Introduction

Introduction

1. Institutional Perspective of Financial System

- Financial markets: equity, fixed income (debt), credits, derivatives
- Financial intermediaries: banks, insurance companies, pension funds, mutual funds, investment banks, venture capital, asset management firms, information providers, …
- Financial infrastructure: trading rules, contract enforcement, account system, capital requirements, …
- Governmental organizations: IMF, World Bank, Federal Reserve System, BIS, SEC, …

2. Stocks

- Characteristics
  - **Equity claim** / Residual claim
    - = the right to claim the profit of a company after all prior obligations have been paid
  - **Limited liability**
    - = the liability of a business owner/investor cannot exceed his/her investments in the company
- Sources of returns
  - **Dividends**
    - = distribution of a portion of the company's earnings
  - **Capital gains**
    - = profits gained on the sale of the investment
- Calculation of returns
  - Buy at $t = 0$ and pay P_0. Sell at $t = T$ and receive P_T and dividend D_T.
  - **Percentage return**

$$r_T = \frac{P_T + D_T - P_0}{P_0}$$

- **Log return**

$$r_T = \ln \frac{P_T + D_T}{P_0}$$

- Determinants of returns
  - Firm-specific condition
    - ∋ management, productivity, earning, growth-potential, market-liquidity, …
  - Market condition
    - ∋ market indices (volatility, volume, …)
    - e.g. Nasdaq, SP500, DAX, FTSE, …
  - Economic condition
    - ∋ macro vars
    - e.g. GDP growth, inflation, unemployment, business cycles, liquidity, interest rates, …

- Key params of returns
  - Patterns in the cross-section
    - value (∋ value & growth)
    - size (small vs large)
    - momentum (low vs high)
  - Time series behavior
    - time-varying expected returns
    - predictability
    - stochastic volatility
    - …

3. Fixed income

- = debt instruments (mostly bonds)
- = fixed, pre-determined stream of cash flows in the future
- Params
    - Coupon payments
    - Principal amount
    - Maturity time
    - Sinking fund obligations
    - …
- **Term-structure** / Yield-curve
    - = interest rates / bond yields vs maturities
    - Primary shapes
        - Upward sloping
            - = “normal”
            - long-term yields > short-term yields
            - → expansionary econ
        - Downward sloping
            - = “inverted”
            - Short-term yields > long-term yields
            - → recessionary econ
        - Flat
            - → market is uncertain about future direction of econ
- Corporate bonds vs Treasury bonds
    - Key: **default risk**
    - **Credit spread**: diff in yields
    - Corporate bonds

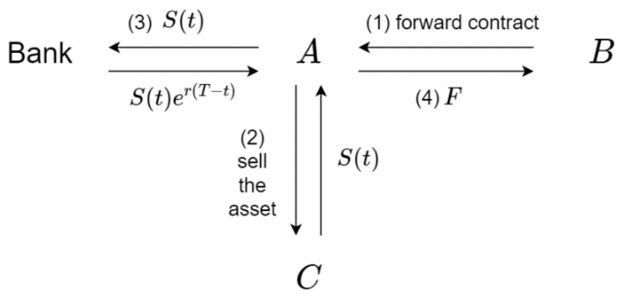
- ♦ Cheaper
- ♦ Higher yields
- ♦ Probability of default
    - Varies over time
    - Varies across firms of diff credit qualities (e.g. countries, industries, guarantees, …)

4. Derivatives

- **Forward & Futures**

Forwards	Futures
Obligation to buy an asset at some specific time (i.e. maturity) at some **specific price**	**Obligation** to buy an asset with a **gradual price settling** (daily) until maturity
Can be privately negotiated	Highly standardized
OTC	exchange
High counterparty risk (i.e. one party may default)	High liquidity (i.e. can be traded whenever)

- o **No-Arbitrage Principle**
    - ♦ = There is **<u>NO risk-free profit</u>** in financial markets
    - ♦ e.g. simple portfolio



- A receives a forward contract from B
- At time t: A goes short to C & receives $S(t)$ (i.e. spot price)
- A puts $S(t)$ into the bank & receives interest till time T

- At time T (i.e. maturity date): A receives the asset & gives F to B.
- A's net position $= S(t)e^{r(T-t)} - F$
  1. If $S(t)e^{r(T-t)} > F$: go along with the forward contract & make riskless profit
  2. If $S(t)e^{r(T-t)} < F$: short the forward contract & make riskless profit
- HOWEVER, jokes on you! This will never happen since other investors will smell this fresh meat and come to take a bite of it. Price will automatically adjust to eliminate such riskless profit! (macro)
- Eventually, A ends up with $S(t)e^{r(T-t)} = F$.

- **Options**
  - **Call Option**
    - = the **right** to **buy** an asset for an agreed amount at a specific time
    - Params
      - Exercise/**Strike price**: the agreed amount (E)
      - **Expiry**: the specific time
      - **Underlying**: the particular asset (S: asset price)
      - **Payoff function**: return on the option

$$\max(S - E, 0)$$

      1. $S > E$ → let's do this
      2. $S < E$ → nahh let's chill
  - **Put Option**
    - = the **right** to **sell** an asset for an agreed amount at a specific time
    - Payoff function

$$\max(E - S, 0)$$

- Factors affecting derivatives' prices:
  - Vars: S & t
  - Params: interest rate, E, **volatility** (= a measure of #fluctuations in S) (i.e. a measure of randomness)

- The confusing & fancy terms
  - **Premium**: the amount paid for the contract
  - **Intrinsic value**: the payoff that would be received if the underlying is at its current level when the option expires
  - **Time value**: any value that the option has above its intrinsic value
  - **In the money**: an option with positive intrinsic value
  - **Out of the money**: an option with no intrinsic value
  - **At the money**: a call/put with a strike $\approx$ current asset level
  - **Long position**: a positive amount of a quantity
  - **Short position**: a negative amount of a quantity
  - **Writing options**: The writer of an option promises to deliver the underlying asset, if the option is a call or buy the asset if the option is a put. The writer receives the premium but faces obligations in the future.
    - The purchaser faces a limited downside of initial premium but an unlimited upside.
    - The writer faces a limited upside of guaranteed payment but an unlimited downside.
  - **Clearing houses**: register & settle options on the deposit of a margin by the writers (~~default risk~~)
  - **Initial margin**: the amount deposited at the initiation of the contract.

- Types of Options by exercise
  - **European Options**: exercise only permitted at expiry

- **American Options**: exercise permitted at any time before expiry
- **Bermudan Options**: exercise permitted on specified dates / in specified periods

- **Leverage**
  - = expectation to get a significantly higher payoff for a small investment
  - e.g.
    - Today is 2020/04/08. The price of Microsoft's stock is \$163.49.
    - The cost of a \$165 call option with expiry 2020/04/15 is \$10.
    - You would like to profit off the expectation that the stock price will rise dramatically within this week. You have two choices:
      1. Buy the stock
         - You buy the stock at \$163.49 on 2020/04/08.
         - The stock price becomes \$180 on 2020/04/15.
         - Your return on investment will be: $\frac{180-163.49}{163.49} = 10.10\%$
      2. Buy the call
         - You buy the call at \$10 on 2020/04/08.
         - The stock price becomes \$180 on 2020/04/15.
         - Your return on investment will be: $\frac{180-165-10}{10} = 50\%$
  - Downside: the risk of facing 100% loss
  - **Hedging**: the offsetting of the writer's risk of writing a highly-leveraged contract by buying other related contracts

- **Put-Call Parity**
  - On day t, you buy an European call option with a strike of E and an expiry of T, and you write an European put option with the same values.
  - You now hold a portfolio of a long call & a short put with:

Today (at t): $C - P = S(t) - Ee^{-r(T-t)}$
Future (at T): $\max(S(T) - E, 0) - \max(E - S(T), 0) = S(T) - E$

- ♦ = the equality of CF is independent of the future (i.e. it holds at any time up to expiry)

- Overview of Derivatives
  - Equity Derivatives
    - ♦ ∋ stock options, index futures, futures options, …
  - Fixed-Income Derivatives
    - ♦ ∋ caps/floors, swaps, swaptions, …
  - Credit Derivatives
    - ♦ ∋ credit swap, collateralized loan obligations, …
  - Other Derivatives
    - ♦ ∋ FX, weather (wait what?), exotics, …

5. Securitization

- = the procedure where a person merge various financial assets into one group to form a new marketable financial instrument
- e.g. MBS, CDO, asset-backed debt, …