Bottlenecks and Oil Price Spikes: Impact on U.S. Ethanol and Agriculture

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Outline

Based on an update of our earlier study “Emerging Biofuels: Outlook of Effects on U.S. Grain, Oilseed, and Livestock Markets”

http://www.card.iastate.edu/publications/synopsis.aspx?id=1050

Updated with available 2006 and 2007 data

The objective is to estimate:

- how large the biofuels sector in the U.S. could become
- the impact of the biofuels sector on crops markets, trade, and on livestock markets
- the response of world agricultural markets
Model Interactions

Trade, Prices, and Physical Flows

Macroeconomic Variables

Policy Parameters

International Dairy

International Livestock

International Grains

Ethanol

U.S. Dairy

U.S. Livestock

U.S. Crops

International Oilseeds

International Sugar

International Rice
Current ethanol capacity: 131 plants, 6.92 billion gallons/year

Total capacity under construction and expansion: 6.56 billion gallons/year

73 new ethanol plants and 10 expansion projects underway

2.2 billion bushels of corn were used in producing fuel ethanol in 2006/2007 marketing year.

3.2-3.5 billion bushels of corn are expected to be used in producing fuel ethanol for 2007/2008 marketing year.
Three Cases

- Baseline
  - Current policies, “normal” weather

- Higher oil prices throughout projection period
  - Adding $10/barrel to the crude oil price

- Drought in the 2012 crop year
  - Placing a 1988-style drought in the middle of the projection period
Projected U.S. Ethanol Production

Annual production based on Jan.-July 2007 numbers ~ 6.4 billion gallons
Projected U.S. Dry Mill Margins

US$/bushel

Margin Over Operating Costs
Margin Over Total Cost
## A Quick Look at Ethanol Blending

<table>
<thead>
<tr>
<th></th>
<th>January 2007</th>
<th>September 2007</th>
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<tbody>
<tr>
<td></td>
<td>Unleaded ($/gallon)</td>
<td>E-10 ($/gallon)</td>
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<tr>
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</tr>
<tr>
<td>Gasoline</td>
<td>1.490</td>
<td>1.341</td>
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<td>Ethanol</td>
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<tr>
<td>Price before Taxes</td>
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<td>1.567</td>
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<tr>
<td>Fed. Gas Tax</td>
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<tr>
<td>Ethanol Tax</td>
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<tr>
<td>Price after Fed. Taxes</td>
<td>1.674</td>
<td>1.700</td>
</tr>
</tbody>
</table>

### ($/gallon)

- **Fed. Gas Tax**: $0.184
- **Ethanol Tax Credit**: -$0.051

### Price after Fed. Taxes: $1.674 - $0.051 = $1.700

- **Price after Fed. Taxes**: $1.700
- **Price of Ethanol**: $0.226
- **Price after Fed. Taxes**: $1.490 + $0.184 + (-$0.051) = $1.674
- **Price of Ethanol after Fed. Taxes**: $1.341
- **Price after Fed. Taxes**: $1.341 + $0.184 + (-$0.051) = $1.490

### Price of Gasoline before Taxes: $1.490

- **Price of Gasoline after Fed. Taxes**: $1.490 + $0.184 + (-$0.051) = $1.674

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<tr>
<td>Price after Fed. Taxes</td>
<td>2.484</td>
<td>2.396</td>
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</tbody>
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### ($/gallon)

- **Fed. Gas Tax**: $0.184
- **Ethanol Tax Credit**: -$0.051

### Price after Fed. Taxes: $2.484 - $0.051 = $2.433

- **Price of Gasoline after Fed. Taxes**: $2.433
- **Price of Ethanol after Fed. Taxes**: $0.184
- **Price of Gasoline before Taxes**: $2.300
- **Price of Ethanol before Taxes**: $0.193

### Price of Gasoline before Taxes: $2.300

- **Price of Gasoline after Fed. Taxes**: $2.300 + $0.184 + (-$0.051) = $2.433

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### ($/gallon)

- **Fed. Gas Tax**: $0.184
- **Ethanol Tax Credit**: -$0.051

### Price after Fed. Taxes: $1.674 - $0.051 = $1.700

- **Price of Gasoline after Fed. Taxes**: $1.700
- **Price of Ethanol after Fed. Taxes**: $1.567
- **Price of Gasoline before Taxes**: $1.490
- **Price of Ethanol before Taxes**: $0.226

### Price of Gasoline before Taxes: $1.490
Ethanol Usage in 2004 (latest available)

Blending Percentage

- 0%
- 1 - 25%
- 25 - 50%
- 50 - 75%
- 75 - 100%
Projected U.S. Corn Planted Area

million acres

Projected U.S. Corn Production and Prices

- Production: The orange bars represent the projected corn production in billion bushels from 2006 to 2016.
- Price: The blue line indicates the projected price per bushel, with values ranging from $2.90 to $3.80.

The chart shows a general increase in production from 2006 to 2011, followed by a decrease in production from 2011 to 2016. The price per bushel, however, shows a decline from 2006 to 2015, with a slight increase in 2016.
Projected Utilization of U.S. Corn

million bushels

Feed - Fuel - HFCS - Seed - Food, Other - Exports
Projected U.S. Distillers Grains Production and Prices

Production
Price

production Price
Projected U.S. Soybean Meal Production and Prices
Impact of Higher Crude Oil Price

- Increased crude oil price by $10/barrel over the projection
- Margins on ethanol plants increase
- New incentive to invest in added capacity for ethanol production
- Eventually, a new equilibrium reached where there is no incentive to invest in or exit the ethanol industry
- Will demand for ethanol be enough?
  - E-10 market will saturate around 15 billion gallons
  - Drop in ethanol price will eventually encourage increase in demand for the flex-fuel cars
Projected U.S. Ethanol Production

billion gallons


Scenario Baseline
Wholesale Gasoline and Ethanol Prices

US$/gallon

- Unleaded Gasoline
- Ethanol
- Unl. Gas (Sept. 2007)
- Ethanol (Sept. 2007)
Projected U.S. Corn Planted Area

<table>
<thead>
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<th>Year</th>
<th>Scenario</th>
<th>Baseline</th>
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<tr>
<td>2016</td>
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</tbody>
</table>
Projected U.S. Corn Production and Prices
Projected Utilization of U.S. Corn

million bushels


Feed  Fuel  HFCS  Seed  Food, Other  Exports
Projected U.S. Distillers Grains Production and Prices
Usage of Distillers Grains by Species

- Beef: 66%
- Pork: 13%
- Poultry: 12%
- Dairy: 9%
Projected U.S. Soybean Meal Production and Prices

- Production (million tons)
- Price ($ per ton)

Year: 2006 to 2016

- Production: 36, 38, 40, 42, 44, 46, 48
- Price: 100, 120, 140, 160, 180, 200, 220, 240

Graph showing trends in production and price over the years.
Projected U.S. Meat Production

- Beef
- Pork
- Broiler

billion pounds
Projected U.S. Egg Production and Prices

- Production: 7200 to 8400 million dozen
- Price: $1.00 to $2.00 per dozen

[Bar chart showing year-on-year production and price trends from 2006 to 2016]
Impact on Rest of the World

- World grain and oilseed prices increase
- Result in higher feed and food prices
- Higher livestock production cost
- Countries in South America and Asia fill the crop gap
Impact of Short Crop Scenario

- Drought in 2012 similar to 1988
  - Regional yields of corn, soybeans and wheat changed from trend levels
  - Yields were off by 25% for corn, 18% for soybeans, and 11% for wheat in 1988

- Ethanol mandate for 2012 assumed to be 14.7 billion gallons
Historical Corn Production Deviations

-35%
-30%
-25%
-20%
-15%
-10%
-5%
0%
5%
10%
15%
20%

Corn, Soybean and Ethanol Markets

- Corn price increases by 44% above baseline levels
- Soybean price rises by 22%
- Corn exports and stock levels decline by more than 60%
- Corn exports from South America, China, etc. fill part of the gap from decline in U.S. corn exports
- Corn feed use declines by 16% (switch to other feeds)
- Ethanol trade increases moderately
Livestock Market

- Higher feed costs affect the livestock sector but to a lesser extent as shock is perceived as temporary

- Production declines
  - Broiler production declines the most (over 2.5%)
  - Milk production declines the least (0.5%)
Thank You