- **Principles of Finance**
  - **Investments, Risk & Return**
    - A First Look at Investments
      - Different Asset classes offer different combinations of risk and expected returns.
    - Investor Choice: Risk & Reward
      - **Diversification** helps to reduce risk while keeping expected return fixed, we don't want "to put all of our eggs in the same basket".
      - **Optimal Portfolio Choice**, we should prefer assets that **pay off often** and assets that **pay off big when other assets do not**.
    - Benchmarked Costs of Capital
    - The Capital Asset Pricing Model (CAPM)
      - Is the model that tells us how risk and reward are related to:
        - How individual products are expected to perform.
        - How individual products are different from others.
    - Market Equilibrium
  - **Prospect Theory**
    - Based on **Allais** and **Ellsberg Paradoxes**. Built by **Kahneman** and **Tversky**.
    - Key Axioms for **Von Neumann - Morgenstern Utility**
      - **Completeness**
      - **Transitivity**
      - **Continuity**
      - **Independence**
    - Is based on **Four Pillars**
      - **Reference Dependence**, people derive utility from gains or losses **relative to some reference point**.
      - **Loss Aversion**, people are more sensitive to losses than to gains of similar magnitude.
      - **Diminishing Sensitivity**, people are risk averse in the domain of gains, but risk seekers in the domain of losses.
      - **Probability Weighing**, people do not weight outcomes by their objective probabilities p_i, but rather by transformed probabilities or decision weights, phi_i.
  - **Valuation and Capital Budgeting**
    - **Valuation** is forward looking, value today depends on net cash flow from now to eternity. It is based on the **Law of One Price**, all financial valuations are relative to alternatives, meaning that same things should cost the same and similar things should cost similar.
    - **Time Value of Money and NPV**
      - A **Project** is anything that generates a series of cash flows.
        - **Financial Securities**
          - Bonds (Debt)
            - A bond is a contractual obligation by a borrower to pay certain amounts of cash in the future to a lender.
          - Stocks (Equity)
        - **Firm**
          - A **Firm is a Collection of Projects**, financed by claims, that provide the inflows that eventually should generate outflows.
          - Firm Value is the sum of the value of all claims: **Firm = Debt + Other Liabilities + Equity = All Future Payouts.**
        - **Values**
          - **Value of Project** = PV of all its future Net Cash Flows
          - **Value of Claim** = PV of all of its future Net Cash Flows
          - **Value of Firm** = Value of all claims on it.
        - **Present Value**
        - **Net Present Value**
          - It's called Net as it adds (subtracts often) the first Cash Flow CF0 to the Present Value.
    - **Stock & Bond Valuation: Perpetuities & Annuities**
      - **Perpetuities**
        - A financial instrument that pays C dollars per period, forever.
        - How can an Infinite Sum Be Worth Less than Inf.? Because each future cash flow is worth a lot less than the preceding cash flow.
      - **Growing Perpetuities**
        - A growing perpetuity pays CF, then CF(1+g), then CF(1 + g)^2, ….
        - How can a Growing Infinite Sum Be Less than Inf.? Because the growth is not fast enough. This is only the case if r > g. The formula makes no sense if r < g.
      - **GDGM, Gordon Dividend Growth Model**
        - It uses Dividends instead of Cash Flows. It's unreliable as Dividends can be rearranged.
        - However, it can be used to get the implied cost of capital.
      - **P/E Ratio**
        - Similar to GDGM, it substitutes Earnings to Cash Flows. It's more reliable than GDGM as earnings are more difficult to rearrange than Dividends.
      - **Annuities**
        - Is a financial instrument that pays CF dollars for T years.
      - **Level-Coupon Bonds**
        - Most corporate bonds are level-coupon bonds, this means that the coupon level will remain the same over the life of the bond.
      - **Growing Annuities**
    - **Capital Budgeting Rules**
      - A **Capital Budgeting Rule** is a method to decide which projects to take and which to reject.
      - **NPV (Net Present Value)**
        - Accept the project if **NPV > 0** is the correct rule in a perfect market.
        - Any alternative rule must converge to the NPV rule as the financial market gets closer to perfection.
        - In perfect markets under certainty, positive NPV projects are close to "arbitrage". Ergo, they should be hard to locate, unless you have some resources that are not widely available. In the real world, if positive NPV projects were abundant the prevailing interest rate should adjust.
      - **IRR (Internal Rate of Return)**
        - It's a measure that generalises the rate of return, in the cash we have more thane inflow.
        - It is calculated setting the NPV = 0, and it is scale-invariant.
        - In the context of Bonds is called **Yield - To - Maturity**.
        - It's a "characteristic"of a project's cash flows and can be considered to be a "time-weighted average rate of return intrinsic to cash flows".
        - **IRR is unique when** we have a negative cash flow followed by only positive cash flows.
          - Usual for Financial Bonds & Corporate Investment Projects.
        - If the IRR is calculated with Promised Cash Flows is called **Promised IRR** and should never be used for capital budgeting.
        - **Capital Budgeting Rule**
          - If out followed only by in, invest if: IRR > Cost of Capital (r).
          - If in followed only by out, borrow if: IRR < Cost of Capital (r).
      - **Profitability Index**
        - It is calculated as the PV of future cash flows, divided by the cost (made positive).
        - **Capital Budgeting Rule**
          - Invest if PI > 1.
          - Reject if PI < 1.
      - **Payback Rule**
        - It measures how long it takes to get your money back.
        - **Capital Budgeting Rule**
          - Take projects with shorter payback time.
    - **Time-Varying Rates of Return & Yield Curve**
      - Interests are no more constant between years.
      - Annualized Interest Rates: sort of average of interests of the years.
      - **Inflation**
        - A real dollar has always the same purchasing power.
        - **(1 + Inflation) * (1 + Real) ≡ (1 + Nominal).**
        - Either discount nominal dollars with nominal interest rates, or discount real dollars with real interest rates. Never Mix.
      - **Yield Curve**
        - It measures differences in the costs of capital for (risk-free, U.S. Treasuries) projects with different horizons.
        - It is the plot of annualised yields (Y-axis) against time-to-maturity (X-axis).
        - The yield curve can be **flat**, **downward sloping** and of course **upward sloping**.
          - The typical upward sloping shape is justified by the **Risk Compensation**, as risk is compensated in long-term investments with a risk premium. Although a role is played also by the expectation of higher future rates.
          - Two projects with the same time horizon, may still have different risk outlooks as we have to consider **Duration**.
            - It is a measure of when the cash flow arrives "on average".
      - **Spot & Forward Rates**
        - We call a currently prevailing interest rate for an investment starting today a **spot** interest rate.
        - A **forward** rate is an interest rate that will being with a cash flow in the future.
  - **Uncertainty, Default & Risk**
    - As we don't know the "histogram"of the rates of return, we try to proxy historical data for predicting future rates of returns through statistics. We estimate a distribution of future rates of return from historical rate of return realisations. We assume each historical realisation was an equally likely draw.
    - **Default (Credit) Risk**
      - Most loans have credit risk, in that the borrower can default.
      - **Premium Decomposition**
        - **Quoted (=Promised) Interest Rate**
          - **Time Premium**
          - **Default Premium**
            - Compensation to make you Break Even, to make Risk-Neutral people to participate.
        - **Expected Interest Rate**
          - **Time Premium**
        - **Risk Premium**
    - **Credit (Default) Swaps**
      - They are an insurance against default.
    - **Two ways of financing a Project**
      - **Equity**
        - You use only "Saving accounts"
      - **Debt + Levered Equity**
        - You use Mortgage + "Saving Accounts. The Debt/Bond is paid before than the Equity/Stock.
      - **Risk**
        - **Full Ownership is less risky than Levered Ownership.**
        - **Full Ownership is riskier than Bond Ownership.**