CHARTA LEARNING · LESSON NOTES

Natural resources: commodities, roll return, timberland and farmland

CFA Level I · Alternative Investments

You will learn: Split the return on a commodity futures position into spot, roll and collateral returns, work out roll return from the shape of the futures curve, and explain how timberland, farmland and appraisal smoothing affect risk and diversification.

Running example: Examples follow Fernwood Fund, a made-up fund with a $10m oil sleeve and some timber and farm holdings. Figures are made up.

1. Three sources of return on a futures position

- A futures contract is an agreement to buy or sell at a fixed price on a set future date. Only a small deposit, called margin, is paid. A commodity pays no interest or dividend and costs money to store, so the return comes from three separate sources.
- Spot return: the change in the commodity's price today (the spot price) divided by the starting price. Roll return: the gain or loss from swapping an expiring contract for a later one. Collateral return: interest on the cash held in safe short-term bills behind the margin.
- Each is a percentage of the money invested and can be positive or negative. The sign of the spot price and the sign of the position can differ.

> **Total return = spot return + roll return + collateral return**

FERNWOOD OIL SLEEVE, $10M

Spot 80 to 84	(84 − 80) ÷ 80	**+5%**
Roll −3%, collateral +4%	5% − 3% + 4%	**+6% = $600,000**
Another year: spot +2%, roll −6%, collateral +3%	2% − 6% + 3%	**−1% = −$100,000**

Watch out: Forecasting only the spot price and forgetting the other two pieces; thinking a futures price is a forecast of spot (it is a price you can deal at today, and it converges to spot at expiry).

2. Roll return and the futures curve

- Contracts expire, so the investor must roll: sell the near contract (about to expire, trading close to spot) and buy the next contract that replaces it. The roll return depends on the price gap.
- Contango: futures above spot, the curve slopes up, the long investor sells cheap and buys dear, so roll return is negative (a cost). Backwardation: futures below spot, the curve slopes down, roll return is positive (a gain).
- Storage and financing costs push toward contango. Convenience yield, the value of having the real thing in hand, pushes toward backwardation when stocks are scarce. The shape can flip as supply and demand change.
- Contango is a cost, not a certain loss: the spot price must rise by more than that cost to leave a profit. Annual roll return is approximately the number of rolls a year times the roll return per roll.

Roll return per roll = (near price − next price) ÷ near price; annual roll return ≈ rolls a year × roll return per roll

SPOT FLAT, 6 ROLLS A YEAR, CASH EARNS 4%

Contango: near 80, next 81.50	(80 − 81.50) ÷ 80; × 6	**−1.875% a roll; −11.25% a year**
Total, contango	−11.25% + 0% + 4%	**−7.25%**
Backwardation: near 80, next 78.40	(80 − 78.40) ÷ 80; × 6	**+2% a roll; +12% a year**
Total, backwardation	12% + 0% + 4%	**+16%**
$1m after a year: contango / flat curve / backwardation		**$927,500 / $1,040,000 / $1,160,000**
Copper: spot 4.00, next 4.10, spot +8%, cash 3%	roll −2.5% × 4 = −10%; 8 − 10 + 3	**+1%**

3. Timberland

- Timberland is land with trees grown to be cut for timber. It earns from biological growth (trees add volume and quality whatever the market does), changes in timber prices, and the value of the land underneath, plus income when timber is harvested.
- The special feature: if timber prices are poor the owner can decline to harvest and let the trees keep growing. This choice is much like an option, and storing the timber costs nothing because it keeps growing in place.
- Waiting helps even with flat prices because of biology, not the market. There are limits: trees can be left too long, and the owner may need the cash.

CUT NOW FOR $2.40M, OR WAIT A YEAR (VOLUME GROWS 5%)

Wait, price flat	2.40 × 1.05	**$2.52m**
Wait, price up 12%	2.40 × 1.05 × 1.12	**$2.82m**
Gain against cutting now	2.82 ÷ 2.40 − 1	**+17.6%**
Break-even price fall	1 ÷ 1.05 − 1	**−4.8%**

4. Farmland, and how it differs from timberland

- Farmland is land used to grow crops, farmed by the owner or rented out. It earns income from the harvest (crop yield × price, less growing costs) or from rent, plus land appreciation. It is exposed to weather, pests and disease (yield) and to commodity prices (revenue).
- Row crops (wheat, corn, soy) are replanted every year, so the owner can switch crops each season. Permanent crops (orchards, vineyards, groves) take years to establish, cannot be switched, and are more exposed to a bad run of prices, but can earn more once mature.
- Both earn from a biological process, a commodity price and the land, and both have shown low correlation with stocks and bonds. The key difference is timing: a timberland owner can leave trees standing, but a farmland owner generally has a harvest date and takes the price on the day.

FARMLAND AT $8,000 AN ACRE: 180 BUSHELS AT $5.00, COSTS $540

Normal income	180 × 5.00 − 540	**$360**
Normal total return	360 ÷ 8,000 = 4.5%, plus 3.0% land	**7.5%**
Drought (yield down a quarter to 135): income	135 × 5.00 − 540	**$135**
Drought total return	1.69% + 3.0% land	**4.69%**

Watch out: Saying farmland has the same option to delay as timberland. It does not.

5. Inflation, diversification and appraisal smoothing

- Natural resources are real assets: their money value tends to rise with prices, so they tend to hold value when inflation rises, unlike a fixed-rate bond. The protection is partial and not guaranteed. Historically their returns have had low correlation with stocks and bonds.
- Weaknesses: illiquid (a sale can take months), concentrated in a few properties, regions or crops, and exposed to weather, disease, fire and commodity price swings.
- Land rarely trades, so values come from appraisals. An appraiser anchors on last year's figure and moves only part of the way to market value, so peaks are lower, troughs shallower and turns late. A weight of 1 means no smoothing; the smaller the weight, the smoother the series.
- Smoothing understates volatility and correlation, so the diversification benefit and the Sharpe ratio look better than they are. The sensible conclusion is a modest allocation, judged on risk adjusted for smoothing.

Reported value = last reported value + weight × (market value − last reported value); Sharpe ratio = (return − risk-free rate) ÷ standard deviation

TIMBERLAND, MARKET VALUES 100, 115, 95, 112, 100; WEIGHT ONE HALF

Market returns		**+15, −17.4, +17.9, −10.7 (%)**
Reported values	halfway to market each year	**107.5, 101.3, 106.6, 103.3**
Reported returns		**+7.5, −5.8, +5.3, −3.1 (%)**
Standard deviation, market vs reported		**17.9% vs 6.4%**
Sharpe, reported (return 7%, risk-free 1%)	6 ÷ 6.4	**0.94**
Sharpe, market	6 ÷ 17.9	**0.34 (about 2.8× better looking)**

Key takeaways

- Futures return = spot return + roll return + collateral return; keep the three apart.
- Roll return = (near − next) ÷ near: contango gives a negative roll, backwardation a positive one.
- A futures price is not a forecast of spot; it is a price available today that converges to spot at expiry.
- Timberland can wait for a better price while trees grow; farmland generally cannot.
- Natural resources tend to hold value in inflation and have diversified stocks and bonds.
- Appraisal smoothing understates volatility and correlation and flatters the Sharpe ratio.

Quick check

1. Spot +3%, roll −5%, collateral +2%. Total return?
   Answer: 3% − 5% + 2% = 0%.
2. Near contract 50, next contract 51. Curve shape and roll return per roll?
   Answer: Contango. (50 − 51) ÷ 50 = −2%.
3. Why do appraisals understate timberland volatility?
   Answer: They move only part-way to market value: calmer, later.

Summary notes for the Charta whiteboard lesson. Examples use made-up figures. Watch the full lesson at charta-learning.com.