**Methodology**

Estimate a Spatial-Temporal Durbin model (LeSage and Pace, 2009) of the form:

or, more generally, from Pace, et. al. (1998)

Rather than allowing the weight matrix to be the standard spatial weight matrix, we decompose the term into a spatial and temporal component such that , where measure the autoregressive impacts from space and time. As shown in Pace, et. al. (1998), this assumes there is no interaction of time and space and if that is not assumed true, then W needs to be decomposed further yielding parameters measure the impact of the space-time interactions (). The most general model that can then be estimated is shown as equation (4) in Pace, et. al. (1998):

In this specification we have Z as an by matrix of independent variables that are unlagged while X is an by matrix of independent variables that are lagged. The parameter estimates of and represent the impact from independent and dependent variables located within some spatial proximity to the observation while and represent the impact from the same variables transacted within a specific timeframe from the current observation. +

Creation of Weight Matrix:

The observations are sorted by closing date and the number of units sold each day is calculated. A block matrix of ones is created with the number of rows equal to the number of units at time and the number of columns set equal to the number of units sold in time such that . These smaller matrices are then placed within a larger matrix denoted as so that the matrix contains observations sold the previous day and contains units sold exactly 50 days before the current unit’s sale date. The final temporal weight matrix is then the sum of the day matrices with the rows normalized to sum to one.

Spatial Weight Matrix () is created to include the fifteen nearest neighbors based on distance calculated from the centroid of each parcel of land. The observations are first sorted by closing date so to ensure sufficient pool from which to find the nearest neighbors, neighbors for the first 10% of the observations, what will be called the seed, are not calculated. In other words, these units can be counted as a neighbor to a unit sold in the future, but the neighbors for these units in the seed are not determined. The matrix ()is then row-standardized so that each row sums to one.

The temporal weight matrix () is a collection of individual matrices that themselves are block matrices where all units are equal to one. Specifically, the number of units sold on a given day, , is calculated. From our data we know that the first day of sales was January 4, 2016, and on that day, seven (7) properties closed. Subsequently, on January 5, 2016, five (5) properties closed, and another six (6) properties closed on January 6, 2016. Therefore, for the temporal weight matrix which indicates the properties sold the day immediately prior to the current close date, there is a matrix of size of ones located in rows eight through twelve and columns one through seven with all other values in columns one through seven being set to zero. Likewise, there is a block of ones that is located in rows thirteen through eighteen and columns eight through thirteen, with all other values in those columns equal to zero. For the matrix of sales two-days prior, the first block becomes a matrix of ones are located in rows thirteen through nineteen and the second block becomes a block of ones and is located in rows twenty through twenty-eight and columns eight through thirteen.

To create the full temporal matrix, we can then simply sum the daily matrix to includes all sales that occur for a chosen window of time which, in this paper, is assumed to be sixty days.