OPTIONS

• Introduction
• Option basics
  – Definitions
  – Types of options
  – Premium, intrinsic value, time value
• Uses of Options
  – Obtain information
  – Trading
    • Speculation
    • Hedging

OPTIONS: INTRODUCTION

• Hedging with FUTURES protects us from adverse changes in cash prices

BUT

• Prevents us from realizing profits if cash prices move in the “right” direction

OPTIONS: INTRODUCTION

• Hedging with OPTIONS protects us from adverse changes in cash prices
• Allows us to realize profits if cash prices move in the “right” direction

BUT

• We must pay a “premium”
OPTIONS

• “Options on futures” are contracts.

• The **buyer** of an option has the **RIGHT** (but not the obligation) to trade a futures contract under certain conditions.

• The **seller** of an option **MUST** trade a futures contract under certain conditions **IF** the option buyer so desires.

OPTIONS ON FUTURES

• Types of options:

  – “Calls” vs. “Puts”

  – **“American”** vs. “European”

OPTIONS ON FUTURES

• American **CALL** Option:

  Gives its buyer the right to **BUY** a futures contract at a predetermined price at any time before a predetermined date.

  (Note: CBOT and CME calls are “American”)
OPTIONS ON FUTURES

• American PUT:

Gives its buyer the right to SELL a futures contract at a predetermined price at any time before a predetermined date

(Note: CBOT and CME puts are “American”)

OPTIONS ON FUTURES

• European CALL:

Gives its buyer the right to BUY a futures contract at a predetermined price on a predetermined date

(Note: CBOT and CME calls are “American”)

OPTIONS ON FUTURES

• European PUT:

Gives its buyer the right to SELL a futures contract at a predetermined price on a predetermined date

(Note: CBOT and CME puts are “American”)

OPTIONS ON FUTURES

- Definitions:
  - “Strike” (“exercise”) Price
  - Expiration (“maturity”) date
  - “Premium”
    - Amount paid by the buyer to the seller of an option at the time of purchase

LIVE CATTLE OPTIONS PIT-TRADED PRICES AS OF 07/22/05 02:30 PM (CST)

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<tr>
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<th>SETT</th>
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| OK OCT05 LIVE CATTLE OPTIONS CALL |
| 80     | ---- | ---- | ---- | ---- | 3.000 | -100 | 3.100 | 1  |
| 82     | 1.900 | 2.000 | 2.000 | 2.000 | 1.900 | -50  | 5    | 1.950 | 1  |
| 83     | ---- | ---- | ---- | ---- | 1.350 | UNCH | 1.350 | 25  |
| 84     | 0.900 | 1.000 | 1.000 | 1.000 | 1.000 | -50  | 192  | 1.050 | 74  |
| 85     | 0.700 | 0.700 | 0.700 | 0.700 | 0.700 | UNCH | 6   |
| 86     | ---- | ---- | ---- | ---- | 0.500 | UNCH | 0.500 | 1  |
| 87     | ---- | ---- | ---- | ---- | 0.350 | UNCH | 0.350 | 1  |
| 88     | ---- | ---- | ---- | ---- | 0.225 | UNCH | 0.225 | 10  |

| OK DEC05 LIVE CATTLE OPTIONS CALL |
| 82     | ---- | ---- | ---- | ---- | 3.625 | -175 | 3.800 | 771 |
| 84     | 2.500 | 2.650 | 2.500 | 2.500 | 2.500 | -50  | 15   | 2.700 | 3  |
| 86     | 1.500 | 1.600 | 1.500 | 1.500 | 1.500 | -50  | 60   | 1.550 | 1740 |
| 88     | ---- | ---- | ---- | ---- | 0.900 | +50  | 0.850 | 2   |
| 90     | ---- | ---- | ---- | ---- | 0.500B | +25  | 0.475 | 27  |
| 92     | 0.350 | 0.350 | 0.350 | 0.350 | 0.325 | UNCH | 1678 |
| 94     | ---- | ---- | ---- | ---- | 0.225 | UNCH | 0.225 | 10  |

LIVE CATTLE OPTIONS PIT-TRADED PRICES AS OF 07/22/05 02:30 PM (CST)

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OPTIONS ON FUTURES

- Characteristics:
  - Traded in Commodity Exchanges
  - Very standardized:
    - 1 underlying futures contract (e.g., March corn futures)
    - “Standardized” strike prices (e.g., $79/cwt, $80/cwt, $81/cwt, $82/cwt)
## OPTIONS ON FUTURES

### Definitions:

- Option “writer” (seller) vs. option “holder” (buyer)

### OPTIONS ON FUTURES

- The HOLDER of an option has 3 alternatives:
  1. Offset it (i.e., sell it back and receive the current premium)
  2. Exercise it (i.e., trade the futures contract at the strike price)
  3. Let it expire unexercised.
OPTIONS ON FUTURES

• The WRITER of an option can:

  1. Offset it (i.e., buy it back by paying the current premium) before it is exercised.

  2. Wait until it is either exercised, or it expires unexercised.

OPTIONS: DEFINITIONS

Intrinsic Value + Time Value

OPTION PREMIUM

OPTIONS ON FUTURES

• Definitions:

  – Intrinsic value:
    What the option would be worth if it expired immediately.
OPTIONS ON FUTURES

• Intrinsic value:
  – Example:
    I own a CALL with strike price $3 (i.e., I have the right to BUY a futures contract for $3)
    • If current futures price is $4, I can exercise the call to buy one futures contract for $3, and simultaneously sell it in the futures market at $4, for a gain of $1 (= $4 - $3). Hence, the call’s intrinsic value is $1.
    • If current futures price is $2, I won’t exercise the call to buy the futures contract for $3, because I can buy it cheaper (at $2) directly in the futures market. Hence, the call’s intrinsic value is $0.
OPTIONS ON FUTURES

• Intrinsic value of a CALL:
  = Current Futures Price - Strike Price
  if Current Futures Price > Strike Price,
  = 0 otherwise.

OPTIONS: DEFINITIONS

“Out-of-the-money” CALL
  Current Futures Price < Strike Price

“At-the-money” CALL
  Current Futures Price = Strike Price

“In-the-money” CALL
  Current Futures Price > Strike Price
OPTIONS ON FUTURES

Intrinsic value:

- Example:
  I own a PUT with strike price $3 (i.e., I have the right to SELL a futures contract for $3)
  - If current futures price is $2, I can buy a futures contract in the futures market for $2 and simultaneously exercise the put to sell the futures contract for $3, for a gain of $1 ($3 - $2). Hence, the put’s intrinsic value is $1.
  - If current futures price is $4, I won’t exercise the put to sell the futures contract for $3, because I can sell it for more (at $4) directly in the futures market. Hence, the put’s intrinsic value is $0.

![Intrinsic Value of a $3 PUT](image-url)
OPTIONS ON FUTURES

- Intrinsic value of a PUT:
  
  = Strike Price - Current Futures Price
  
  if Current Futures Price < Strike Price,
  
  = 0 otherwise.

OPTIONS: DEFINITIONS

"Out-of-the-money" PUT
Current Futures Price > Strike Price

"At-the-money PUT"
Current Futures Price = Strike Price

"In-the-money PUT"
Current Futures Price < Strike Price
OPTIONS ON FUTURES

• Definitions:
  – Time value:
    Amount by which the premium exceeds the intrinsic value. The time value stems entirely from the option’s time left until maturity.

\[
\text{Time value} = \text{Premium} - \text{Intrinsic Value}
\]
OPTIONS: DEFINITIONS

• Typically:

  Premium ≥ Intrinsic Value
  (i.e., Time Value ≥ 0)

Otherwise, one could make unlimited profits without risk.

OPTIONS ON FUTURES

• How to make unlimited profits without risk when Premium < Intrinsic Value for a CALL:

  – Example:
    Current futures price = $2.10
    Current premium for $1.80 call = $0.20
    So Premium ($0.20) < Intrinsic Value ($0.30 = 2.10 - 1.80)

    Buy one call for $0.20, exercise it to buy one futures contract for $1.80, and simultaneously sell the futures contract in the futures market to receive $2.10, for a gain of $0.10 (= 2.10 - 1.80 - 0.20). Perform this operation as many times as possible.

OPTIONS ON FUTURES

• How to make unlimited profits without risk when Premium < Intrinsic Value for a PUT:

  – Example:
    Current futures price = $2.10
    Current premium for $2.50 put = $0.25
    So Premium ($0.25) < Intrinsic Value ($0.40 = 2.50 - 2.10)

    Buy one futures contract in the futures market for $2.10, and simultaneously buy one put for $0.25 and exercise it to sell the futures contract for $2.50, for a gain of $0.15 (= 2.50 - 2.10 - 0.25). Perform this operation as many times as possible.
OPTIONS: TIME VALUE

- Time Value (and Premium) \( \uparrow \) as

  - Futures price volatility \( \uparrow \)
Futures Prices with High Volatility

Futures Prices with Low Volatility

Intrinsic Value of a $3 CALL

Current Futures Price

Premium
Premiums for $3 CALLs for Different Futures Volatilities

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<th>Current Futures Price</th>
<th>Low Volatility Premium</th>
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Intrinsic Value of a $3 PUT

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Current Futures Price

Intrinsic Value

Intrinsic Value of a $3 PUT

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</table>
**OPTIONS: TIME VALUE**

- Time Value (and Premium) $\uparrow$
  - Time to expiration $\uparrow$

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**Premiums for S3 PUTs for Different Futures Volatilities**

- Low Volatility
- High Volatility

**Time Value (and Premium)**

- Time to expiration $\uparrow$
Intrinsic Value of a $3 PUT

Intrinsic Value

Current Futures Price

Premium

Far Maturity

Intrinsic Value of a $3 PUT

Intrinsic Value

Current Futures Price

Premium

Far Maturity

Intrinsic Value of a $3 PUT

Intrinsic Value

Current Futures Price

Premium

Far Maturity

Intrinsic Value of a $3 PUT

Intrinsic Value

Current Futures Price

Premium

Far Maturity
Intrinsic Value of a $3 PUT

Current Futures Price

Premium
Nearby Maturity

Premium
Far Maturity

Premiums for $3 PUTs with Different Maturities

Current Futures Price

Premium
Far Maturity

Premium
Nearby Maturity

Premium
Nearby Maturity