**Table 1**

Variables Available to Study Pavement Roughness Opinions.

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| --- | --- |
| **Variable  No.** | **Variable Description** |
| 1 | Individual number |
| 2 | Roadway segment number |
| 3 | Indicator for number of observations from respondent |
| 4 | Roughness ranking: 1 if very smooth; 5 if very rough |
| 5 | Sedan: 1 if yes, 0 if no |
| 6 | Sport utility vehicle: 1 if yes, 0 if no |
| 7 | Pickup: 1 if yes, 0 if no |
| 8 | Minivan: 1 if yes, 0 if no |
| 9 | Noise dBA reading |
| 10 | Speed in miles per hour |
| 11 | Highway level of service (LOS): 1 if LOS A, 2 if LOS B, 3 if LOS C, 4 if LOS D,  5 if LOSE, 6 if LOS F |
| 12 | User regularly uses Interstate 5: 1 if yes, 0 if no |
| 13 | User regularly uses Interstate 90: 1 if yes, 0 if no |
| 14 | User regularly uses Interstate 405: 1 if yes, 0 if no |
| 15 | User regularly uses State Route 520: 1 if yes, 0 if no |
| 16 | Female: 1 if yes, 0 if no |
| 17 | Married: 1 if yes, 0 if no |
| 18 | Age in years: 0 if Less than 21; 1 if 21 to 25; 2 if 26 to 30; 3 if 31 to 35; 4 if 36 to 40;  5 if 41 to 45; 6 if 46 to 50; 7 if 51 to 55; 8 if 56 to 60; 9 if 61 to 65; 10 if 66 to 70;  11 if Over 70 |
| 19 | Annual household income (U.S. dollars): 0 if no income; 1 if under $15,000;  2 if $15,000 to $24,999; 3 if $25,000 to $34,999; 4 if $35,000 to $44,999;  5 if $45,000 to $54,999; 6 if $55,000 to $64,999; 7 if $65,000 to $74,999;  8 if $75,000 to $84,999; 9 if $85,000 to $99,999; 10 if $100,000 to $150,000;  11 if over $150,000 |
| 20 | Education: 1 if some high school; 2 if high school diploma;  3 if technical college degree (AA); 4 if college degree (BS or BA) 5 if post-graduate degree |
| 21 | Vehicle type normally driven: (miscoded, do not use) |
| 22 | Number of household vehicles |
| 23 | Household size |
| 24 | Number of household infants |
| 25 | Number of household children |
| 26 | Number of household workers |
| 27 | International roughness index (IRI) in m/km |
| 28 | Roadway surface age |
| 29 | Visible wear: 1 if yes, 0 if no |
| 30 | Visible joints: 1 if yes, 0 if no |
| 31 | Visible patching: 1 if yes, 0 if no |
| 32 | Bridge in segment: 1 if yes, 0 if no |
| 33 | Surface type: 1 if concrete, 0 if asphalt |
| 34 | Rut depth in mm |
| 35 | Pavement structural condition index (PSC) |
| 36 | Segment length in miles |
| 37 | Number of lanes |
| 38 | Cracking present: 1 if yes, 0 if no |
| 39 | Scaling present: 1 if yes, 0 if no |
| 40 | Faulting present: 1 if yes, 0 if no |
| 41 | Spalling present: 1 if yes, 0 if no |
| 42 | International roughness index (IRI) change from last segment (m/km) |
| 43 | Noise change from last segment (dBA) |

**Table 2**

Random Effects Ordered Probit Model of User-Perceived Roughness Rankings [dependent variable responses are integers between 1 (very smooth) and 5 (very rough)]

|  |  |  |
| --- | --- | --- |
| **Variable Description** | **Estimated Parameter** | ***t* Statistic** |
| Constant | 1.910 | 5.08 |
| Female indicator (1 if participant was female, 0 if male) | –0.568 | –6.15 |
| Older age indicator (1 if participant was over age 55, 0 otherwise) | –0.599 | –5.86 |
| IRI measurement (m/km) of roadway segment | 0.797 | 15.81 |
| Age of roadway segment surface (years) | 0.018 | 5.68 |
| Patch indicator (1 if the segment appeared to have patch work,  0 otherwise) | 0.176 | 2.15 |
| Pavement structural condition (PSC) index of roadway | –0.022 | –6.07 |
| Noise (dBA) inside test vehicle during evaluation if age less than 35 years old | 0.005 | 5.47 |
| Noise increase indicator (1 if the noise inside test vehicle during evaluation increases by 3 dBA or more between two adjacent test segments, 0 otherwise) | 0.721 | 5.74 |
| Threshold 1 | 1.630 | 34.75 |
| Threshold 2 | 2.982 | 70.53 |
| Threshold 3 | 4.403 | 86.77 |
| Random effect parameter,  | 0.753 | 14.14 |
| Number of observations | 2,179 | |
| Log-likelihood at convergence | –2331.57 | |

**Table 3**

Computed Average Marginal Effects for the Parameter Estimates Shown in Table 14.4 [*y* = 1 (very smooth) to *y* = 5 (very rough)]

| **Variable Description** | **Marginal Effects** | | | | |
| --- | --- | --- | --- | --- | --- |
| **[ *y* = 1 ]** | **[ *y* = 2 ]** | **[ *y* = 3 ]** | **[ *y* = 4 ]** | **[ *y* = 5 ]** |
| Female indicator (1 if participant was female, 0 if male) | 0.0600 | 0.1668 | –0.1357 | –0.0862 | –0.0049 |
| Older age indicator (1 if participant was over age 55, 0 otherwise) | 0.0632 | 0.1758 | –0.1430 | –0.0908 | –0.0052 |
| IRI measurement (m/km) of roadway segment | –0.0841 | –0.2339 | 0.1902 | 0.1209 | 0.0069 |
| Age of roadway segment surface (years) | –0.0019 | –0.0054 | 0.0044 | 0.0028 | 0.0001 |
| Patch indicator (1 if the segment appeared to have patch work, 0 otherwise) | –0.0185 | –0.0515 | 0.0419 | 0.0266 | 0.0015 |
| Pavement structural condition (PSC) | 0.0023 | 0.0064 | –0.0052 | –0.0033 | –0.0002 |
| Noise (dBA) inside test vehicle during evaluation if age less than 35 years old | –0.0006 | –0.0015 | 0.0012 | 0.0008 | 0.0001 |
| Noise increase indicator (1 if the noise inside test vehicle during evaluation increases by 3 dBA or more between two adjacent test segments, 0 otherwise) | –0.0761 | –0.2116 | 0.1722 | 0.1094 | 0.0061 |