

# Lecture 21: Futures Markets

Economics 252, Spring 2008

Prof. Robert Shiller, Yale University

Open Yale courses

# FX Forwards and Forward Interest Parity

- FX Forward is like a pair of zero coupon bonds.
- Therefore, forward rate reflects interest rates in the two currencies
- Forward Interest Parity:

$$\text{forward exchange rate (Y/\$)} = \text{spot exchange rate (Y/\$)} \times \frac{1 + r_Y}{1 + r_\$}$$

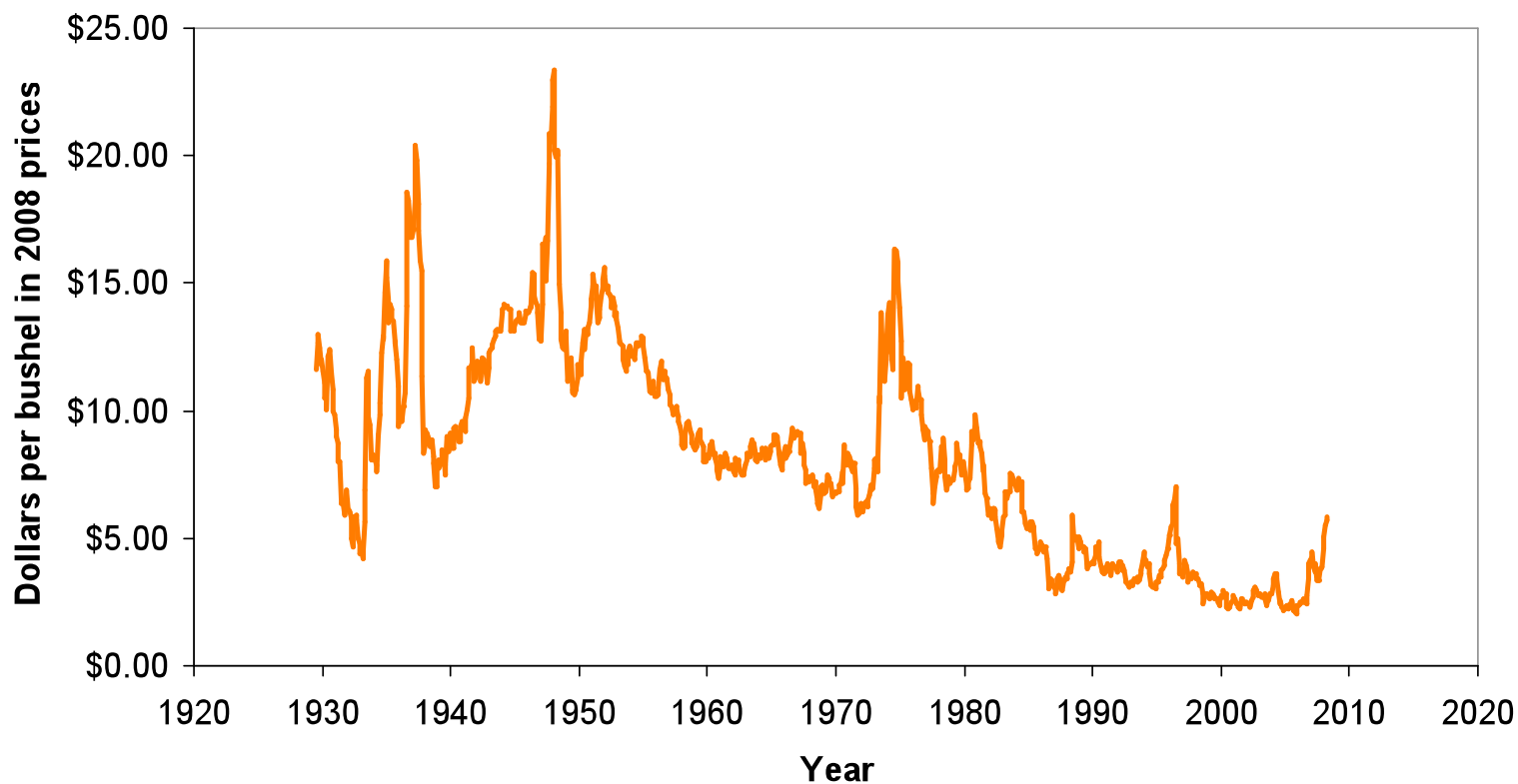
# Forward Rate Agreements

- Promises interest rate on future loan.
- $L$ =actual interest rate on contract date
- $R$ =contract rate
- $D$ =days in contract period
- $A$ =contract amount
- $B=360$  or  $365$  days

$$\text{Settlement} = \frac{(L - R) \times D \times A}{(B \times 100) + L \times D}$$

Open Yale courses

# Real CBOT Corn Price \$/Bushel in 2008 Dollars, 1929-2008



Open Yale courses

# CBOT Wheat Futures

- Delivery: No 2 Soft red winter, No 2 Hard Red winter, no dark northern spring, no 2 northern spring at par
- No 1 soft red winter, no 1 hard red winter, no 1 dark northern spring and no 1 northern spring at 3 cents /bushel over contract price
- Jul, sp, Dec Mar May,

Open Yale courses

# Fair Value in Futures Contract

- $r$  = interest rate
- $s$  = storage cost
- $r+s$ =cost of carry
- Futures price is normally above cash price (contango) (otherwise, “backwardation”)

$$P_{future} = P_{spot} (1 + r + s)$$

(See <http://www.indexarb.com>)

Open Yale courses

# Arbitrage Enforcing Fair Value

- If commodity is in storage, there is a profit opportunity that will tend to drive to zero any difference from fair value.
- If commodity is not in storage, then it is possible that:

$$P_{future} < P_{spot} (1 + r + s)$$

# Example of Hard Winter Wheat (Holbrook Working)

- No. 2 Hard Winter Wheat Kansas City Wheat Futures
- Plant winter wheat in Fall, harvest in May
- $\frac{3}{4}$  of US wheat crop is hard.
- Hard wheat is used for bread, soft wheat for pie crusts, breakfast foods and biscuits



# Working's Example of Wheat in Storage, Typical Year

- July 2

Spot 229  $\frac{1}{4}$

Sept future 232  $\frac{1}{4}$

Spot premium -3

Basis 3

- September 4

Spot 232  $\frac{1}{2}$

Sept future 233  $\frac{1}{2}$

Spot premium -1

Basis 1

Gain of 2 (reflects gain in premium)

# Continuing Working's Example

• Sept 4	• December 1
Spot No. 2 232 $\frac{1}{2}$	252
Dec. Future 238 $\frac{1}{4}$	252
Spot Premium $-5 \frac{3}{4}$	0
	Gain of $5 \frac{3}{4}$

# Just Before May Harvest

- May 1

Spot No. 2 247  $\frac{1}{4}$

July future 229  $\frac{1}{4}$

Spot premium +18

- July 1

Spot No. 2 218  $\frac{1}{2}$

July future 225

Spot premium  $-6 \frac{1}{2}$

Loss of 24  $\frac{1}{2}$