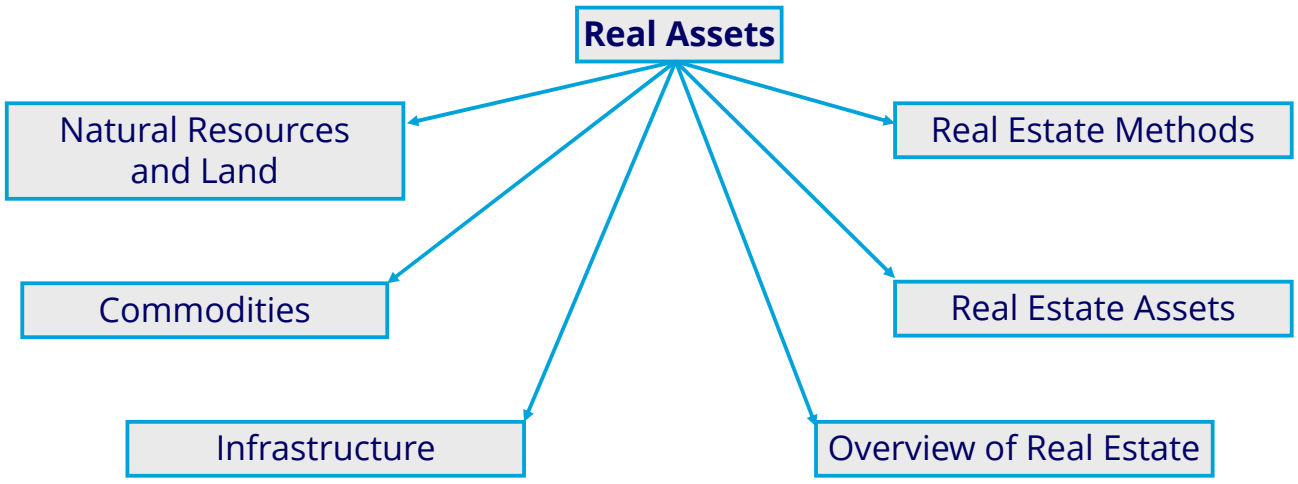
Real Assets

Overview



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Natural Resources and Land



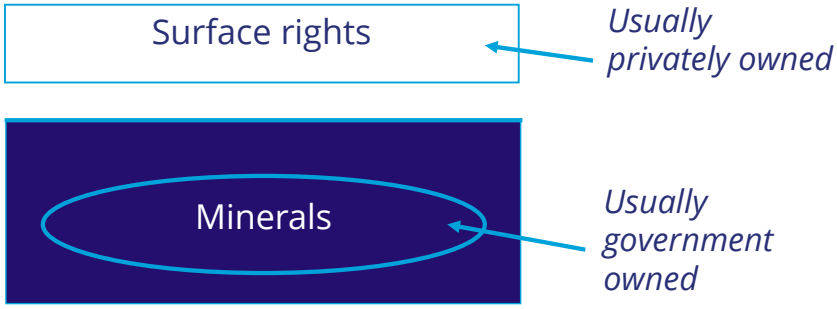
Need-to-Know Concepts

- Valuing **natural resources as an exchange option**
- Valuing **land as a call option** (binomial approach)
- Calculating the expected return of land
- Pros and cons of **timberland** investment
- Pros and cons of **farmland** investment
  - **Capitalization rate** valuation (calculation)

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Natural Resources

- **Natural resources**
  - Real assets with no or almost no human alteration
    - Example: undeveloped land and minerals



Usually privately owned

Usually government owned

Access

- Direct ownership
- Leases/rights
- Pure plays (rare)

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Natural Resources as Exchange Options

- **Exchange option**
  - An option to deliver out an asset to receive another asset

Mineral rights Extraction costs	Processed minerals (i.e., commodity)

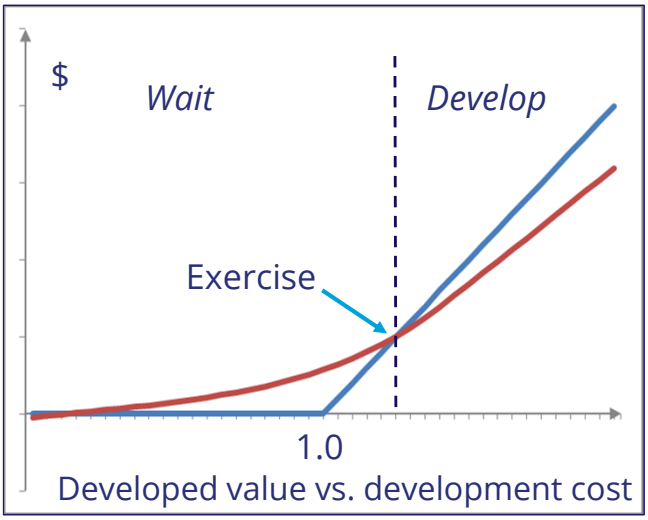
  - Option value depends on:
    - Volatility of price of asset being delivered
    - Volatility of price of asset being received
    - Correlation between the two

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Natural Resources as Exchange Options

Value if exercised immediately

Value if exercised later (deferred basis)



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Land

- Land banking
  - Purchasing vacant lots for future development
- Value chain
  - *Raw land*
  - *Entitled lots:* planning complete; "zoning" permission achieved
  - *Paper lots:* development approved, construction yet to begin
  - *Blue-top lots:* rough grading complete; home building permit can be obtained
  - *Finished lots:* grading complete; ready for home construction; all development fees paid
- Broken lots: some pre-development occurred before progress halted

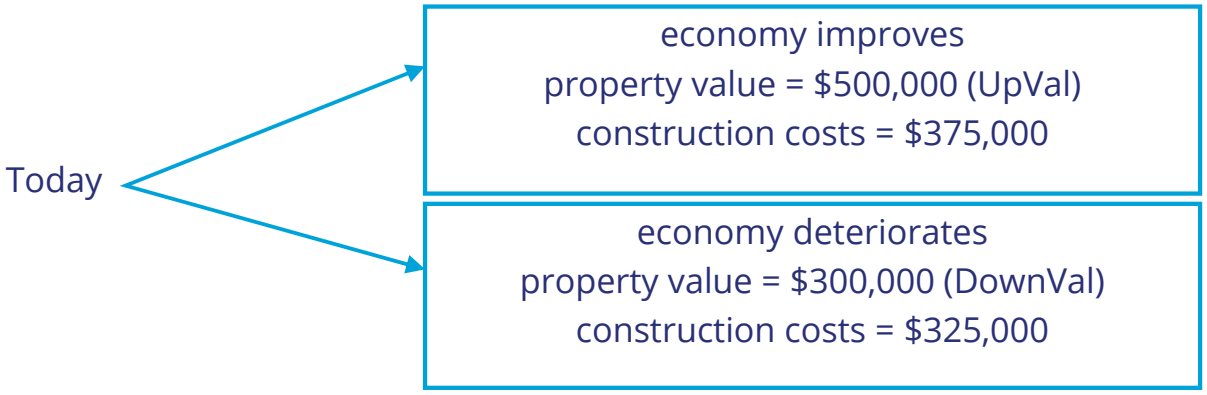
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Land as a Call Option

- Value of raw land can be attributed to development option
- Can be modeled as a call option with:
  - **Strike:** costs of construction
  - **Underlying asset:** land + completed development
  - **Time to expiration:** unlimited
  - **Moneyness:** completed development – costs of construction
- Option will be exercised when net benefits of development exceed the net value of retaining the option

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Example: Binomial Model Approach



- Risk-free rate: 0%
- Value of equivalent property today: $370,000
- **Calculate** the value of call option

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Solution: Binomial Model Approach

- **Step 1:** Use the **values** of the property to solve for the probability of an improvement in the economy (UpProb).

- **Step 2:** Use the Step 1 probabilities to calculate the value of the right to develop the land (property will not be developed in poor economy).

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Solution: Binomial Model Approach

- **Step 1:**
  $370,000 = (UpProb × $500,000) + (1 – UpProb) × $300,000
  UpProb = $70,000 / $200,000 = 0.35

- **Step 2:**
  Option value = [0.35 × ($500,000 – $375,000)] + [0.65 × 0] = $43,750

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Example: Binomial Model Approach

- Factors affecting valuation:
  - What will be the impact of construction costs being fixed at $342,500 (weighted-average cost)?
  - What will be the impact of a wider dispersion of end property values?

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Solution: Binomial Model Approach

- Factors affecting valuation:
  - Land value = 0.35 × ($500,000 – $342,500) = $55,125.
    Fixed construction costs increase the value of the option.
  - Wider dispersion of end property values lead to higher profits when the economy improves, increasing the value of the option.

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Risk and Return of Investing in Land

- If the land is developed, expected returns will be higher than if the land remains undeveloped.

- **Expected return:**

  $E(R) = [P_d \times E(R_d)] + [(1 - P_d) \times E(R_{nd})]$

  where:

  P_d = probability of developing land

  $E(R_d)$ = expected return of developed land

  $E(R_{nd})$ = expected return of undeveloped land

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Timberland Investments

Methods of accessing

Direct/private

Timberland investment management organizations (TIMOs)

Publicly traded vehicles

- Listed timber companies
- ETFs
- REITs
- Lumber futures

- Most common institutional method

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Pros and Cons of Timberland

Pros

1. Low correlation with stocks and bonds
2. Potential inflation hedge
3. Flexible harvest/*rotation* schedule (timing option)

Cons

1. Values tied to cyclical industries (housing)
2. Technology/recycling may diminish timber demand
3. Natural disaster/legal risk

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Farmland Investments

Methods of accessing

- Direct/private
- Publicly traded vehicles
  - Listed agricultural companies
  - ETFs
  - REITs
  - Agricultural futures

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Investing in Farmland

Farmland returns

- Linked to commodity prices; steady lease income

Demand driven by:

- Growth in population
- Higher incomes and increased protein diets
- Increased biofuel demand

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Investing in Farmland

Supply driven by:

- Changing yields (transgenic modification, agronomy, increased fertilizers, increasing mechanization)
- Improved infrastructure
- Increasing quantity of land under cultivation

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