

Commodity Price Analysis and Forecasting

Introduction to Commodity Markets

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What is a Commodity?

A commodity is a good that can be supplied without qualitative differences.

- Fully or partially fungible
- Market treats a unit the same no matter who produced it or where
- Example: A bushel of wheat is regarded as a bushel of wheat everywhere

Contrast with differentiated goods where branding and quality matter. Try to find someone indifferent between iPhone and Android!

Fungibility in Practice

Grain Elevator Example:

- Farmers bring grain to an elevator at harvest
- Sometimes sell outright, sometimes pay for storage
- When farmer retrieves grain from storage, does he get the exact same kernels?
- No—elevator gives back the same amount and quality
- Farmer is happy because wheat is fungible

Commodity Markets

Since commodities are fungible:

- Prices determined by the entire (often global) market
- Tend to be basic resources:
 - Agricultural and food products
 - Metals
 - Energy
 - Fibers
- Fungibility enables trading in centralized spot and futures markets

Transformation Over Space, Time, and Form

Transformation Over Space

- Production of commodities is often concentrated in specific geographic locations
- Consumption is usually dispersed
- For traders to move a commodity from one location to another, a certain pattern of prices must prevail
- Traders must be able to make a profit (or at least break even)

Transformation Over Time

- What prices are required to provide incentive to store a commodity for later use?
- Example: Grain is produced once per year (in the U.S.), but consumption occurs all year
- Prices through time give incentive for stockholders to bring grain to market or hold on longer
- Market coordinates just the right amount of grain to be stored through time

Transformation Over Form

Commodities can be transformed into completely different goods.

Creating new commodities:

- Soybeans → soybean oil + soybean meal

Creating differentiated products:

- Feeder cattle → live cattle → different cuts of meat
- Green coffee beans → roasted, ground, brewed coffee (Starbucks)

Storable and Non-Storable Commodities

Storable Commodities

Can be stored for long periods of time:

- Corn
- Soybeans
- Wheat
- Peanuts
- Crude Oil
- Natural Gas

Non-Storable Commodities

Highly perishable or otherwise non-storable:

- Hogs
- Cattle
- Milk
- Potatoes
- Apples
- Tomatoes
- Electricity

Implications of Storability

Storable commodities:

- Can be stored from one period to the next
- Prices in one period must be related to prices in another period
- Stockholders constantly calculate: sell now or later?

Non-storable commodities:

- Prices can only be affected by current supply
- Past supply cannot be brought forward

Why Commodity Prices Matter

Economic and Political Importance

Commodity prices are important both economically and politically in almost all countries.

- Strongly influence farm income (can be quite volatile year-to-year)
- U.S. has long history of policies aimed at smoothing price and income volatility:
 - Price supports
 - Revenue supports
 - Subsidized crop insurance programs

Global Importance

- Some countries' economies rely heavily on commodity exports
 - Economic growth subject to commodity price volatility
- In developing countries, large share of population engages in agricultural production
 - Commodity prices determine bulk of their income
 - Incomes of the poor is a primary concern

Forecasting in Business

Companies exposed to price volatility spend considerable resources analyzing prices:

- ADM
- Cargill
- Caterpillar
- ConAgra
- Kraft
- Weyerhaeuser

Consistent employment opportunities for students trained in price analysis, forecasting, and risk management.

Price Analysis vs. Forecasting

Backward looking

Goals:

- Understand the complex array of forces that influence commodity price levels and behavior
- Aid in understanding performance of commodity markets
- Aid in development of policy
- Key component of policy analysis

Price Forecasting

Forward looking

Goals:

- Reliably and accurately forecast future price levels
- Forecasts used in:
 - Marketing strategies
 - Risk management
 - Speculative strategies

Forecasting Basics

Forecasting Basics: Key Principle

All meaningful forecasts guide decisions.

An awareness of the nature of the decisions will impact the design, use, and evaluation of the forecasting process.

Forms of Forecast Statements

Directional forecast:

Fed steer prices for Q1 2016 will be down compared to the same quarter last year.

Simple point forecast:

Fed steer prices for Q1 2016 = \$150/cwt.

Interval forecast:

Fed steer prices for Q1 2016 = \$140–\$160/cwt.

Forms of Forecast Statements (cont.)

Confidence interval forecast:

We are 80% confident that fed steer prices for Q1 2016 will be between \$140–\$160/cwt.

Density forecast:

Provides entire probability distribution of forecast price.

Forecast Horizon

Forecast horizon = number of periods between today and the forecast date.

With monthly data:

- 1-step ahead = one month beyond current month
- 2-step ahead = two months beyond current month
- h -step ahead = h months beyond current month

Crop market forecasting:

- Typical unit of time is a “marketing year”
- Forecasts typically updated monthly

Parsimony Principle (Occam's Razor)

Among competing hypotheses that predict equally well, the one with the fewest assumptions should be selected.

Other things equal, simple approaches are preferred.

Why Simple Models?

- Simple approaches tend to work best in real world applications (decades of experience and research)
- Simpler models can be estimated more precisely
- Unusual behavior and outcomes more easily spotted
- Easier to communicate → more likely to be used by decision-makers
- Lessens chances of data mining problems

If a complex model is tailored to fit historical data very well but does not capture the true data process, forecasts will perform poorly.

Two “Simple” Forecasting Methods

1. Fundamental Analysis

- Use of economic models and data on production, consumption, income, etc.
- Balance sheet analysis (Chapter 3)

2. Reduced Form Time-Series Econometrics

- Statistical econometric models
- Minimal inputs beyond a few recent prices

Not covered here: Technical analysis (use of past price patterns to predict future movement)

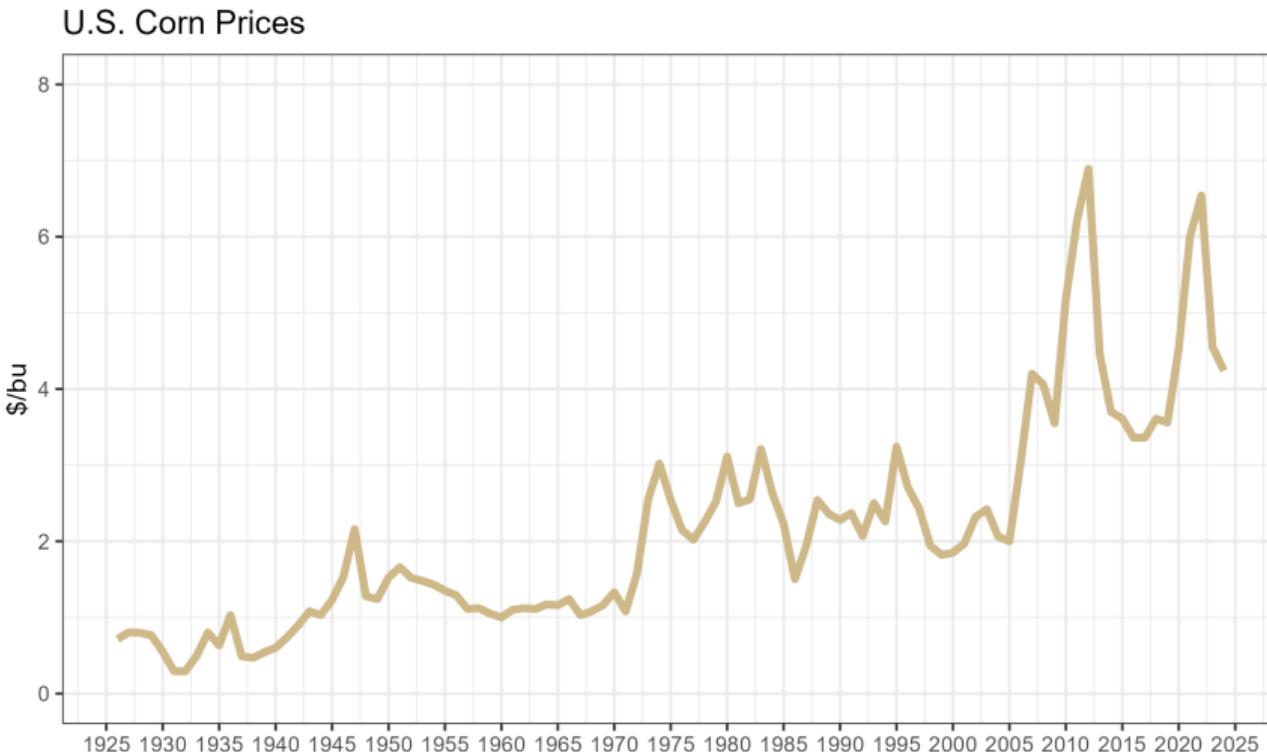
Commodity Production Cycles

Production of agricultural commodities is bound by biological traits of the life cycle.

Forecasting prices requires:

- Awareness of key seasons
- Understanding of problems that can arise during each phase of the life cycle

Long Term Trends



Monthly prices received by farmers in the U.S., 1908–2015

Three Price Regimes in Corn

Irwin and Good (2016) identify three distinct periods:

- ① **Pre-1973:** Stable, low prices
- ② **1973–2005:** Higher plateau
- ③ **2006–present:** New, higher era (most volatile)

Clear run-up in prices in the 1970s and again around 2006–2007.

What caused these seemingly permanent price hikes?

Summary

- Commodities are fungible goods traded in centralized markets
- Transformation over space, time, and form drives price relationships
- Storability has profound implications for price dynamics
- Price analysis (backward) vs. forecasting (forward)
- Parsimony: simple models often work best
- Long-term corn prices show distinct “eras”