Trilogy for Troubleshooting Convergence: Manipulation, Structural Imbalance, and Storage Rates

Scott H. Irwin
Convergence: The pattern of cash and futures prices tending to come together, that is, basis approaching zero at the delivery market as the futures contract expires.
Arbitrage in the cash and futures markets should force prices to converge during the delivery period (law of one price)

- Futures > cash price: buy cash commodity, sell futures, and deliver
- Futures < cash price: Buy futures, stand for delivery, and then sell cash

Convergence is necessary for:

- Effective futures hedging
- Efficient discovery of prices and storage returns (“the carry”)
- Performance of crop insurance revenue contracts
Cheapest-to-Deliver Basis for CBOT Corn Futures Contracts, Average of First Five Days of Delivery, March 1986 - December 2017 Contracts (basis = futures - cash)
Cheapest-to-Deliver Basis for CBOT Soybean Futures Contracts, Average of First Five Days of Delivery, March 1986 - November 2017 Contracts (basis = futures - cash)
Cheapest-to-Deliver Basis for CBOT Wheat Futures Contracts, Average of First Five Days of Delivery, March 1986 - December 2017 Contracts (basis = futures - cash)
Cheapest-to-Deliver Basis for KCBOT Wheat Futures Contracts, Average of First Five Days of Delivery, March 1996 - December 2017 Contracts (basis = futures - cash)
Whodunnit?

1. Manipulation in the form of traditional “corners” and “squeezes”
2. Structural imbalance in contract design or market conditions that favors one side of the market
3. Futures contract storage rates below the market-clearing price of storage in the physical market
Key Facts about Delivery Systems for Grain Futures Contracts

- Delivery is not satisfied literally by cash grain
- A “delivery instrument” must be used to make and take delivery
  - Warehouse receipt
  - Shipping certificate
- Terms for delivery instruments are matched as closely as possible to actual commercial grain transactions
- Delivery instruments are negotiable instruments that can be held indefinitely in theory
- Takers of delivery (longs) must pay storage fee because makers of delivery (shorts) have to back delivery instruments with grain
KCBOT wheat futures market prices this
The Market for Physical Grain Storage

[Graph showing the market for physical grain storage with axes for Market Value of Physical Storage and Supply of Storage, and demand curves for Storage']
Storage Rates and Non-Convergence

Expiring Futures Price = Delivery Spot Price

Price

$4.00

Today  + 1 month  Time
Storage Rates and Non-Convergence

Market Value of Physical Storage = Futures Storage Rate = 5 cents

Price

$4.00

Today + 1 month

Time

Expiring Futures Price = Delivery Spot Price
Storage Rates and Non-Convergence

Market Value of Physical Storage = Futures Storage Rate = 5 cents

Expected Spot Price = Current One-Month Ahead Futures Price

Expanding Futures Price = Delivery Spot Price

Today + 1 month
Storage Rates and Non-Convergence

Market Value of Physical Storage = 10 cents
Futures Storage Rate = 5 cents

Expanding Futures Price
= Delivery Spot Price

Today
+ 1 month
Time

Price

$4.00
Storage Rates and Non-Convergence

Market Value of Physical Storage = 10 cents
Futures Storage Rate = 5 cents

Expected Spot Price = Current One-Month Ahead Futures Price
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Storage Rates and Non-Convergence

Market Value of Physical Storage = 10 cents
Futures Storage Rate = 5 cents

Price

$4.10
$4.05
$4.00

Expiring Futures Price
One-Month Ahead Futures Price
Futures Spread
Positive Delivery Basis
Delivery Spot Price

Today + 1 month Time
Storage Rates and Non-Convergence

Market Value of Physical Storage = 10 cents
Futures Storage Rate = 5 cents

Expiring Futures Price

One-Month Ahead Futures Price

Futures Spread

Positive Delivery Basis

= Market Value of Physical Storage

Today + 1 month

Price

Time

$4.10

$4.05

$4.00

Delivery Spot Price

$4.05
Estimated Market Price of Physical Storage and Storage Rate for CBOT Corn Futures Contracts, Average of First Five Days of Delivery, March 1986 - December 2017 Contracts

"the wedge"
Estimated Market Price of Physical Storage, Storage Rate, and Basis for CBOT Corn Futures Contracts, Average of First Five Days of Delivery, March 1986 - December 2017 Contracts

Storage Price or Rate (cents/bushel)

Basis (cents/bushel)

Futures Storage Rate
Market Value of Storage
Basis

Contract Year


Storage Price or Rate (cents/bushel)

0 5 10 15

Basis (cents/bushel)

0 10 20 30 40 50 60 70
Estimated Market Price of Physical Storage and Storage Rate for CBOT Wheat Futures Contracts, Average of First Five Days of Delivery, March 1986 - December 2017 Contracts
Fixed vs. Variable Storage Rates

Fixed rates:

+ Fixed financial full carry
+ Simplicity of carry calculations
+ May improve liquidity in deferred futures
  - Adjusted in an *ad hoc* manner

Variable storage rates:

+ Pre-specified rule for adjusting rates
+ With a lag, will fully adjust to market value of storage
  - Uncertainty about financial full carry
  - May be detrimental to liquidity in deferred futures
Where You Can Find Me

Personal website:  
http://www.farmdoc.illinois.edu/irwin/

Twitter: @ScottIrwinUI

LinkedIn: https://www.linkedin.com/in/scotthirwin/

Email: sirwin@Illinois.edu
Disclosure Statement

• University Funding
  • Recent grants from USDA/ERS USDA/OCE
  • Regular support from endowments for research and extension program

• Occasional consulting projects

• Sometimes trade in commodity futures markets

• Principal in a private company that provides U.S. corn and yield forecasts

• Member of CME Agricultural Markets Advisory Council

• Co-manage family grain farm in Iowa
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