Building a Small Model Named LUMP with VORSIM

Problem: A national market exists for bolt, nuts, and washers. What might happen to production and sales in the Eastern and Western Regions if expected sales changed in the Eastern region due to a number of factors. We want to be able to simulate scenarios with various unanticipated sales changes in the Eastern region. This problem can be studied with a simple simulation model that can be built in VORSIM.

Data and markets: We have production and sales data for bolts, nuts, and washers for the Eastern and Western regions as well as average wholesale prices for the three products. Products from both regions are sold in both regions so we have to consider the total market reaction to changes in sales in the Eastern region. We also know that sales in each region generally depend upon new construction and we have historical indices as well as projections into the future.

Modeling strategy: We have estimates of production responses to price changes (supply elasticity in economic jargon) as well as the response of sales to price (demand elasticity). Having or attaining all of this information allows us to specify a simple supply and demand model with sales shift terms that can be used to simulate unanticipated sales changes in the Eastern region. A model is designed based on a) the problem to be studied, b) the available data, and c) the understanding of the markets in question and the availability of parameters that capture market behavior. A model needs to be constructed with markets in equilibrium at a base period and that can be projected out into the future. Functional forms for equations need to be picked as well. In this case, exponential production and sales equations are used. These equations have an advantage of simplicity of interpretation – the elasticities are readable directly in the equation, something which is not true for a linear equation, for example. All of this modeling strategy should be thought out and sketched with pencil and paper before a model is built in VORSIM.

With all of the above in mind, VORSIM can be used to construct the LUMP model starting with the use of the Model Builder control screen to create a new model. It is important to note that even if your first try has errors or problems, VORSIM makes it very easy to change a model's structure and equations. We are choosing the major model division (the sheet in a workbook) to represent the Eastern and Western regions to which a market clearing mechanism sheet is added. Minor divisions within sheets (categories) will be the three products nuts, bolts, and washers. We will need variables for prices, unexpected demand shifts, production, sales, new construction, and time (to represent normal growth into the future in the Eastern and Western regions. Regional equations are needed for production, sales, and the growth of new production. In addition, equations are needed for equilibrium conditions in the product markets (sales equal production for each product). The model will be built so that if sales are perturbed, product prices will change until product markets are cleared again. This is a fairly common way of modeling multi-market equilibrium problems.