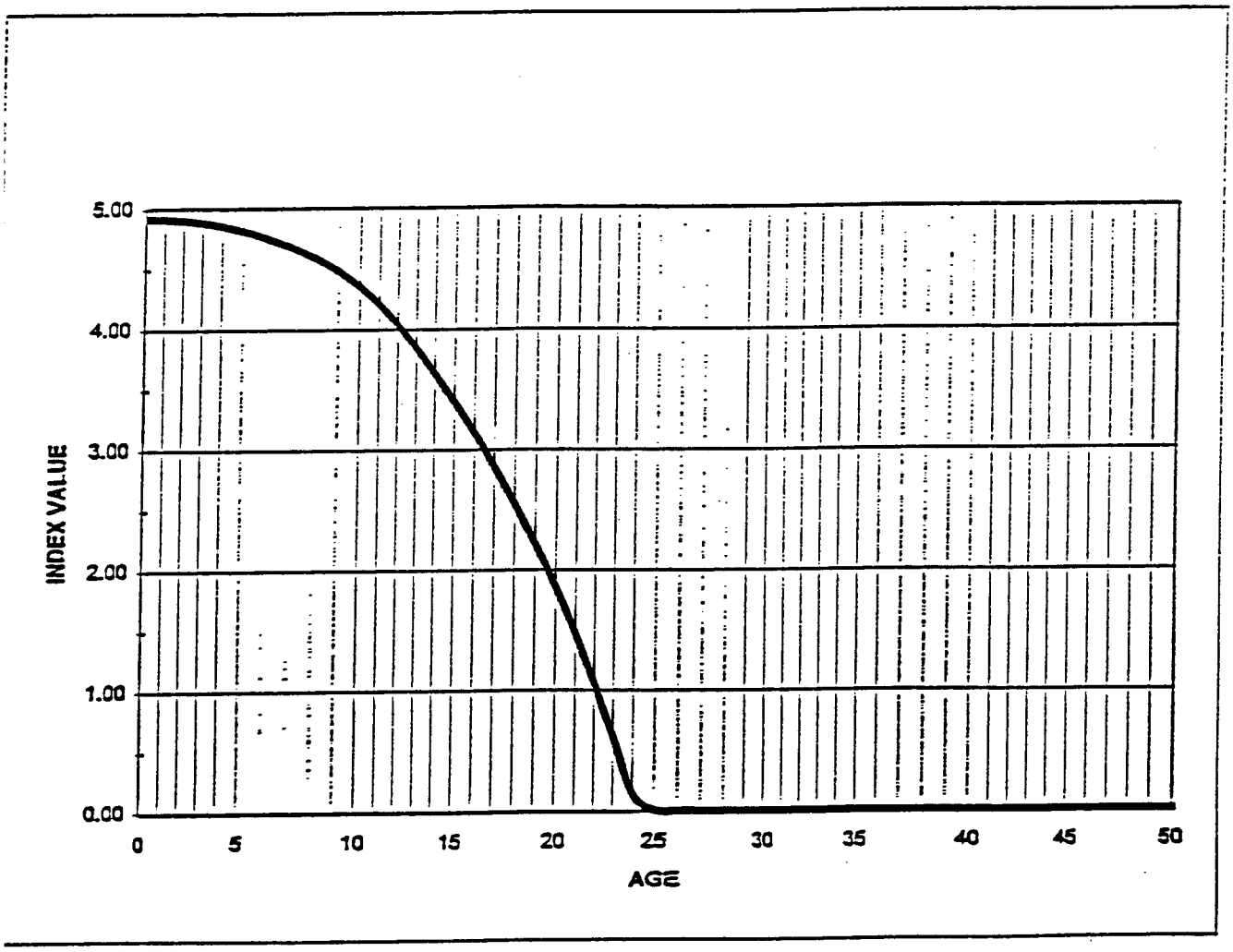
C Value: 4.92
M Value: 0.002191
B Value: 2.42

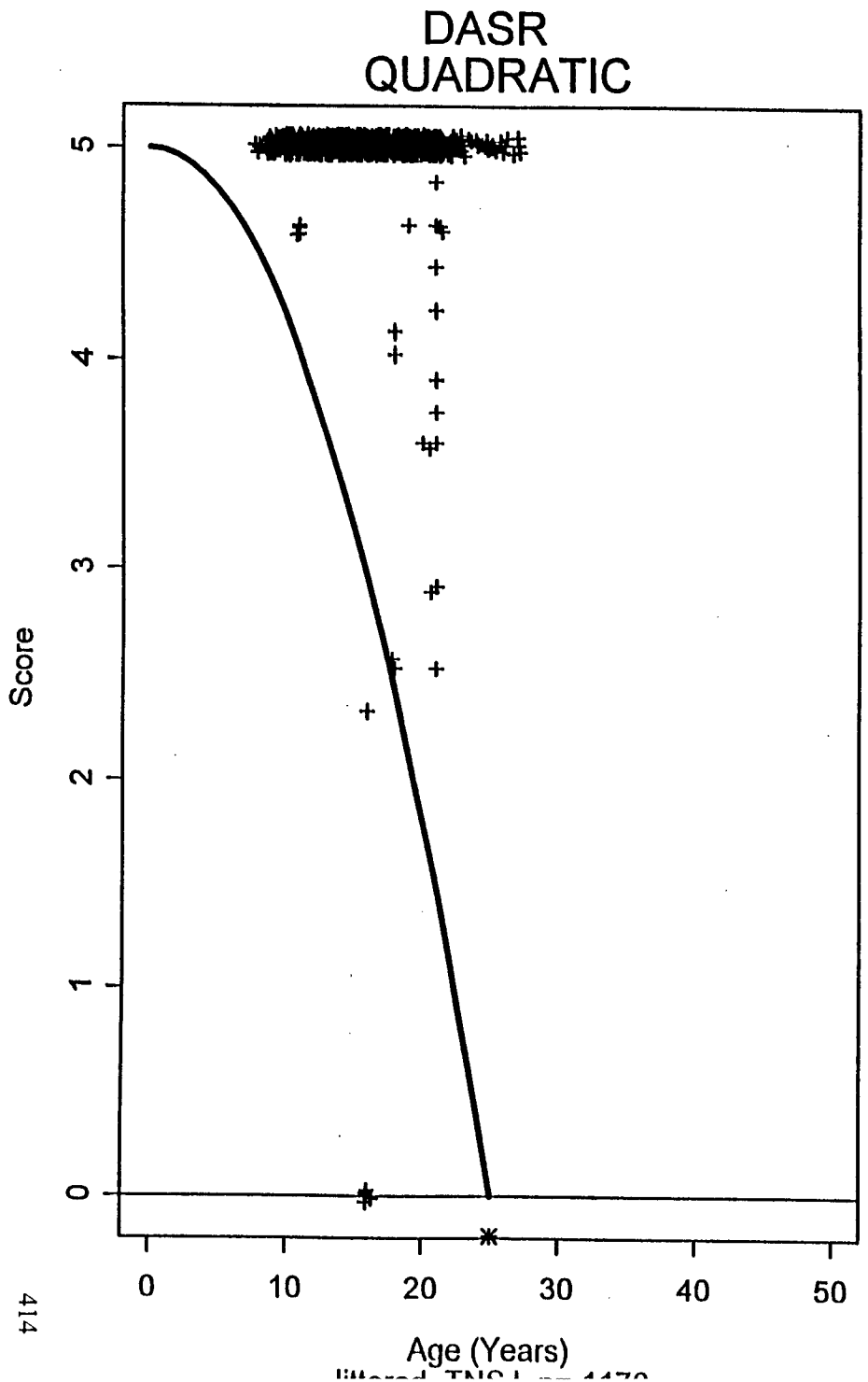
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.92	4.92	4.91	4.89	4.86	4.81	4.75	4.68	4.58	4.47	4.34

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.19	4.02	3.83	3.62	3.38	3.12	2.84	2.53	2.20	1.84	1.45

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	1.04	0.59	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 08:57:46 1998
Family: TNSJ
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 25

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.359	0.064	5.578	0

R-Squared = 0.647

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.359	0.064	5.578	0

R-Squared = 0.647

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.359	0.064	5.578	0

R-Squared = 0.647

FAULTING ON TNSJ

NDEX = C - M * AGE ^ B

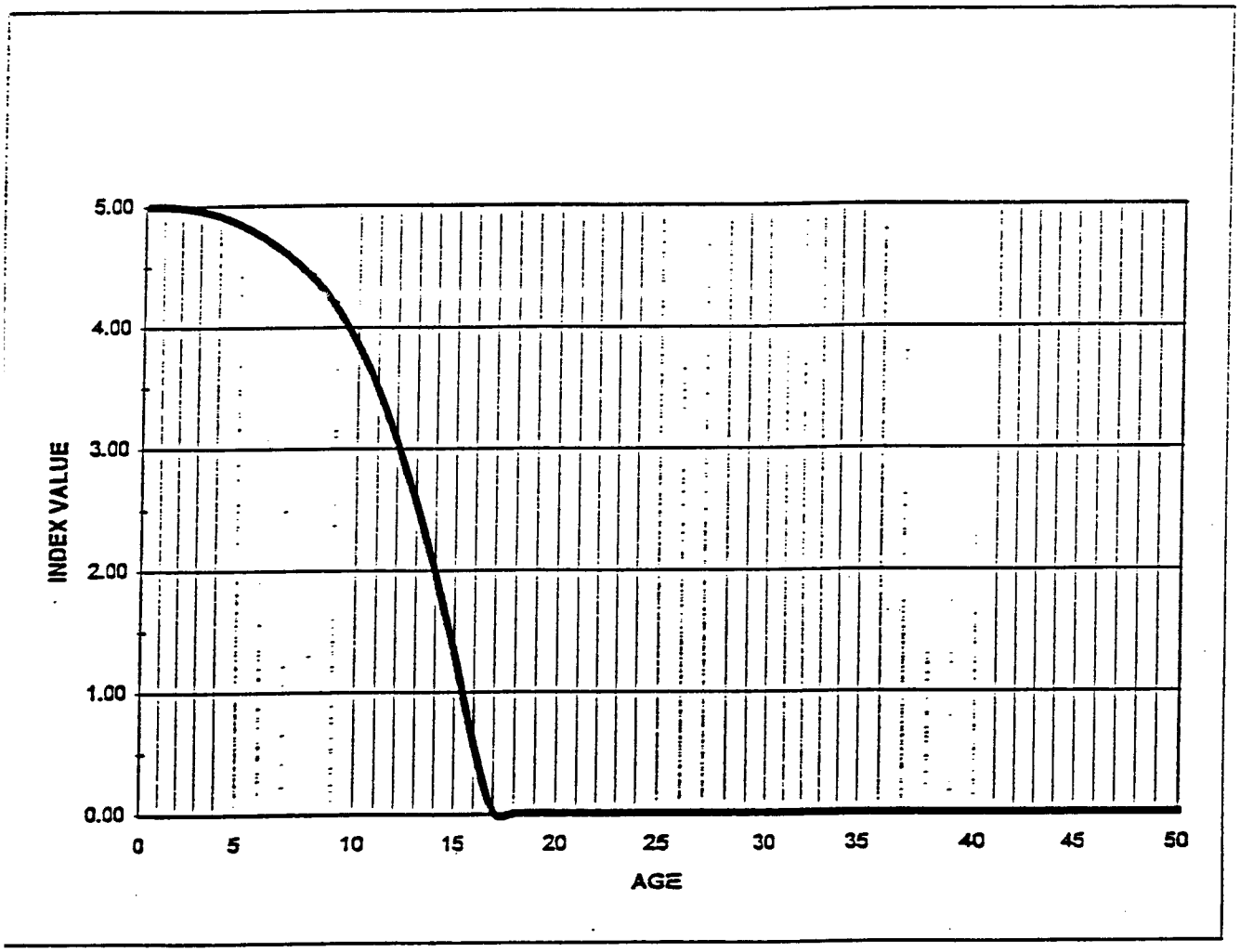
C Value: 5.00
M Value: 0.001609
B Value: 2.86

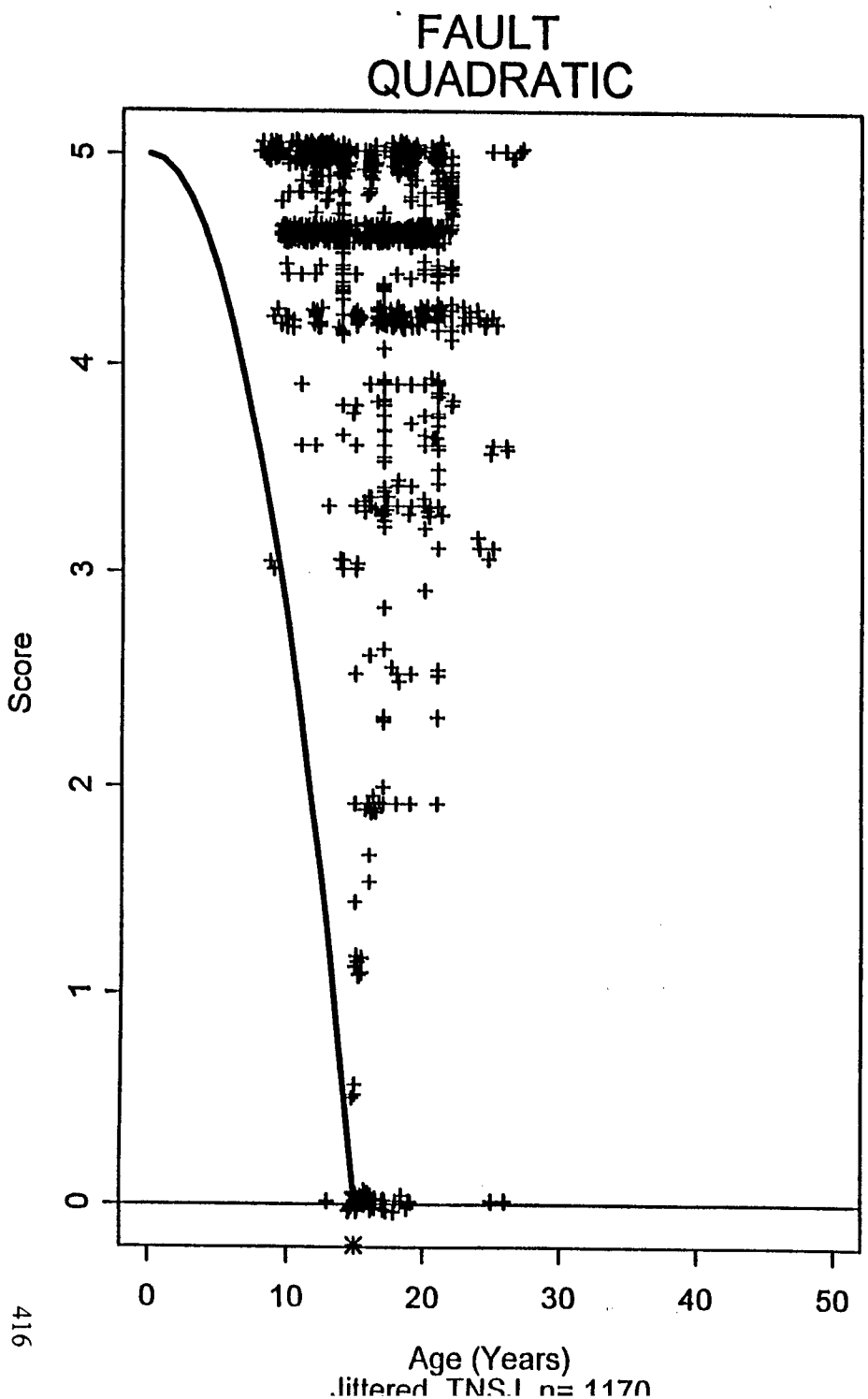
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	5.00	5.00	4.99	4.96	4.92	4.84	4.73	4.58	4.38	4.14	3.83

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	3.47	3.04	2.53	1.95	1.28	0.53	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 09:00:31 1998
Family: TNSJ
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 15

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.975	0.26	3.756	0.007

R-Squared = 0.668

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.038	0.321	3.238	0.014

R-Squared = 0.6

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	1.083	0.372	2.907	0.023

R-Squared = 0.547

JOINT SEAL DAMAGE ON TNSJ

IEX = C - M * AGE ^ B

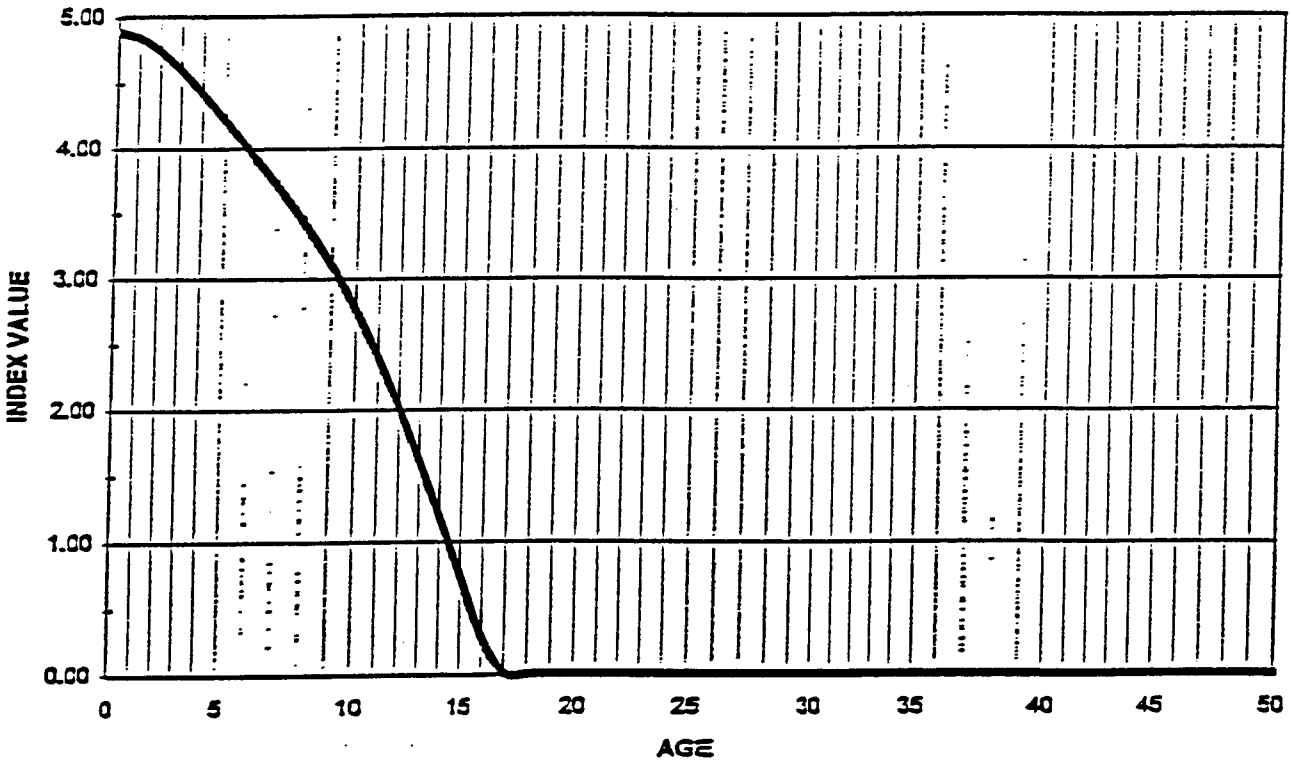
'alue: 4.89
'alue: 0.050452
'alue: 1.63

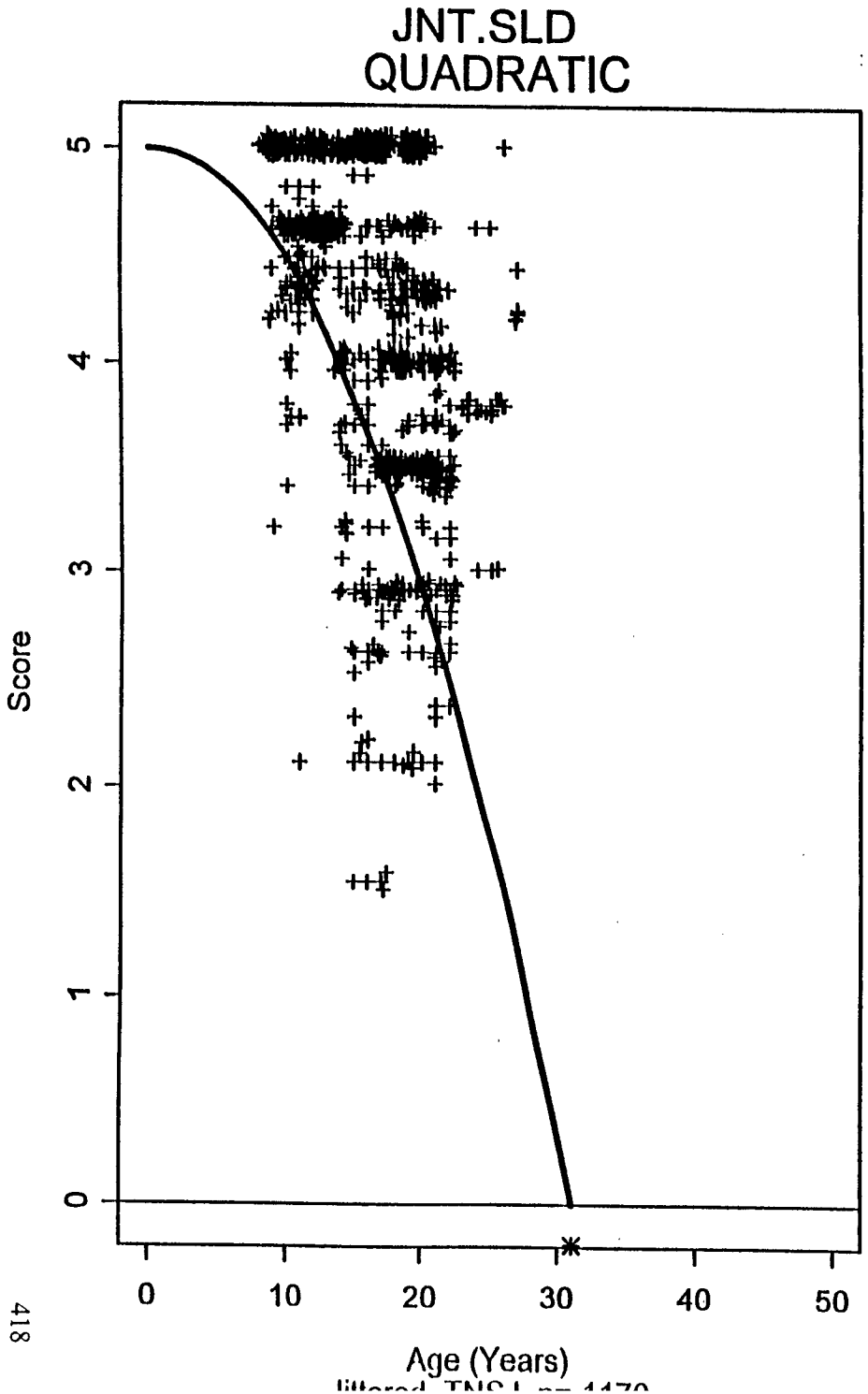
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.89	4.84	4.73	4.59	4.41	4.19	3.95	3.69	3.39	3.08	2.74

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	2.38	1.99	1.59	1.17	0.72	0.25	0.00	0.00	0.00	0.00	0.00

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 09:01:19 1998
Family: TNSJ
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 31

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.05	0.014	3.641	0.002

R-Squared = 0.411

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.113	0.015	7.759	0

R-Squared = 0.76

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.149	0.017	8.545	0

R-Squared = 0.793

JOINT SPALLING ON TNSJ

DEX = C - M * AGE ^ B

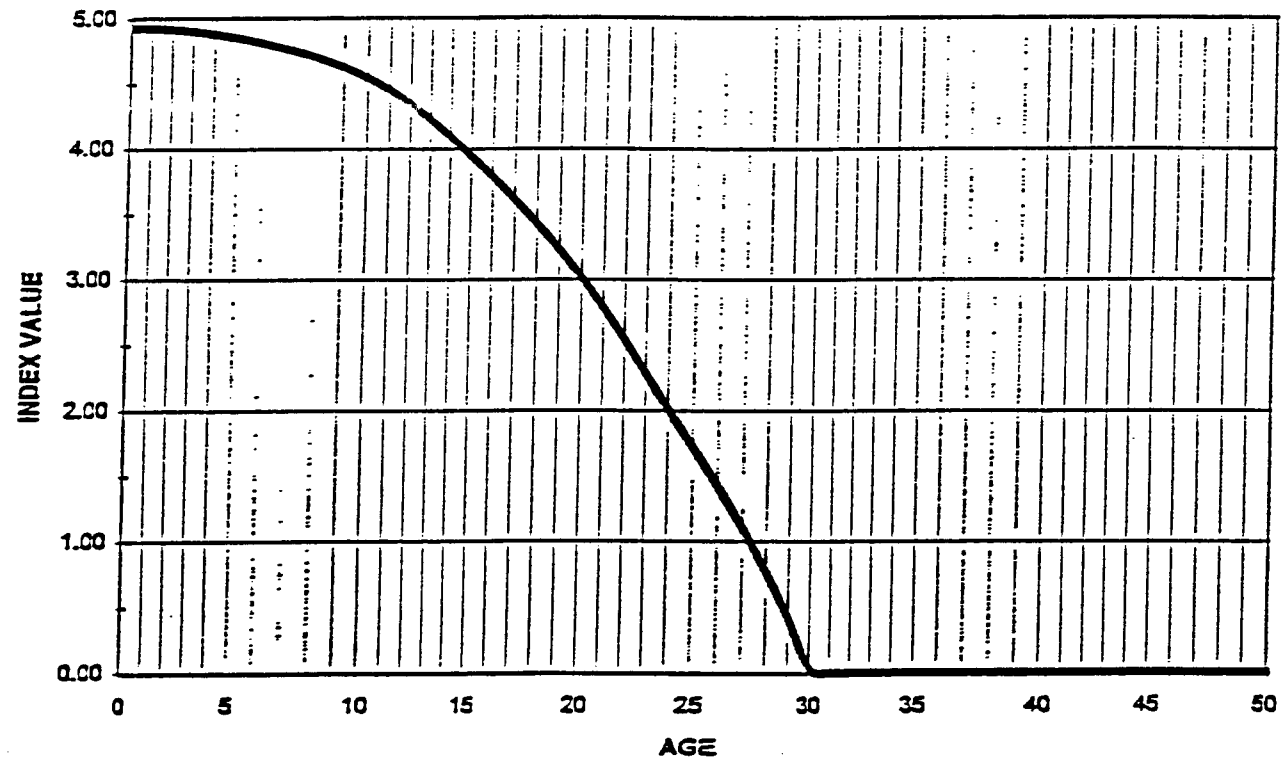
Value: 4.93
Value: 0.001964
Value: 2.30

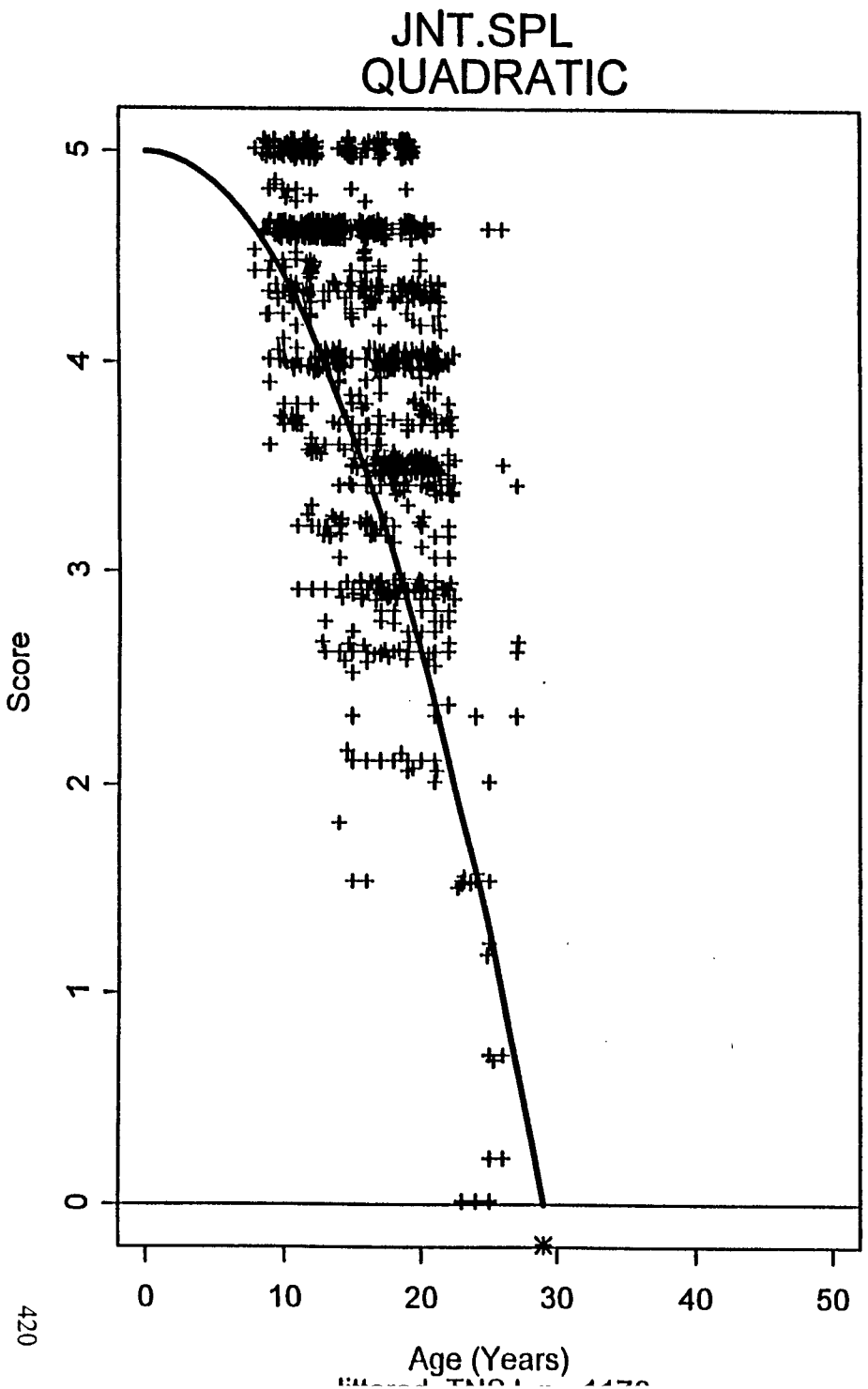
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.93	4.93	4.92	4.91	4.88	4.85	4.81	4.76	4.70	4.62	4.54

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.44	4.33	4.21	4.08	3.93	3.77	3.60	3.42	3.21	3.00	2.77

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	2.53	2.27	1.99	1.71	1.40	1.08	0.75	0.39	0.03	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 08:58:38 1998
Family: TNSJ
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 29

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.046	0.015	3.106	0.006

R-Squared = 0.337

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.109	0.014	7.67	0

R-Squared = 0.756

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.164	0.021	7.836	0

R-Squared = 0.764

ROUGHNESS ON TNSJ

IDEX = C - M * AGE ^ B

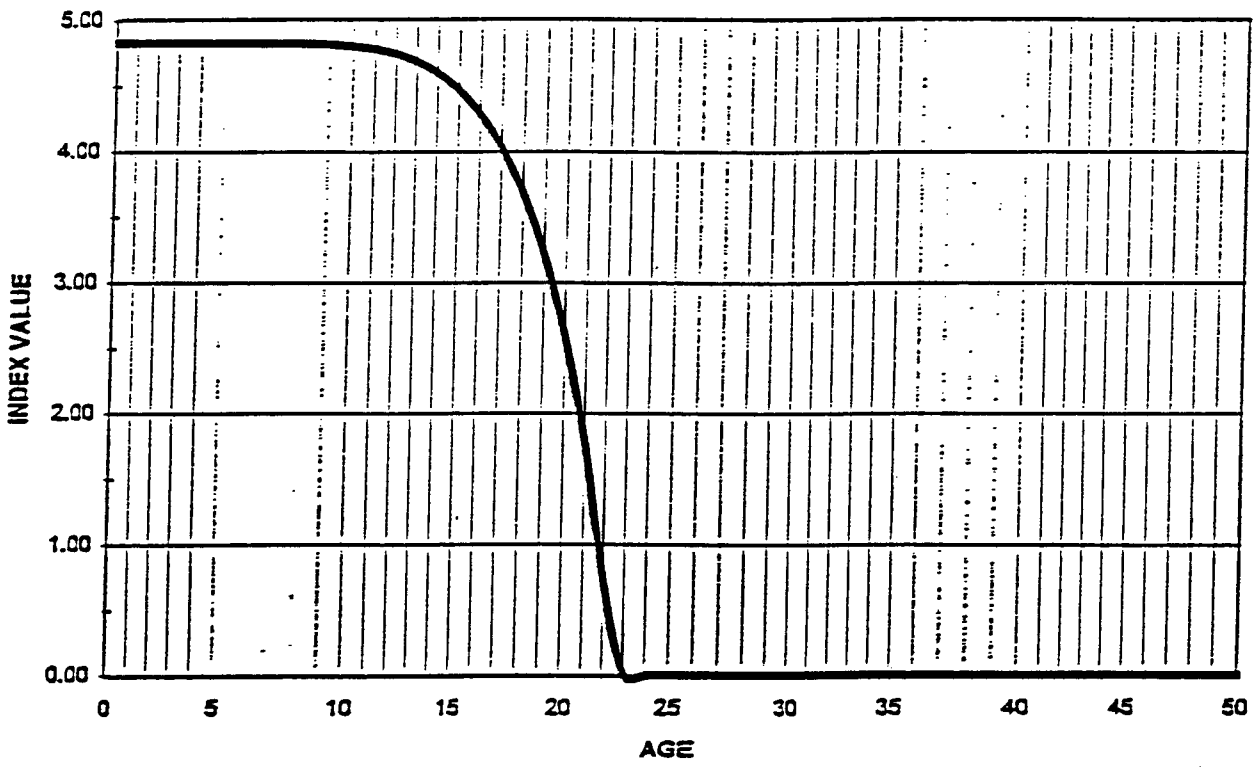
; Value: 4.83
I Value: 0.00000001489
Value: 6.29

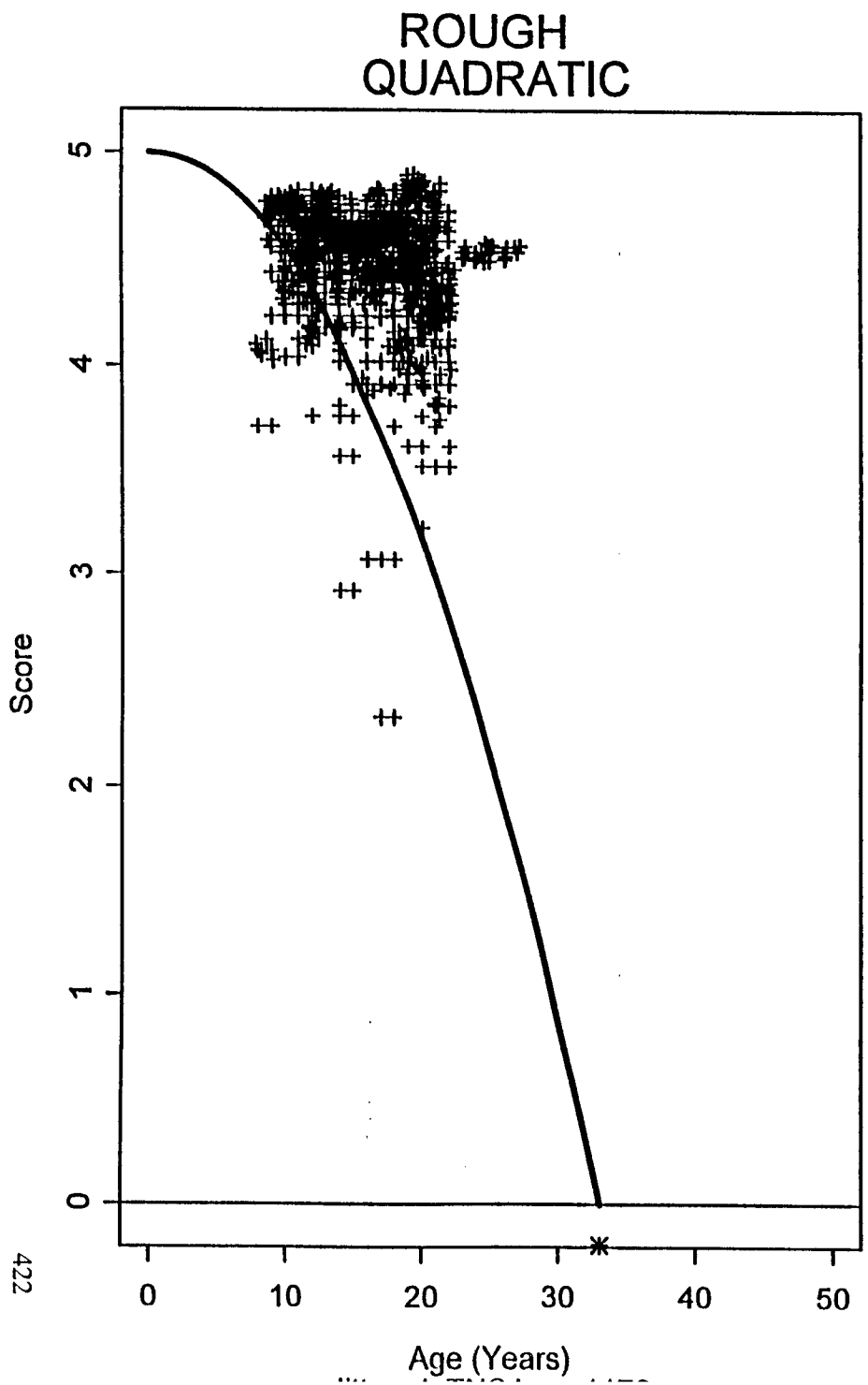
AGE	0	1	2	3	4	5	6	7	8	9	10
VALUE	4.83	4.83	4.83	4.83	4.83	4.83	4.83	4.83	4.82	4.82	4.80

AGE	11	12	13	14	15	16	17	18	19	20	21
VALUE	4.78	4.74	4.68	4.59	4.46	4.27	4.01	3.66	3.18	2.56	1.74

AGE	22	23	24	25	26	27	28	29	30	31	32
VALUE	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AGE	33	34	35	36	37	38	39	40	41	42	43
VALUE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00





Date of Analysis: Fri May 8 08:56:39 1998
Family: TNSJ
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 33

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.08	0.015	5.154	0

R-Squared = 0.583

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.098	0.015	6.4	0

R-Squared = 0.683

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.112	0.016	7.003	0

R-Squared = 0.721

APPENDIX F5.2

PERFORMANCE MODELS FOR TNSJ - G PAVEMENT FAMILY

PAVEMENT FAMILY: TNSJ – G [Grinding on Original]

Number of data points available for regression of performance curves : 78
Range of years of data available for the given family : 6 years

1. Corner Cracking [CRNR_CK]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.
   Adjusting from the expert curve of the TNSJ-U Family use endpoint of 16 years
   Historical data forced to end at 16 years has a R^2 value of : 0.078 ✓

2. D-Cracking/ASR [DASR]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.
   Adjusting from the expert curve of the TNSJ-U Family use endpoint of 10 years
   Historical data forced to end at 10 years has a R^2 value of : 0.960 ✓

3. Faulting [FAULT]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.
   Adjusting from the expert curve of the TNSJ-U Family use endpoint of 12 years
   Historical data forced to end at 12 years has a R^2 value of : 0.504 ✓

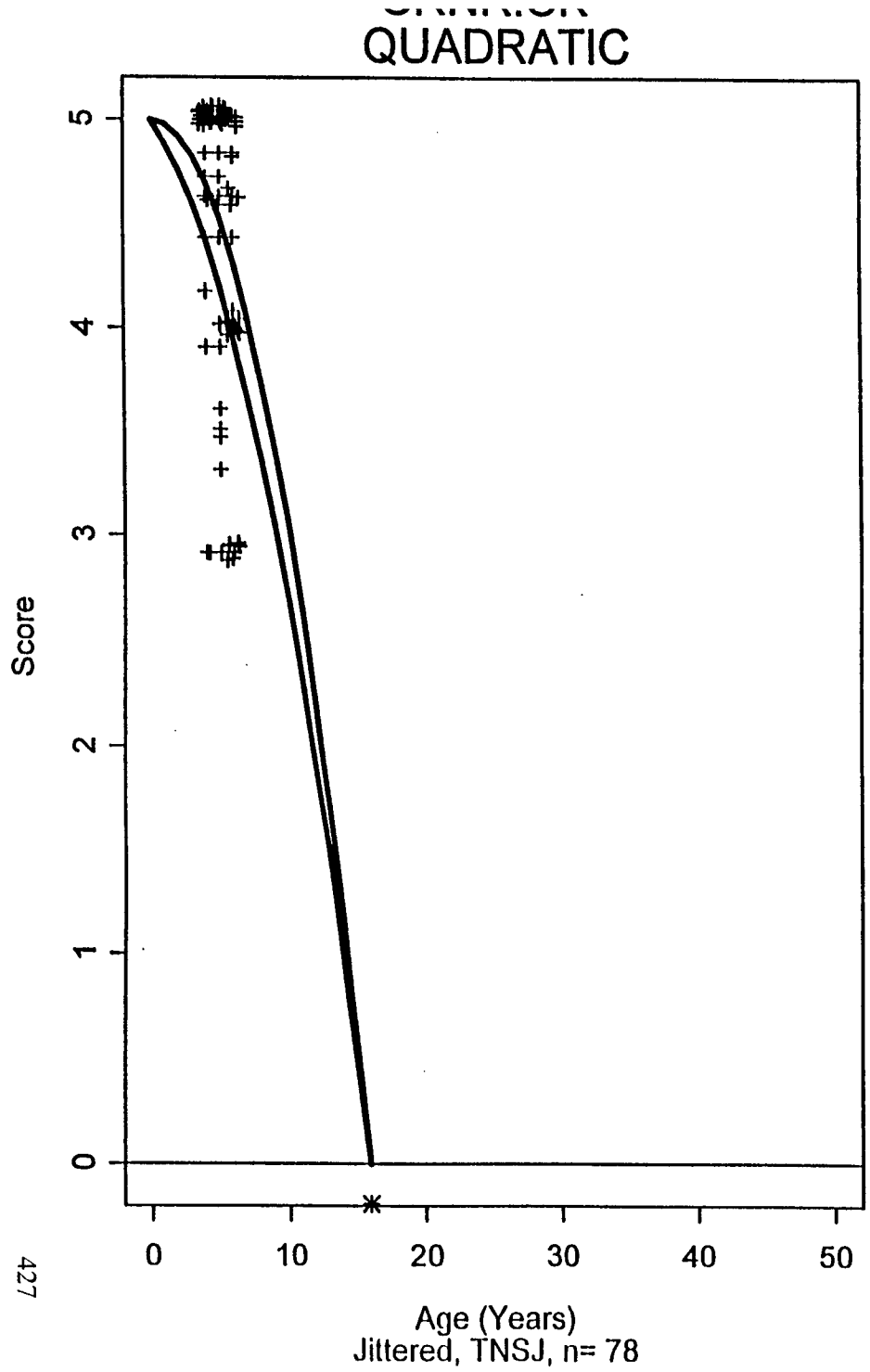
4. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.
   Adjusting from the expert curve of the TNSJ-U Family use endpoint of 10 years
   Historical data forced to end at 10 years has a R^2 value of : 0.001 ✓

5. Joint Spalling [JNT_SPL]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.
   Adjusting from the expert curve of the TNSJ-U Family use endpoint of 29 years
   Historical data forced to end at 29 years has a R^2 value of : 0.748 ✓

6. Punchouts [PUNCH]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.

7. Roughness [ROUGH]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.
   Adjusting from the expert curve of the TNSJ-U Family use endpoint of 12 years
   Historical data forced to end at 12 years has a R^2 value of : 0.524 ✓

Selection of endpoints (from TNSJ-O or TNSJ-U) is based on engineering judgement.



Date of Analysis: Fri May 8 09:10:39 1998
Family: TNSJ
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.095	0.042	-2.287	0.15

R-Squared = 0.723

50TH PERCENTILE
Coefficient Estimates:

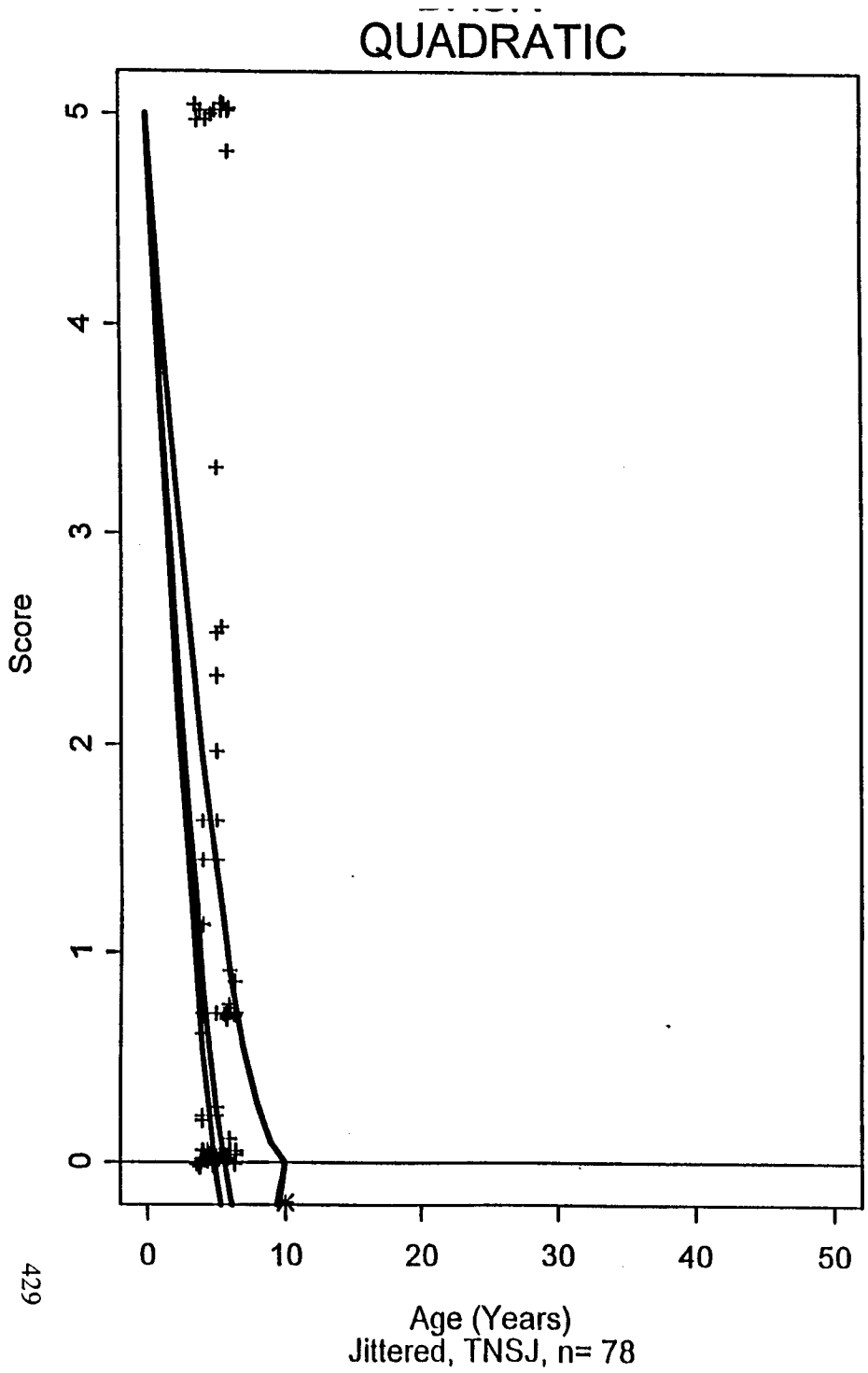
	Value	Std. Error	t value	Pr(>|t|)
1	0.023	0.055	0.41	0.721

R-Squared = 0.078

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.124	0.01	11.911	0.007

R-Squared = 0.986



Date of Analysis: Fri May 8 09:08:54 1998
Family: TNSJ
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-1.527	0.119	-12.784	0.006

R-Squared = 0.988

50TH PERCENTILE
Coefficient Estimates:

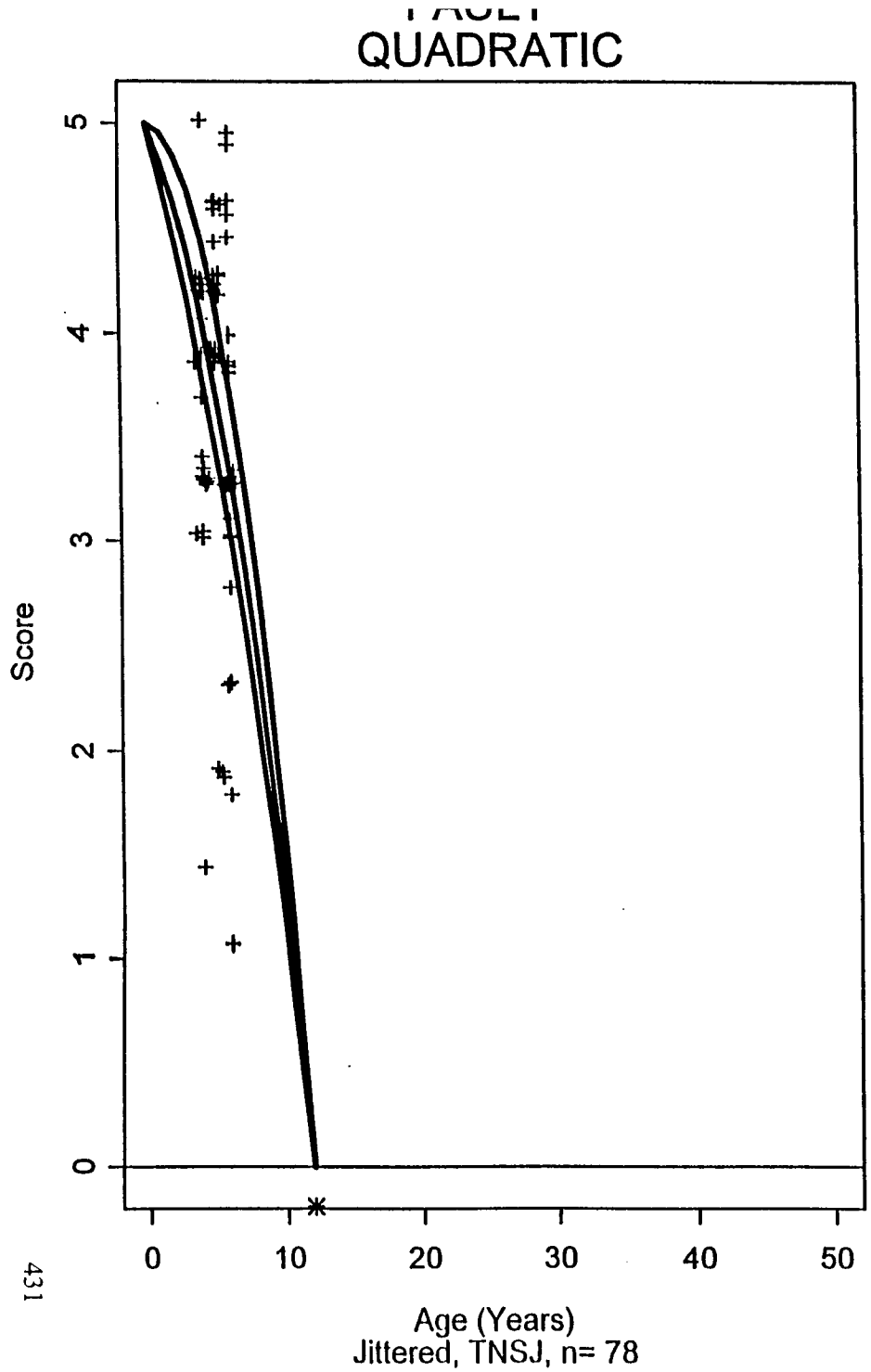
	Value	Std. Error	t value	Pr(>|t|)
1	-1.402	0.202	-6.948	0.02

R-Squared = 0.96

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.953	0.24	-3.967	0.058

R-Squared = 0.887



Date of Analysis: Fri May 8 09:11:24 1998
Family: TNSJ
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.243	0.098	-2.472	0.132

R-Squared = 0.753

50TH PERCENTILE
Coefficient Estimates:

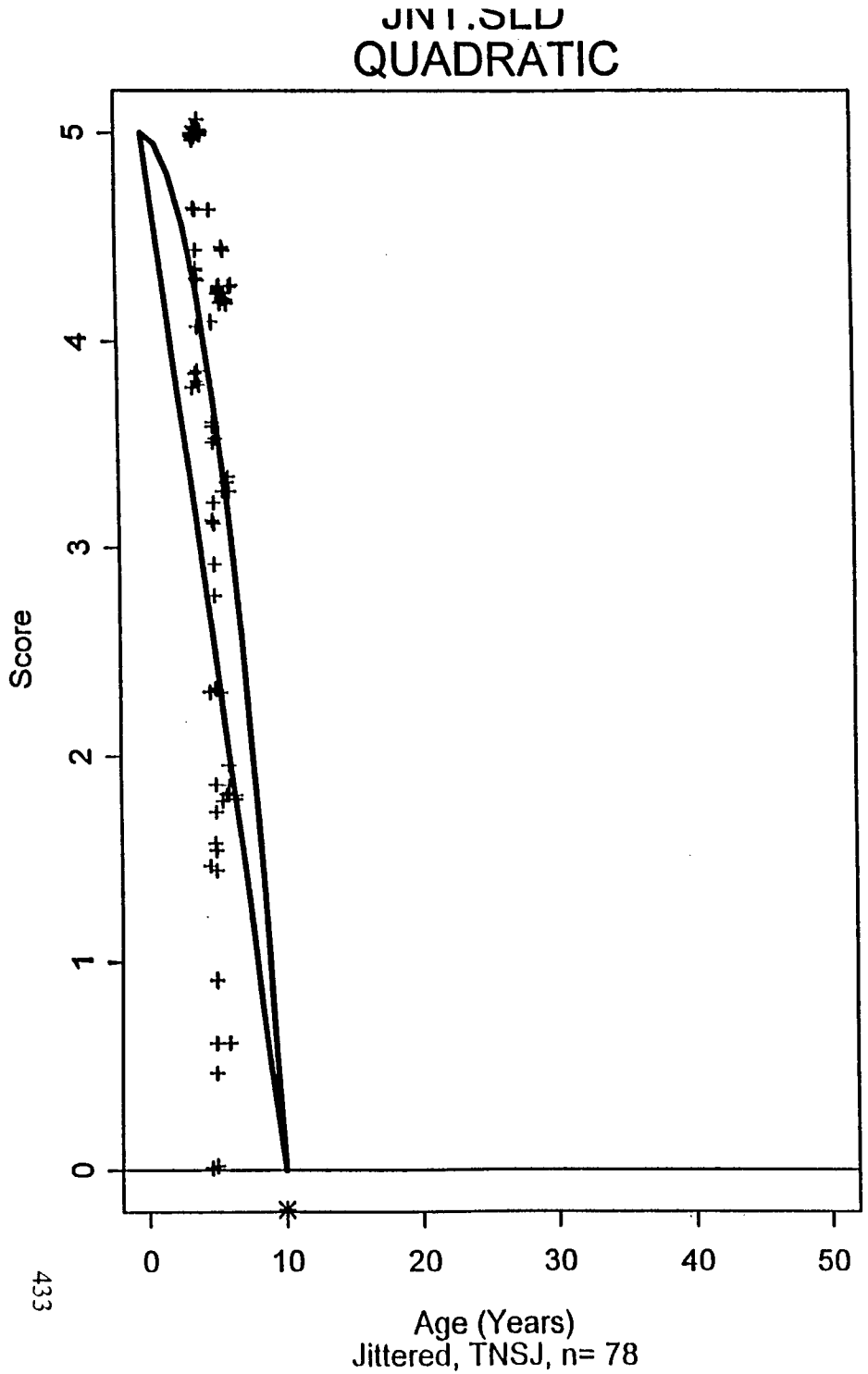
	Value	Std. Error	t value	Pr(>|t|)
1	-0.144	0.101	-1.425	0.29

R-Squared = 0.504

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.006	0.039	-0.144	0.898

R-Squared = 0.01



Date of Analysis: Fri May 8 09:12:11 1998
Family: TNSJ
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.498	0.284	-1.751	0.222

R-Squared = 0.605

50TH PERCENTILE
Coefficient Estimates:

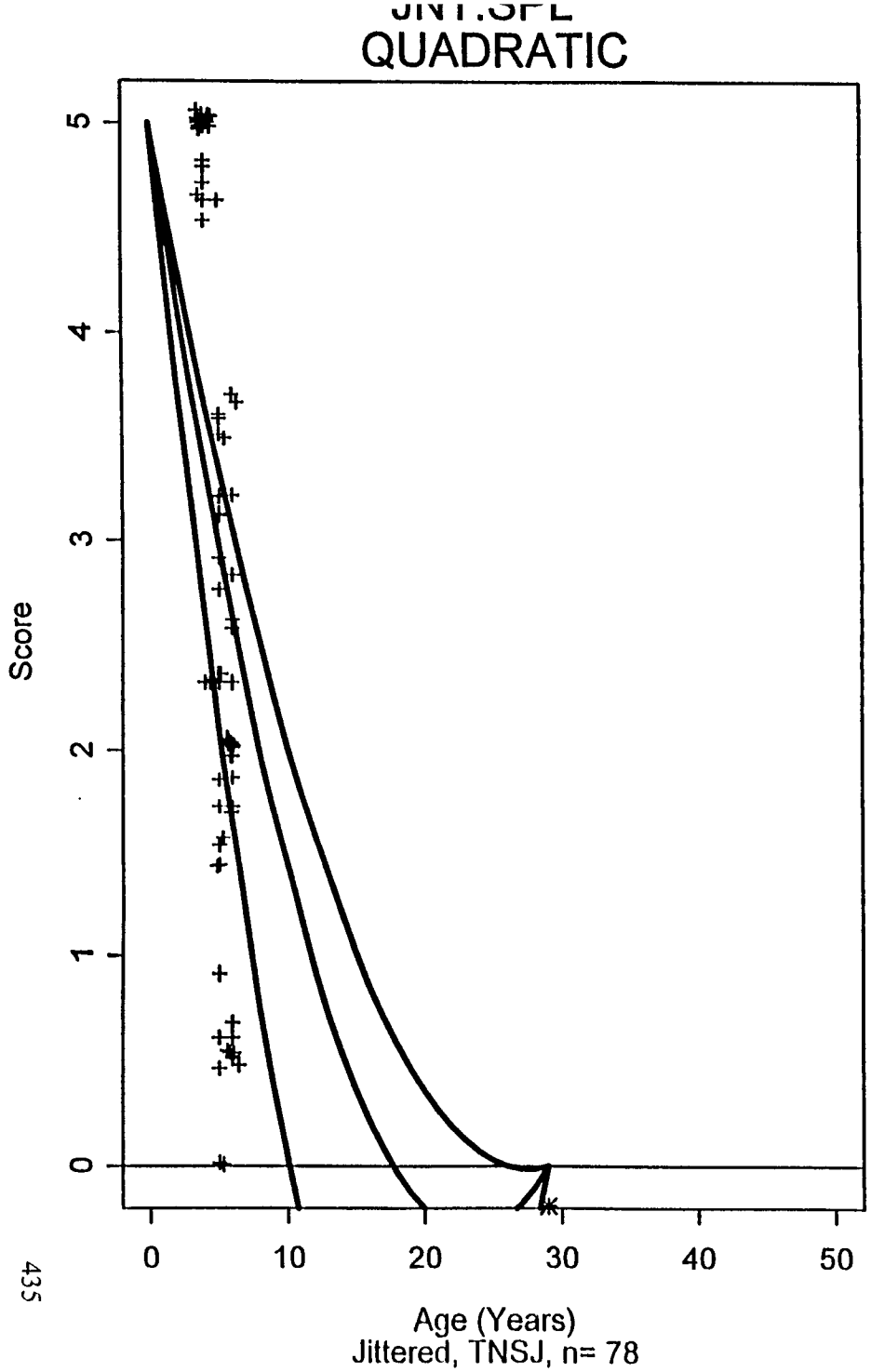
	Value	Std. Error	t value	Pr(>|t|)
1	0.012	0.312	0.039	0.973

R-Squared = 0.001

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.162	0.206	0.789	0.513

R-Squared = 0.237



Date of Analysis: Fri May 8 09:09:49 1998
Family: TNSJ
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 29

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.667	0.244	-2.733	0.112

R-Squared = 0.789

50TH PERCENTILE
Coefficient Estimates:

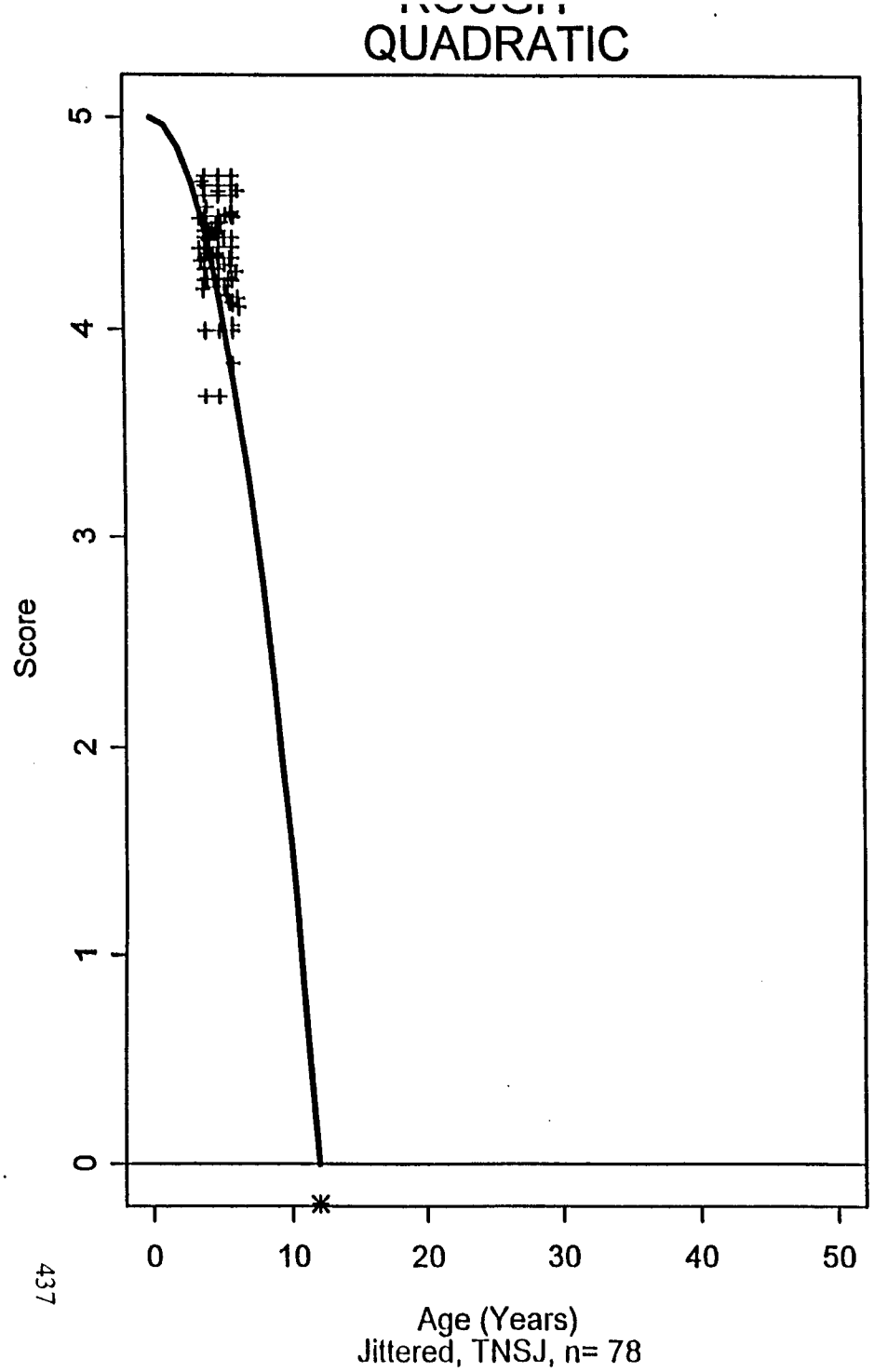
	Value	Std. Error	t value	Pr(>|t|)
1	-0.455	0.187	-2.435	0.135

R-Squared = 0.748

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.364	0.157	-2.324	0.146

R-Squared = 0.73



Date of Analysis: Fri May 8 09:08:08 1998
Family: TNSJ
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.047	0.049	0.961	0.438

R-Squared = 0.316

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.088	0.06	1.483	0.276

R-Squared = 0.524

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.141	0.066	2.152	0.164

R-Squared = 0.698

APPENDIX F5.3

PERFORMANCE MODELS FOR TNSJ - U PAVEMENT FAMILY

PAVEMENT FAMILY: TNSJ – U [Undersealing on Original]

Number of data points available for regression of performance curves : 558

Range of years of data available for the given family : 05 to 08 years

1. Corner Cracking [CRNR_CK]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 16 years with a R^2 value of : 0.796 ✓

2. D-Cracking/ASR [DASR]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.924 ✓

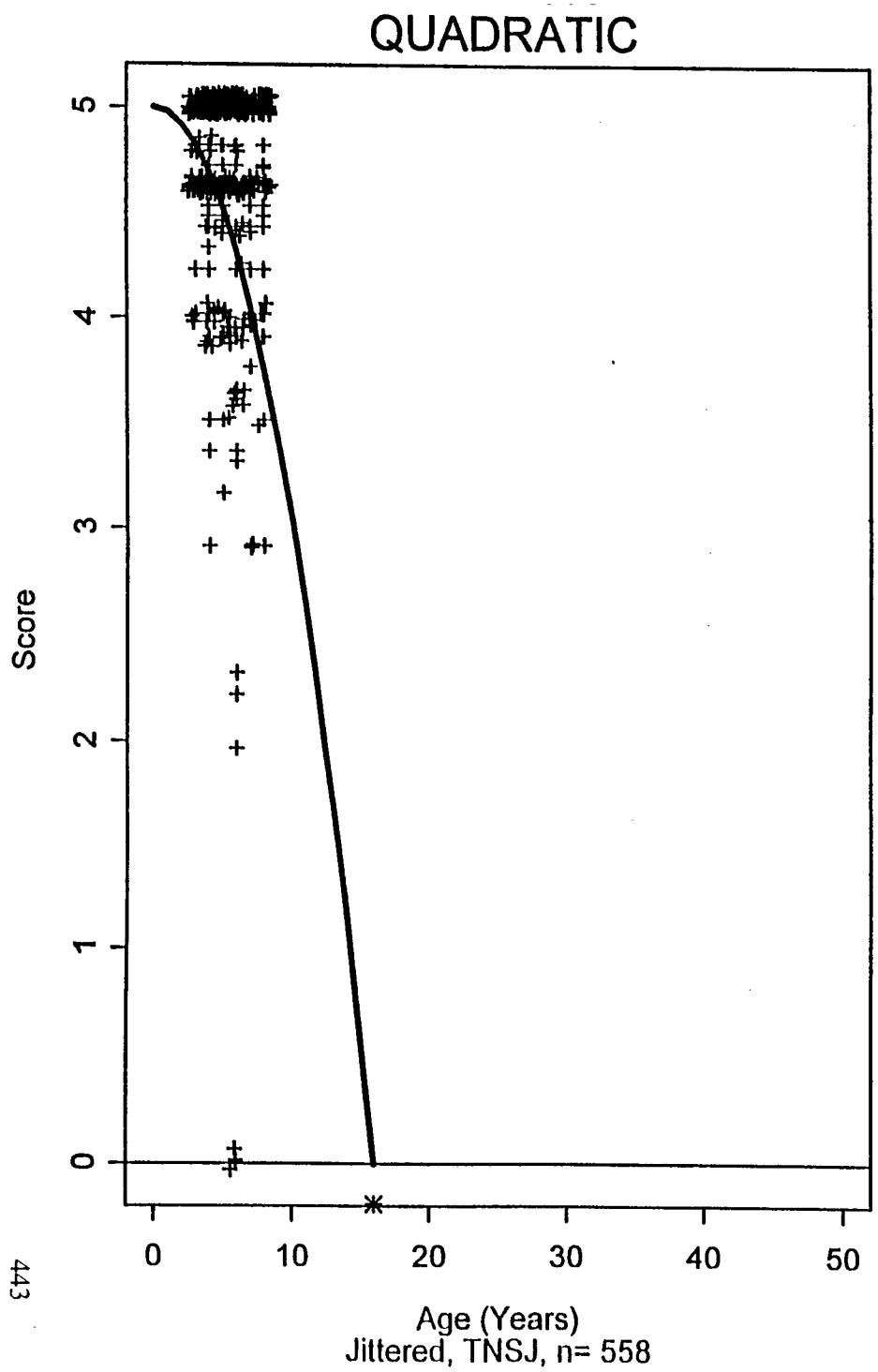
3. Faulting [FAULT]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.659 ✓

4. Joint Seal Damage [JNT_SLD]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 10 years with a R^2 value of : 0.627 ✓

5. Joint Spalling [JNT_SPL]
   No Existing Expert Model
   Insufficient data so develop an expert opinion.
   Adjusting from the expert curve of the Original Family use endpoint of 29 years
   Historical data forced to end at 29 years has a R^2 value of : 0.912 ✓

6. Punchouts [PUNCH]
   No Existing Expert Model
   Regression analysis provides inconclusive results.

7. Roughness [ROUGH]
   No Existing Expert Model
   Historical data forced to end at ** years has a R^2 value of : N/A
   Optimum forced end point is obtained at 12 years with a R^2 value of : 0.639 ✓



Date of Analysis: Fri May 8 09:18:06 1998
Family: TNSJ
Index: CRNR.CK
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 16

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.072	0.038	1.891	0.117

R-Squared = 0.417

50TH PERCENTILE
Coefficient Estimates:

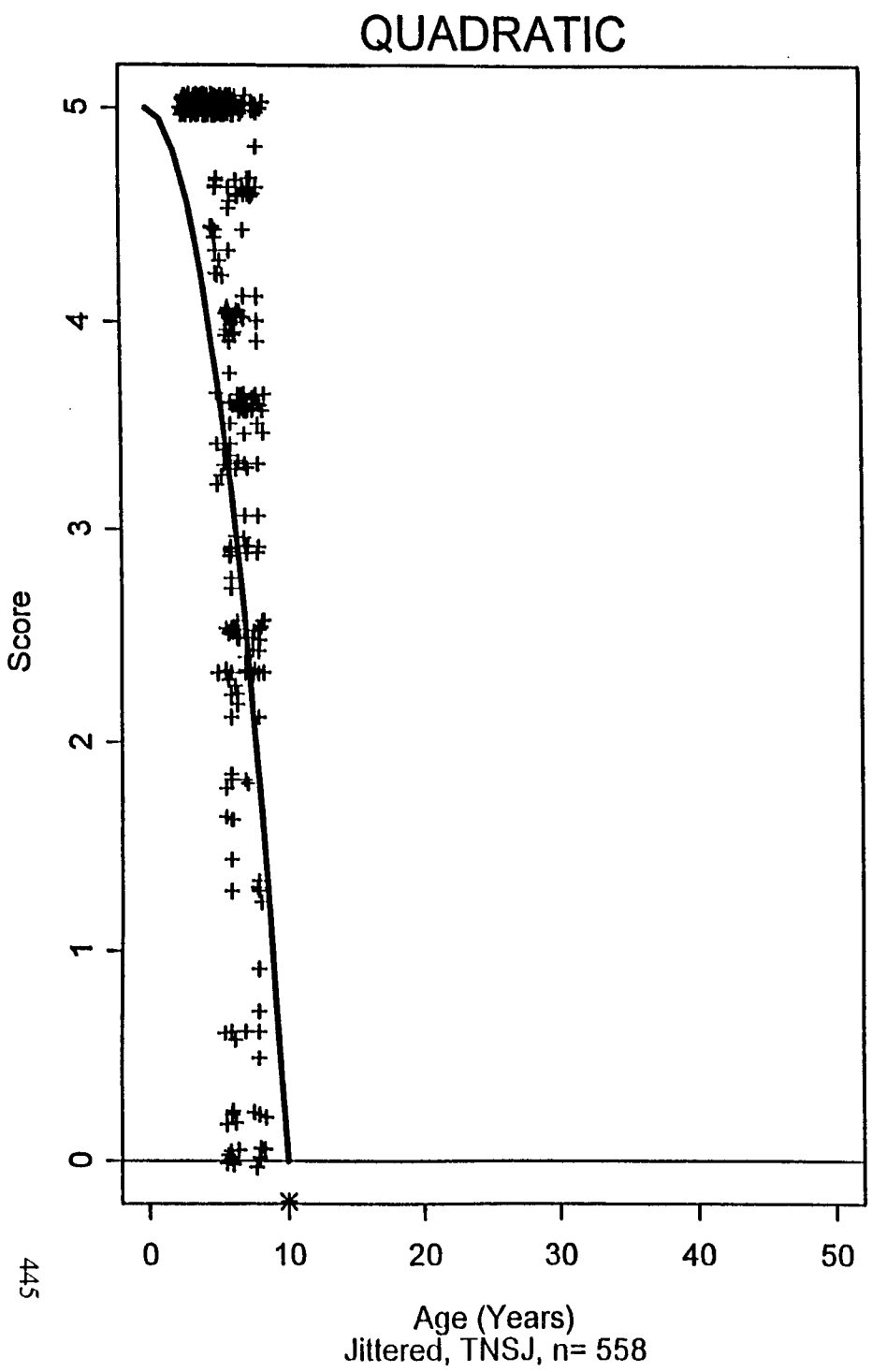
	Value	Std. Error	t value	Pr(>|t|)
1	0.178	0.04	4.414	0.007

R-Squared = 0.796

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.186	0.032	5.842	0.002

R-Squared = 0.872



Date of Analysis: Fri May 8 09:15:53 1998
Family: TNSJ
Index: DASR
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.21	0.138	1.518	0.189

R-Squared = 0.316

50TH PERCENTILE
Coefficient Estimates:

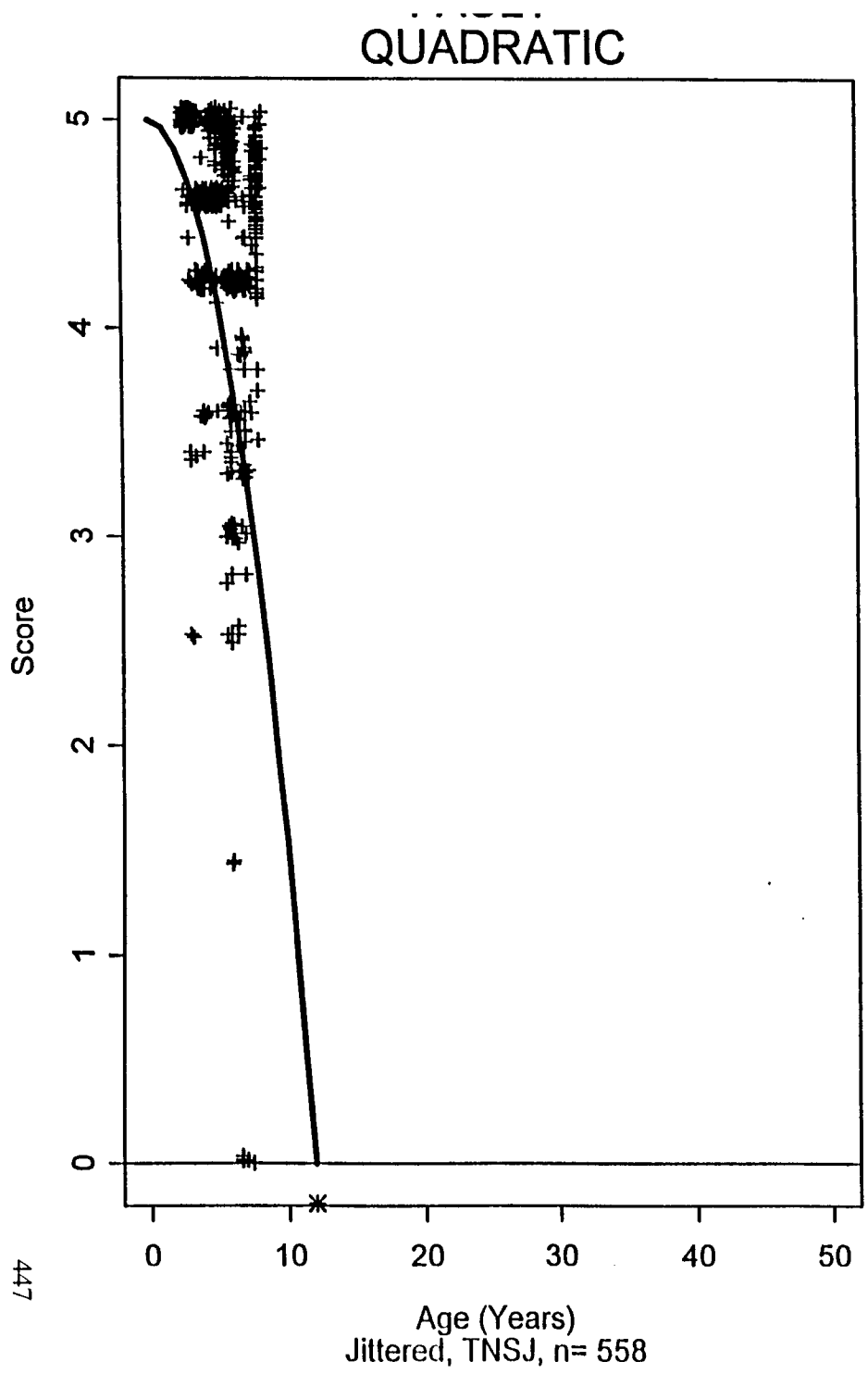
	Value	Std. Error	t value	Pr(>|t|)
1	0.403	0.052	7.806	0.001

R-Squared = 0.924

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.594	0.128	4.65	0.006

R-Squared = 0.812



Date of Analysis: Fri May 8 09:19:07 1998
Family: TNSJ
Index: FAULT
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.119	0.087	1.36	0.232

R-Squared = 0.27

50TH PERCENTILE
Coefficient Estimates:

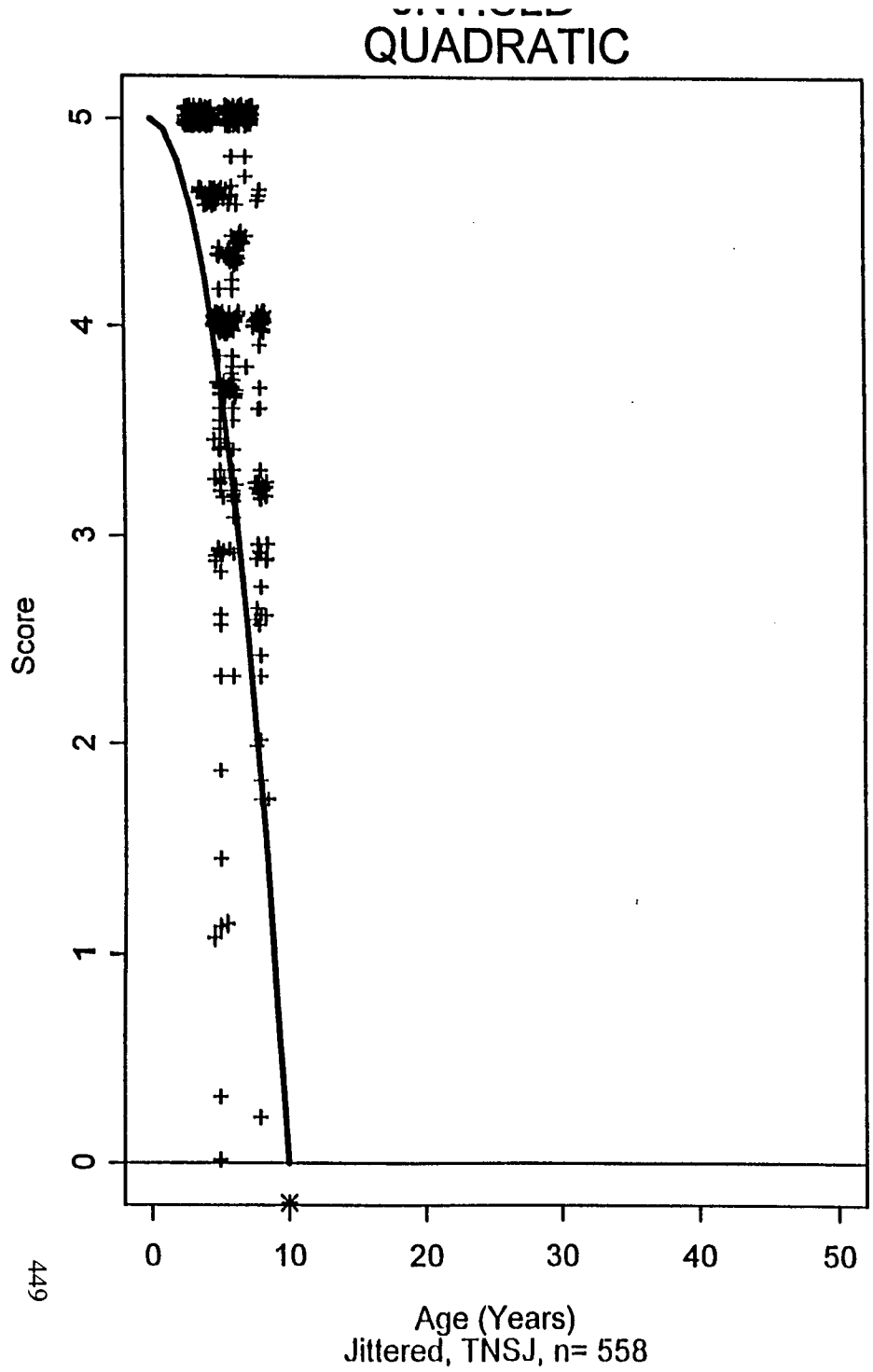
	Value	Std. Error	t value	Pr(>|t|)
1	0.253	0.082	3.106	0.027

R-Squared = 0.659

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.308	0.087	3.551	0.016

R-Squared = 0.716



Date of Analysis: Fri May 8 09:20:16 1998
Family: TNSJ
Index: JNT.SLD
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 10

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.304	0.16	1.902	0.116

R-Squared = 0.42

50TH PERCENTILE
Coefficient Estimates:

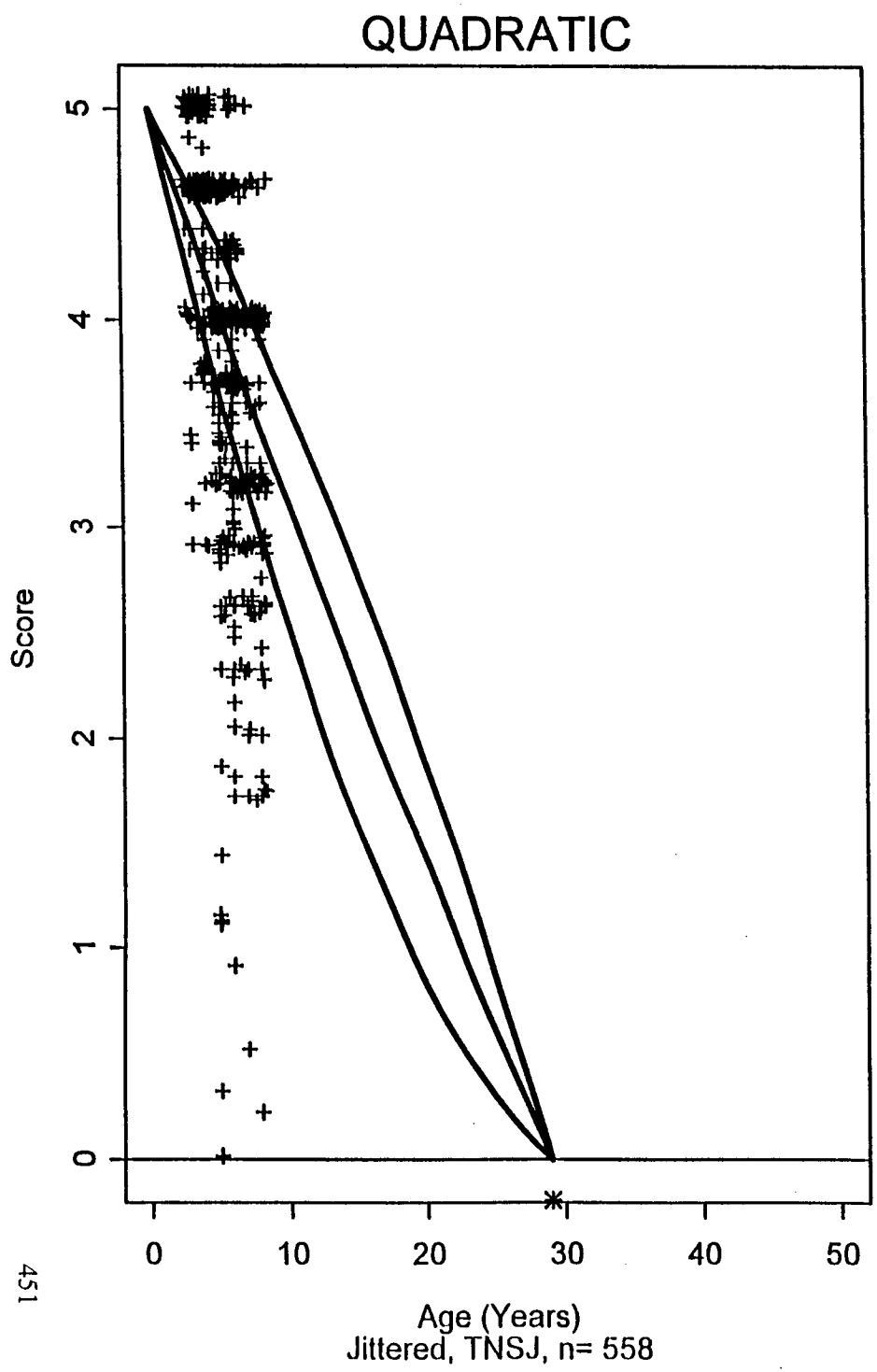
	Value	Std. Error	t value	Pr(>|t|)
1	0.406	0.14	2.898	0.034

R-Squared = 0.627

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.51	0.178	2.87	0.035

R-Squared = 0.622



Date of Analysis: Fri May 8 09:16:57 1998
Family: TNSJ
Index: JNT.SPL
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 29

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.289	0.04	-7.293	0.001

R-Squared = 0.914

50TH PERCENTILE
Coefficient Estimates:

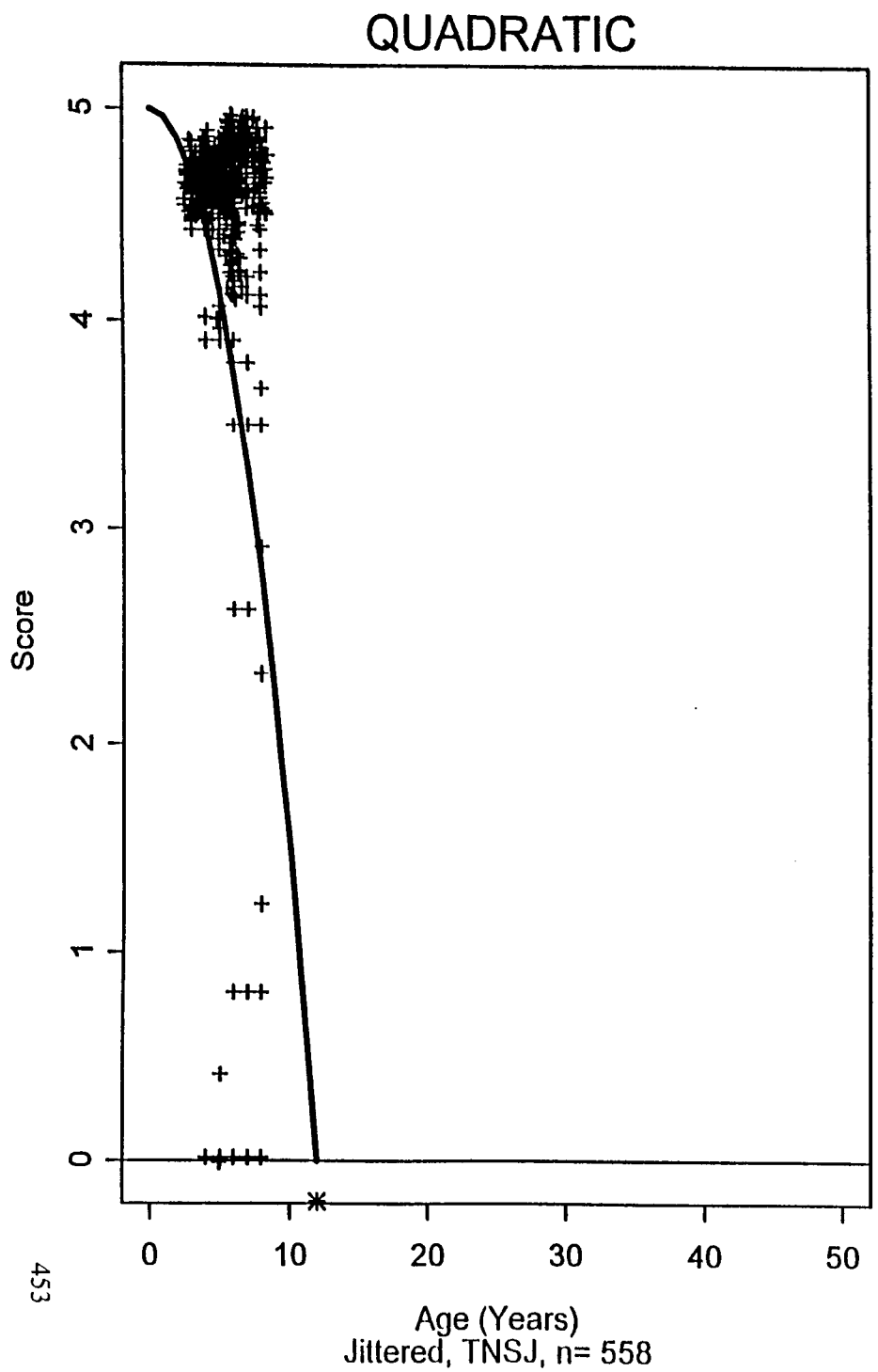
	Value	Std. Error	t value	Pr(>|t|)
1	-0.197	0.027	-7.187	0.001

R-Squared = 0.912

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	-0.122	0.022	-5.55	0.003

R-Squared = 0.86



Date of Analysis: Fri May 8 09:14:52 1998
Family: TNSJ
Index: ROUGH
Year(s): ALL
Model Type: QUADRATIC
Analysis Method: GQ
Forced Endpoint: 12

25TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.224	0.088	2.547	0.051

R-Squared = 0.565

50TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.272	0.091	2.976	0.031

R-Squared = 0.639

75TH PERCENTILE
Coefficient Estimates:

	Value	Std. Error	t value	Pr(>|t|)
1	0.301	0.093	3.234	0.023

R-Squared = 0.677