Sample Programs for Crime Travel Demand Module

The following files are provided as examples of using the crime travel demand module. They follow the background material on crime travel demand modeling that is described in Chapters 25-30. The data were provided, with permission, by the Baltimore County Police Department. The zones are traffic analysis zones (TAZ). The coordinate system is longitude, latitude (spherical). The destination zones modeled are those from Baltimore County while the origin zones modeled are those from both Baltimore County and the City of Baltimore. Three of the four modeling stages are shown in these examples and instructions for conducting the fourth stages is discussed. The files should be copied to a ***single*** directory.

The files and their associated variables are:

Input files

1. **BCOrigins.dbf** – the number of crimes originating in traffic analysis zones (TAZ) for both Baltimore County and the City of Baltimore. The variables listed for each TAZ are:

   A. AREA – square miles
   B. ARTERIAL – linear miles of arterial roads
   C. BALTCITY – whether TAZ is in City of Balitmore ('1') or in Baltimore County ('0')
   D. BELTWAY – whether the Baltimore Beltway (I-695) passes through the TAZ ('1') or not ('0')
   E. DENSTY96 – Persons per square mile in 1996
   F. DIST_CBD – Direct distance in miles to downtown Baltimore g.
   G. ID – an ID number
   H. INCEQUAL – the median household income of a TAZ relative to the TAZ with the highest median household income. The scale varies from 0 to 100.
   I. INCOME96 – 1996 median household income
   J. LAT – the latitude of the centroid of the TAZ
   K. LON – the longitude of the centroid of the TAZ
   L. NONRET96 – 1996 non-retail employment
   M. NUMVEH – the total number of personal vehicles owned in 2000
   N. ORIGINS – the number of crimes originating in the TAZ. This is the dependent variable for the origin model.
   O. POP96 – 1996 total population
   P. RETEMP96 – 1996 retail employment
   Q. STREET – linear miles of all roads
   R. TAZ – the TAZ number. This is an alphanumeric variable.
   S. ZEROAUTO – the number of households without personal automobiles

2. **BCDestinations.dbf** – the number of crimes ending in TAZ's for Baltimore County only. The variables listed for each TAZ are:

   A. AREA – square miles
   B. ARTERIAL – linear miles of arterial roads
   C. BELTWAY – whether the Baltimore Beltway (I-695) passes through the TAZ ('1') or not ('0')
   D. COMMACRES – acres of commercial land use in 2000
   E. DENSTY96 – Persons per square mile in 1996
   F. DEST – the number of crimes occurring in each TAZ. This is the dependent variable for the destination model.
   G. DIST_CBD – Direct distance in miles to downtown Baltimore
   H. EASTPOINT – a dummy variable for the TAZ that included Eastpoint Mall ('1') compared to all other TAZ's ('0')
   I. GOLDENRING – a dummy variable for the TAZ that included Goldenring Mall ('1') compared to all other TAZ's ('0')
   J. ID – an ID number
   K. INCEQUAL – the median household income of a TAZ relative to the TAZ with the highest median household income. The scale varies from 0 to 100.
   L. INCOME96 – 1996 median household income
   M. LAT – the latitude of the centroid of the TAZ
   N. LON – the longitude of the centroid of the TAZ
   O. MALLACRES – acres of shopping mall land use in 2000
   P. MANUACRES – acres of manufacturing land use in 2000
   Q. MEDYEARBLT –the median year in which housing units were built.
   R. NONRET96 – 1996 non-retail employment
   S. NUMVEH – the total number of personal vehicles owned in 2000
   T. OFFICACRES – acres of office land use in 2000
   U. POP96 – 1996 total population
   V. POVHH – number of households living under poverty line (census definition)
   W. RESACRES – acres of residential land use in 2000 x. RETEMP96 – 1996 retail employment
   X. STREET – linear miles of all roads
   Y. TAZ – the TAZ number. This is an alphanumeric variable
   Z. TOTALACRES – total acres of land
   AA. UNITS20MOR – number of buildings with 20 or more units
   BB. VERYLRGMLA – acres of land in very large shopping mall
   CC. ZEROAUTO – the number of households without personal automobiles

3. **ObservedODTrips.dbf** – the actual trip distribution indicating the number of trips from each origin zone to each destination zone.

Parameter files

4. Eight *CrimeStat* parameter files are provided. Each of these parameter files are loaded on the Options page. They will step through the first three modeling stages, two of which involve multiple steps. The parameter files ***must*** be run in ***sequence*** because the output file from an earlier step becomes the input file for a later step.

   The parameter files include:

   A. **Trip generation origin model.param** - Runs trip generation model using the Poisson regression for the origin zones affecting Baltimore County. These include the TAZs from both Baltimore County and the City of Baltimore.

      Input:

      a. BCOrigins.dbf

      Output:

      b. BCOriginModelCoefficients.dbf (predicted coefficients)

      c. PredictedOrigins.dbf (predicted origins by TAZ)

   B. **Trip generation destination model.param** – Runs trip generation model for Baltimore County destinations.

      Input:

      a. BCDestinations.dbf

      Output:

      b. BCDestinationModelCoefficients.dbf (predicted coefficients)

      c. PredictedDestinations.dbf (predicted destinations by TAZ)

C. **Make predicted origins.param** – Applies modeled coefficients for the origin model to the same data set from which it was modeled. Then the routine adds in external trips.

Input:

a. PredictedOrigins.dbf (from **A** above)

b. BCOriginModelCoefficients.dbf (from **A** above)

c. Independent estimate of external trips (1627 for example)

Output:

d. PredictedOriginswithExternalTrips.dbf

D. **Balance Origins and Destinations.param** – Balances the number of trips by origin and by destination. In the example, the number of predicted destinations are held constant.

Input:

a. PredictedOriginswithExternalTrips.dbf (from **C** above)

b. PredictedDestinations.dbf (from **B** above)

Output:

d. AdjustedPredictedOrigins.dbf

E. **Calibrate Origin-Destination Model Coefficients.param** – Using the predicted origins and predicted destinations from the trip generation stage, estimates coefficients for distributing trips from origin zones to destination zones.

Input:

a. AdjustedPredictedOrigins.dbf (from **D** above)

b. PredictedDestinations.dbf (from **B** above)

c. Parameter estimates for impedance function (on trip distribution setup page)

Output:

d. ODCoefficients.dbf

F. **Apply Origin-Destination Model.param** – Inputs the predicted origins and predicted destinations from the trip generation stage as well as the modeled coefficients from **E** above. Outputs predicted trips for each origin-destination zone combination. For the graphic display, outputs top 200 trips.

Input:

a. AdjustedPredictedOrigins.dbf (from **D** above)

b. PredictedDestinations.dbf (from **B** above)

c. ODCoefficients.dbf (from **E** above) *Output:*

d. PredictedODTrips.dbf (table of trips by each origin- destination pair)

e. PODTPredictedODTrips.shp (lines representing predicted inter-zonal trips for top 200 trips)

f. PODTPointPredictedODTrips.shp (point representing predicted intra-zonal trips for top 200 trips).

G. **Compare Observed and Predicted Trip Lengths.param** – Inputs observed (actual) and predicted trip distribution and compares them by trip lengths. Calculates coincidence ratio and then compares the top 200 origin-destination links.

Input:

a. BCOrigins.dbf

b. ObservedODTrips.dbf

c. PredictedODTrips.dbf *Output:*

d. CompareObservedPredictedTrips.dbf (trip lengths of observed and predicted trip distributions)

H. **Mode Split Model.param** – Inputs predicted origins, predicted destinations, and predicted trips along with estimates of the mode split function (see Excel spreadsheet below). Splits trips by origin-destination pair into specific travel modes. The output is both a table of origin-destination trips by mode as well as five *ArcGIS* shape files representing zone-to-zone trips by mode.

> Note: because the transit modes are not constrained to a transit network in the example, the output is not necessarily realistic.

Input:

a. AdjustedPredictedOrigins.dbf (from **D** above)

b. PredictedDestinations.dbf (from **B** above)

c. PredictedODTrips.dbf (from **F** above)

d. Parameter estimates for impedance functions for each mode.

Output:

e. PredictedModeSplit.dbf (table of split trips by origin-destination zone)

f. TripMode#PredictedModeSplit.shp (lines representing predicted inter-zonal trips by mode where # is the mode number)

g. TripMode#PointsPredictedModeSplit.shp (points representing predicted intra-zonal trips by mode where # is the mode number)

Utility file

5. **Mode Split Impedance Defaults.xls** - An Excel spreadsheet for estimating the coefficients of the mode split stage. This should be used to establish the modeling parameters in the mode split routine.

Network assignment

6. Because we are not authorized to distribute road or transit networks, there is not a sample data set for the network assignment stage. See Chapter 26 for a discussion of where to obtain these files. However, if they are obtained, the input files would be the predicted origin-

destination trips by each mode. The networks need to be input either on the Measurement Parameters page as a global network or on the network assignment page; both require a dialogue to filled out. Each mode will need to be modeled with a separate network and routes would then be assigned (e.g., a road network for walking mode, driving mode or bicycling mode; a bus network for bus mode; a rail network
for train mode).