**QUESTION 2**

**Code: Binary Logistic Regression**

/\*

\*

\* Task code generated by SAS Studio 3.8

\*

\* Generated on '1/11/22, 8:29 AM'

\* Generated by 'u45209732'

\* Generated on server 'ODAWS01-USW2.ODA.SAS.COM'

\* Generated on SAS platform 'Linux LIN X64 3.10.0-1062.9.1.el7.x86\_64'

\* Generated on SAS version '9.04.01M6P11072018'

\* Generated on browser 'Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/96.0.4664.110 Safari/537.36'

\* Generated on web client 'https://odamid-usw2.oda.sas.com/SASStudio/main?locale=en\_US&zone=GMT-05%253A00&https%3A%2F%2Fodamid-usw2.oda.sas.com%2FSASStudio%2Findex='

\*

\*/

ods noproctitle;

ods graphics / imagemap=on;

**proc** **logistic** data=WORK.TRAIN;

model Response(event='1')=Age Annual\_Premium / link=logit technique=fisher;

**run**;

**Log: Binary Logistic Regression**

Notes (5)

1 OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;

NOTE: ODS statements in the SAS Studio environment may disable some output features.

73

74 /\*

75 \*

76 \* Task code generated by SAS Studio 3.8

77 \*

78 \* Generated on '1/11/22, 8:29 AM'

79 \* Generated by 'u45209732'

80 \* Generated on server 'ODAWS01-USW2.ODA.SAS.COM'

81 \* Generated on SAS platform 'Linux LIN X64 3.10.0-1062.9.1.el7.x86\_64'

82 \* Generated on SAS version '9.04.01M6P11072018'

83 \* Generated on browser 'Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko)

83 ! Chrome/96.0.4664.110 Safari/537.36'

84 \* Generated on web client

84 ! 'https://odamid-usw2.oda.sas.com/SASStudio/main?locale=en\_US&zone=GMT-05%253A00&https%3A%2F%2Fodamid-usw2.oda.sas.com%2FS

84 ! ASStudio%2Findex='

85 \*

86 \*/

87

88 ods noproctitle;

89 ods graphics / imagemap=on;

90

91 proc logistic data=WORK.TRAIN;

92 model Response(event='1')=Age Annual\_Premium / link=logit technique=fisher;

93 run;

NOTE: PROC LOGISTIC is modeling the probability that Response='1'.

NOTE: Convergence criterion (GCONV=1E-8) satisfied.

NOTE: There were 381109 observations read from the data set WORK.TRAIN.

NOTE: PROCEDURE LOGISTIC used (Total process time):

real time 0.92 seconds

user cpu time 0.83 seconds

system cpu time 0.09 seconds

memory 46509.37k

OS Memory 85248.00k

Timestamp 01/11/2022 01:29:08 PM

Step Count 43 Switch Count 8

Page Faults 0

Page Reclaims 10673

Page Swaps 0

Voluntary Context Switches 25

Involuntary Context Switches 0

Block Input Operations 0

Block Output Operations 74296

94

95 OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;

107

**Results: Binary Logistic Regression**

| **Model Information** | |
| --- | --- |
| **Data Set** | WORK.TRAIN |
| **Response Variable** | Response |
| **Number of Response Levels** | 2 |
| **Model** | binary logit |
| **Optimization Technique** | Fisher's scoring |

|  |  |
| --- | --- |
| **Number of Observations Read** | 381109 |
| **Number of Observations Used** | 381109 |

| **Response Profile** | | |
| --- | --- | --- |
| **Ordered Value** | **Response** | **Total Frequency** |
| **1** | 0 | 334399 |
| **2** | 1 | 46710 |

**Probability modeled is Response='1'.**

| **Model Convergence Status** |
| --- |
| Convergence criterion (GCONV=1E-8) satisfied. |

| **Model Fit Statistics** | | |
| --- | --- | --- |
| **Criterion** | **Intercept Only** | **Intercept and Covariates** |
| **AIC** | 283548.15 | 278973.05 |
| **SC** | 283559.00 | 279005.60 |
| **-2 Log L** | 283546.15 | 278967.05 |

| **Testing Global Null Hypothesis: BETA=0** | | | |
| --- | --- | --- | --- |
| **Test** | **Chi-Square** | **DF** | **Pr > ChiSq** |
| **Likelihood Ratio** | 4579.1011 | 2 | <.0001 |
| **Score** | 4795.0457 | 2 | <.0001 |
| **Wald** | 4688.9999 | 2 | <.0001 |

| **Analysis of Maximum Likelihood Estimates** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **DF** | **Estimate** | **Standard Error** | **Wald Chi-Square** | **Pr > ChiSq** |
| **Intercept** | 1 | -2.8722 | 0.0158 | 33071.7040 | <.0001 |
| **Age** | 1 | 0.0203 | 0.000304 | 4488.1025 | <.0001 |
| **Annual\_Premium** | 1 | 2.433E-6 | 2.75E-7 | 78.3009 | <.0001 |

| **Odds Ratio Estimates** | | | |
| --- | --- | --- | --- |
| **Effect** | **Point Estimate** | **95% Wald Confidence Limits** | |
| **Age** | 1.021 | 1.020 | 1.021 |
| **Annual\_Premium** | 1.000 | 1.000 | 1.000 |

| **Association of Predicted Probabilities and Observed Responses** | | | |
| --- | --- | --- | --- |
| **Percent Concordant** | 62.8 | **Somers' D** | 0.256 |
| **Percent Discordant** | 37.2 | **Gamma** | 0.256 |
| **Percent Tied** | 0.1 | **Tau-a** | 0.055 |
| **Pairs** | 15619777290 | **c** | 0.628 |