Lecture 3

Fundamental Analysis of Crop Prices: The Balance Sheet Approach

by
Professor Scott H. Irwin

Required Reading:


Fundamental Analysis

• Definition: An assessment of _______ based on the underlying _______ and _______ factors and the changes in those relationships

• Motivated by economic _____ of supply and demand

• The task of the market is to establish a price that will ____________

• Fundamental analysis can be thought of as the process of anticipating the market clearing price

• Techniques: Subjective judgment to sophisticated statistical models

• Goal: Estimate _________________ and compare to _____________
  ▪ Bullish: Value > Price
  ▪ Bearish: Value < Price
You will buy high and sell low.

THE INVISIBLE HAND OF THE MARKETPLACE
Price Making Forces in Crop Markets

• A _______ set of variables impact ___________:
  ▪ Acreage
  ▪ Yield
  ▪ Weather
  ▪ Exchange rates
  ▪ Consumer income
  ▪ Government policies
  ▪ Foreign grain production

• Additional factors that add to ________________:
  ▪ Lack of adequate knowledge of ___________
    relationships
  ▪ Large amount of inventory _____________
  ▪ Constant _______________
Types of Fundamental Analysis

*Old Hand Approach*

Subjective approach based on extensive ________ of an analyst:

- ________ for the market based on extensive industry contacts

- Well-tuned to flow of ______________ and market’s reaction to the news

- ________ of the market contained “in the head” of the analyst

- Strictly individual approach that can only be acquired by long experience
Analogous Year Approach

_____ for marketing years for crops or calendar years for livestock that have the _____ fundamental characteristics as projected for the forecast year

- ____________ for the analogous year serves as the “road map” for the projecting prices in the forecast year

- Basic premise is that “history repeats itself”
Econometric Models

_________________________ are used to forecast prices

Economic theory used to guide the specification of relationships

\[ PH_t = a + b_1 P_P + b_2 B_P + b_3 C_P + b_4 D_I \]

where

\( PH_t \) is the price of hogs for quarter \( t \)

\( P_P \) is per person production of pork in quarter \( t \)

\( B_P \) is per person production of beef in quarter \( t \)

\( C_P \) is per person production of chicken in quarter \( t \)

\( D_I \) is per person US disposable consumer income in quarter \( t \)

OLS is used to _________ intercept and slope parameters based on a given sample period
Econometric models range from simple ______ equation models to large, ______ models

- Large econometric models were very popular in the 1960s and 1970s

- Fell out of favor in the 1980s when ______ models were shown to forecast just as well

- Not surprising given principal of parsimony!

J. PHILLIP COOPER and CHARLES R. NELSON

The Ex Ante Prediction Performance Of the St. Louis and FRB-MIT-PENN Econometric Models and Some Results on Composite Predictors

1. INTRODUCTION

The primary objective of this paper is to evaluate and compare the prediction performance of two econometric models of the U.S. economy, namely, the St. Louis (SL) and FRB-MIT-Penn (FMP) models, using Box-Jenkins [5] time series models to provide a benchmark for accuracy. The two econometric models have received considerable attention in both academic and policy-making contexts. The fact that they differ greatly in a number of important dimensions is an additional motivation for the choice of these particular models.

Computation of predictions from the econometric models requires their solution for a given time period conditional on projected values of the exogenous variables. If the time period in question is in the past, then the simplest method of projection sets the exogenous variables at their actual values. We refer to the resulting predictions as ex post predictions. In an earlier paper, Nelson [16] evaluated the ex

*The authors are indebted to Carl Christ, Edwin Koh, Payam Nadjafi, Harry Roberts, Arnold Zellner, and a referee for their helpful comments. Computation was financed by a grant from the Research Committee of the Graduate School of Business and was performed on Program PDP and the Econometric Software Package (ESP). Cooper's participation was partially supported by the National Science Foundation under NSF Grant GS 30711 and Nelson's under NSF Grant GS 34601. A preliminary version of this paper was given at the Meetings of the Econometric Society, New Orleans, 1971.

1 The St. Louis model is described by Anderson and Carlson [1]. The FMP model has been described by Bache and Stephie [16], de Larran and Gruenbich [8, 15], de Larran and Zellner [15], and Zellner [21]. We used version 4.1, released during the summer of 1969, in this study.

2 This is a discussion of the estimation method of the FMP model, see Cooper [16] or Freccaro and Klein [10]. The SL model has a "triangular" structure and does not require an iterative solution method.

J. Philip Cooper is director, Quantitative Analysis, Dynamic Associates. Charles R. Nelson is associate professor, Graduate School of Business, University of Chicago.
**Balance Sheets**

- Most popular tool used in fundamental analysis of crop prices

- Unit of analysis is a ___________

- Constructed for a particular ________, ________ or the entire ___________

- Build ________ side first

- Then build ________________, or use, side

- ______ ties both sides together by rationing available supplies to competing uses

**Marketing Year**

- Usually begins the __________________ for a crop

- For the US:
  - Corn: September 1 – August 31
  - Soybeans: September 1 – August 31
  - Wheat: June 1 – May 31
Economic Model Underlying Balance Sheets before Planting

\[ S_0 \]

\[ P_0 \]

\[ Q_0 \]
Economic Model Underlying Balance Sheets after Planting

![Diagram showing demand and supply curves with points Q₀ and P₀.]
### Generic Balance Sheet Format for a Commodity

<table>
<thead>
<tr>
<th>Category</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Stocks</td>
<td>+ Production + Imports = Total Supply</td>
</tr>
<tr>
<td>Domestic Consumption</td>
<td>+ Exports + Residual = Total Consumption (Use)</td>
</tr>
<tr>
<td>Ending Stocks</td>
<td>= Total Supply – Total Consumption</td>
</tr>
</tbody>
</table>

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*ACE 427, University of Illinois*
**Balance Sheet Format for Corn**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning Stocks</strong></td>
<td></td>
</tr>
<tr>
<td>+ Production</td>
<td></td>
</tr>
<tr>
<td>+ Imports</td>
<td></td>
</tr>
<tr>
<td>= <strong>Total Supply</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Feed and Residual</strong></td>
<td></td>
</tr>
<tr>
<td>+ Food, Seed and Industrial</td>
<td></td>
</tr>
<tr>
<td>Ethanol</td>
<td></td>
</tr>
<tr>
<td>+ Exports</td>
<td></td>
</tr>
<tr>
<td>= <strong>Total Consumption (Use)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ending Stocks</strong></td>
<td>= <strong>Total Supply</strong> – <strong>Total Consumption</strong></td>
</tr>
</tbody>
</table>
### Balance Sheet Format for Soybeans

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning Stocks</strong></td>
<td></td>
</tr>
<tr>
<td>+ Production</td>
<td></td>
</tr>
<tr>
<td>+ Imports</td>
<td></td>
</tr>
<tr>
<td>= Total Supply</td>
<td></td>
</tr>
<tr>
<td><strong>Crush</strong></td>
<td></td>
</tr>
<tr>
<td>+ Exports</td>
<td></td>
</tr>
<tr>
<td>+ Food, Seed and Residual</td>
<td></td>
</tr>
<tr>
<td>= Total Consumption (Use)</td>
<td></td>
</tr>
<tr>
<td><strong>Ending Stocks</strong></td>
<td>= Total Supply – Total Consumption</td>
</tr>
</tbody>
</table>
Forecasting Calendar for 2013/14 Corn and Soybean Balance Sheets

- Fall 2012: First forecasts of supply and use for 2013/14 marketing year
  - Typically based on _______________, recent ___________ and basic ________________

- Spring 2013: Update _______ forecasts based on __________________

- Summer 2013: Update supply forecasts based on __________________

- Fall 2013-Summer 2014:
  - Continue to update supply forecasts based on USDA crop reports (Aug-Nov, Jan)
  - Update _______ forecasts based on:
    - Export sales and inspections reports
    - Quarterly USDA stock estimates
    - Livestock numbers
    - Monthly processing reports
WASDE Balance Sheet Estimates from the USDA

- **WASDE**: ____________________________________________
  - Released monthly 12 times a year

- Cover numerous crops and livestock

- Separate balance sheets maintained for over 90 countries!

- _______ and _______________ published for major commodities

- Serve as the _________ balance sheet estimates for nearly all market participants

- Numerous agencies within USDA participate in ________________________________________

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**World Agricultural Supply And Demand Estimates**

United States Department of Agriculture
Office of the Chief Economist

Agricultural Marketing Service
Economic Research Service
Farm Service Agency
Foreign Agricultural Service

ISSN: 1554-9000

WASDE-428 Approved by the World Agricultural Outlook Board November 16, 2005

ACE 427, University of Illinois
USDA’s Economic Information System

- National Agricultural Statistics Service
- Joint Agricultural Weather Facility
- Foreign Agricultural Service
- Economic Research Service
- Farm Service Agency

World Agricultural Outlook Board

- Domestic Production and Stocks Estimates
- Weekly Weather and Crop Bulletin
- FAS Commodity Circulars
- World Agricultural Supply and Demand Estimates
- ERS Situation and Outlook Reports

Long-term Baseline Projections
- **Foreign Agriculture Service (FAS):** information regarding foreign production, use and trade

- **Economic Research Service (ERS):** identifies important economic effects and implications for prices, quantity supplied and quantity demanded

- **Farm Service Agency (FSA):** describes current policy environment and farmers’ reaction to current policies

- **Agricultural Marketing Service (AMS):** provides current price and marketing reports

- **World Agricultural Outlook Board (WAOB):** co-ordinates the interagency process used to produce WASDE estimates
WASDE reports can be found on the web at:

### WASDE - 502 - 12

#### U.S. Feed Grain and Corn Supply and Use 1/

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area Planted</strong></td>
<td>100.0</td>
<td>99.6</td>
<td>102.4</td>
<td>102.5</td>
</tr>
<tr>
<td><strong>Area Harvested</strong></td>
<td>89.5</td>
<td>90.0</td>
<td>91.5</td>
<td>91.1</td>
</tr>
<tr>
<td><strong>Yield per Harvested Acre</strong></td>
<td>3.89</td>
<td>3.67</td>
<td>3.53</td>
<td>3.55</td>
</tr>
<tr>
<td><strong>Beginning Stocks</strong></td>
<td>47.0</td>
<td>48.1</td>
<td>32.3</td>
<td>32.3</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>348.6</td>
<td>330.0</td>
<td>323.1</td>
<td>323.5</td>
</tr>
<tr>
<td><strong>Imports</strong></td>
<td>22.2</td>
<td>24.2</td>
<td>2.2</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Supply, Total</strong></td>
<td>397.8</td>
<td>380.5</td>
<td>357.6</td>
<td>358.0</td>
</tr>
<tr>
<td><strong>Feed and Residual</strong></td>
<td>136.7</td>
<td>127.7</td>
<td>121.2</td>
<td>120.9</td>
</tr>
<tr>
<td><strong>Food Seed &amp; Industrial</strong></td>
<td>158.3</td>
<td>170.0</td>
<td>169.6</td>
<td>169.6</td>
</tr>
<tr>
<td><strong>Domestic, Total</strong></td>
<td>293.1</td>
<td>297.6</td>
<td>290.8</td>
<td>290.5</td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td>347.7</td>
<td>348.3</td>
<td>333.5</td>
<td>334.2</td>
</tr>
<tr>
<td><strong>Use, Total</strong></td>
<td>48.1</td>
<td>32.3</td>
<td>24.2</td>
<td>23.8</td>
</tr>
<tr>
<td><strong>CCC Inventory</strong></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Free Stocks</strong></td>
<td>48.1</td>
<td>32.3</td>
<td>24.2</td>
<td>23.8</td>
</tr>
<tr>
<td><strong>Outstanding Loans</strong></td>
<td>3.9</td>
<td>1.3</td>
<td>2.6</td>
<td>2.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CORN</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area Planted</strong></td>
<td>86.4</td>
<td>88.2</td>
<td>91.9</td>
<td>91.9</td>
</tr>
<tr>
<td><strong>Area Harvested</strong></td>
<td>79.5</td>
<td>81.4</td>
<td>82.9</td>
<td>84.0</td>
</tr>
<tr>
<td><strong>Yield per Harvested Acre</strong></td>
<td>164.7</td>
<td>152.8</td>
<td>146.7</td>
<td>147.2</td>
</tr>
<tr>
<td><strong>Beginning Stocks</strong></td>
<td>1,673</td>
<td>1,708</td>
<td>1,128</td>
<td>1,128</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>13,092</td>
<td>12,447</td>
<td>12,310</td>
<td>12,358</td>
</tr>
<tr>
<td><strong>Imports</strong></td>
<td>8</td>
<td>28</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td><strong>Supply, Total</strong></td>
<td>14,774</td>
<td>14,182</td>
<td>13,453</td>
<td>13,501</td>
</tr>
<tr>
<td><strong>Feed and Residual</strong></td>
<td>5,125</td>
<td>4,793</td>
<td>4,600</td>
<td>4,600</td>
</tr>
<tr>
<td><strong>Food, Seed &amp; Industrial</strong></td>
<td>5,961</td>
<td>6,428</td>
<td>6,405</td>
<td>6,405</td>
</tr>
<tr>
<td><strong>Ethanol &amp; by-products 3/</strong></td>
<td>4,391</td>
<td>5,021</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>Domestic, Total</strong></td>
<td>11,086</td>
<td>11,220</td>
<td>11,005</td>
<td>11,005</td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td>1,980</td>
<td>1,835</td>
<td>1,660</td>
<td>1,650</td>
</tr>
<tr>
<td><strong>Use, Total</strong></td>
<td>13,066</td>
<td>13,055</td>
<td>12,650</td>
<td>12,655</td>
</tr>
<tr>
<td><strong>Ending Stocks</strong></td>
<td>1,708</td>
<td>1,128</td>
<td>848</td>
<td>846</td>
</tr>
<tr>
<td><strong>CCC Inventory</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Free Stocks</strong></td>
<td>1,708</td>
<td>1,128</td>
<td>848</td>
<td>846</td>
</tr>
<tr>
<td><strong>Outstanding Loans</strong></td>
<td>147</td>
<td>48</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

**Note:** Totals may not add due to rounding. 1/ Marketing year beginning September 1 for corn and sorghum; June 1 for barley and oats. 2/ For a breakout of FSI corn uses, see Feed Outlook table 5 or access the data on the Web through the Feed Grains Database at www.ers.usda.gov/data/feedgrains. 3/ Corn used to produce ethanol and by-products including distillers' grains, corn gluten feed, corn gluten meal, and corn oil. 4/ Marketing-year weighted average price received by farmers.
Constructing Early Season 2013/14 Balance Sheets for Corn and Soybeans

- The first WASDE estimates will not be released until ________

- We will use Dr. Good’s projections as our starting point

- We will ______ the projections throughout the semester as more __________ becomes available

Note:

In practice most market analysts use some ___________ of the old hand approach, analogous years, econometric models (usually single equation) and balance sheets

_________ and _______ of the different methods is highly __________ and varies from analyst-to-analyst

Why use multiple approaches?

- Reality is so ________ that no single approach is likely to forecast accurately at all times

- In the best case, different approaches add __________ not picked up by the other approaches