# Appendix C

# Evaluating the Functional Form of the Price Models

We present here the results of our analysis of the price model, which is similar to the analysis of the performance of the purity model reported in Appendix B,. The primary price model employed in these reports includes city-specific slope coefficients on the expected pure amount of the drugs involved in the transactions as well as city-specific slope coefficients on the time variables. Again, we compared our most complex version of these models to two simpler forms, with the simplest version allowing for only a random intercept (or individual city-specific effect) and the next version allowing for random intercepts and the relationship between price and expected pure amount of the drug to vary across cities. We present the AIC statistics for each of the price models in Table C.1, indicating the model with the smallest AIC statistic in bold type.

**Table C.1. Akaike Information Criterion Test Statistics Evaluating Goodness of Fit of Alternative Models for the Price Equation**

| Quantity Level | Column A<br>Random intercept (no random slopes on amount or time) | Column B<br>Random intercepts and random slope on amount only | Column C<br>Primary Model: Random intercept and random slopes on amount and time |
|---|---|---|---|
| ***Powder Cocaine*** | | | |
| 1 | 6,236.5 | **6,158.9** | 6,431.8 |
| 2 | **2,902.2** | 2,906.2 | 2,977.2 |
| 3 | -3,494.3 | -3,576.5 | **-5,069.9** |
| 4 | -2,310.1 | -2,440.2 | **-2,650.6** |
| ***Crack Cocaine*** | | | |
| 1 | 8,771.9 | 8,728.7 | **8,398.4** |
| 2 | 13,585.4 | 13,492.3 | **13,089.5** |
| 3 | -1,620.8 | -1,770.3 | **-2,239.0** |
| ***Heroin*** | | | |
| 1 | 12,212.9 | 11,093.3 | **9,559.5** |
| 2 | 21,253.8 | 15,307.4 | **9,398.4** |
| 3 | **7,729.7** | 8,412.1 | 7,906.8 |
| ***D-Methamphetamine*** | | | |
| 1 | **2,932.6** | 3,175.3 | 3,747.3 |
| 2 | 4,498.5 | 4,327.6 | **4,298.2** |
| 3 | 6,089.7 | 5,108.7 | **2,474.6** |
| ***Marijuana*** | | | |
| 1 | **1,503.9** | 1,818.2 | |
| 2 | 1,167.2 | 1167.2 | **1,165.0** |
| 3 | 1,500.8 | **1,475.5** | 1,770.2 |

The results in Column C represent the AIC value for the primary model presented in the report for all substances except marijuana, lowest quantity level. In that case, the model is estimated using only random intercept and slope coefficients because of the relatively small sample size reducing statistical power. In general, the AIC test for the primary model (Column C) is smaller than that for the simpler models, with a few notable exceptions. In the case of powder cocaine and heroin, where the sample sizes are relatively large, yet the simpler models generated lower AIC values, the difference between the AIC value in our primary model and the winning model is not very large, suggesting that the additional parameterization does not dramatically reduce the

overall performance of the model. Further, as can be seen in Table C.2, in most of these cases, supplemental tests suggest that the additional parameterization in terms of random slope coefficients is warranted, based on the statistical significance of the covariance estimates for specific variables.

**Table C.2. Covariance Estimates Generated for the Price Equation from Our Primary Model, Including Random Slope Coefficients**

| | Covariance Parameter Estimate for Price & Time | | | | Covariance Parameter Estimate for Price & Ln(Expected Pure Gram) | | | |
|---|---|---|---|---|---|---|---|---|
| **Model** | **Estimate** | **Std Error** | **Z-Value** | **Prob Z** | **Estimate** | **Std Error** | **Z-Value** | **Prob Z** |
| ***Powder*** | | | | | | | | |
| Quantity Level 1 | 0.0864 | 0.0057 | 15.15 | <.0001 | 0.0033 | 0.0018 | 1.83 | 0.034 |
| Quantity Level 2 | 0.0381 | 0.0022 | 17.35 | <.0001 | 0.0012 | 0.0007 | 1.59 | 0.057 |
| Quantity Level 3 | 0.0176 | 0.0007 | 23.97 | <.0001 | 0.0012 | 0.0004 | 2.58 | 0.005 |
| Quantity Level 4 | 0.0115 | 0.0007 | 16.94 | <.0001 | 0.0005 | 0.0002 | 2.75 | 0.003 |
| ***Crack*** | | | | | | | | |
| Quantity Level 1 | 0.0849 | 0.0057 | 14.95 | <.0001 | 0.0052 | 0.0024 | 2.21 | 0.014 |
| Quantity Level 2 | 0.0317 | 0.0022 | 14.64 | <.0001 | 0.0041 | 0.0012 | 3.3 | 0.001 |
| Quantity Level 3 | 0.0082 | 0.0006 | 13.11 | <.0001 | 0.0007 | 0.0002 | 2.85 | 0.002 |
| ***Heroin*** | | | | | | | | |
| Quantity Level 1 | 0.1159 | 0.0054 | 21.43 | <.0001 | 0.0281 | 0.0074 | 3.8 | <.0001 |
| Quantity Level 2 | 0.1288 | 0.0073 | 17.76 | <.0001 | 0.0228 | 0.0060 | 3.8 | <.0001 |
| Quantity Level 3 | 0.1480 | 0.0076 | 19.58 | <.0001 | 0.0026 | 0.0010 | 2.73 | 0.003 |
| ***D-Methamphetamine*** | | | | | | | | |
| Quantity Level 1 | 0.0050 | 0.0029 | 1.74 | 0.041 | 0.1018 | 0.0086 | 11.79 | <.0001 |
| Quantity Level 2 | 0.0074 | 0.0029 | 2.56 | 0.005 | 0.0520 | 0.0044 | 11.81 | <.0001 |
| Quantity Level 3 | 0.0115 | 0.0040 | 2.91 | 0.002 | 0.0294 | 0.0051 | 5.78 | <.0001 |
| ***Marijuana*** | | | | | | | | |
| Quantity Level 1 | | | | | 0.1162 | 0.0401 | 2.9 | 0.002 |
| Quantity Level 2 | 0.2983 | 0.0368 | 8.12 | <.0001 | | | | |
| Quantity Level 3 | 0.1184 | 0.0140 | 8.44 | <.0001 | 0.0012 | 0.0006 | 1.9 | 0.029 |

Table C.1 and C.2 suggest that the primary model fits the majority of quantity levels within each substance except marijuana better than the other models. Because specific quantity levels were determined on criteria independent of model specification, we imposed the primary model on all quantity levels so that they could all be estimated in a consistent fashion (for comparability). The results in Tables C.1 and C.2 suggest that some efficiency may be lost in doing this, but certainly not much. In the case of marijuana, there is no clearly superior model that can be applied to all quantity levels. However, the loss in goodness of fit from adapting a slightly more parameterized specification is not great, and the predicted trends generated from differing models are not very different. Thus, again for consistency, we imposed the same basic functional form as that of the other models.