A Partial Equilibrium of the Sorghum Markets in US, Mexico, and Japan

Kazuyoshi Ishida and Malaga Jaime
Texas Tech University  Applied and Agricultural Economics

A Partial Equilibrium of the Sorghum Markets in US, Mexico, and Japan

Kazuyoshi Ishida and Malage Jaime
Texas Tech University  Applied and Agricultural Economics

Introduction
Grain sorghum is a major food grain. The United States is the largest grain sorghum producer in the world, though its contribution decreased from 93% to 77% from 2010 to 2013. Nonetheless, the international market share of US sorghum expanded over the time. This indicates that US sorghum grain industry has increased its reliance on foreign markets. Major importers of grain sorghum include Mexico, Japan, and China. Mexican imports have increased because Mexican production has grown over the last 10 years. On the other hand, Japanese imports of US sorghum have diminished over the same period, and Australian grain sorghum now has the top-share in the Japanese market. Chinese imports of US grain sorghum have increased significantly over the last 2 years because Chinese productivity has grown in recent years at a rapid rate.

The purpose of this research is to develop a partial equilibrium model of international grain sorghum to illustrate its production-utilization-trade process. This model has 23 equations, which include equations for the demands and supplies of grain sorghum in Japan, Mexico, and the US, as well as price transmission equations. We estimated the parameters of this model and forecasted the endogenous variables from 2014 to 2018. Nowadays, Chinese imports of grain sorghum are an important factor in the international trade. We assumed three scenarios of Chinese imports of US grain sorghum from 2014 to 2016, and then, conducted a forecast of this model taking into account these scenarios.

Thell Forecast Error Statistics

<table>
<thead>
<tr>
<th>Endogenous Variable</th>
<th>Base (US)</th>
<th>Var (US)</th>
<th>Cov (US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Harvest</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>HarvestOtherStates</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Stock</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Retail</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Milling</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>CornProduction</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>CornSupply</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Excess</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Empirical Framework
An Iterated Seemingly Unrelated Regression (ISUR) was used for the estimation of parameters, and Poisson was used for the estimation of the model. The analysis is from 1975 to 2013. The sources of data for this analysis are USDA, FAO, and the Department of Agriculture of Mexico. We forecasted the endogenous variables of this model from 2013 to 2018 based on the parameter estimation and the three scenarios of Chinese imports over the same period.

Scenarios of Chinese Imports of US Sorghum
Chinese imports of US sorghum have increased at a rapid pace. In 2012, they were just 48 thousand metric tons, while by 2013, they had increased to 459 thousand metric tons. The growth rate of Chinese imports of US sorghum from the 1st quarter of 2013 to the 1st quarter of 2014 was 2.19.

We projected three scenarios of Chinese imports of US sorghum from 2014 to 2018, and then, forecasted US sorghum exports to the rest of the world during the years.

Scenario 1
Chinese imports of US sorghum will expand by 21.8% each year.

Scenario 2
Chinese imports of US sorghum will stop-expanding in 2014, and their amount will be the same in the remaining years.

Scenario 3
Chinese imports of US sorghum will increase by 5.90 thousand metric tons (1.58 thousand metric tons) each year.

Projections of Endogenous Variables from 2014 to 2018

Reference