Key Topics for Today’s Lecture

- Introduction to the language of the class
  - Cash Flows
  - Projects
  - Firms

- Corporate Securities
  - Common Stock (Equity)
  - Preferred Shares
  - Corporate Debt (Bonds)
  - Derivatives
Definitions:
Cash Flows, Projects, and Firms

- **Cash flow** is an amount of money paid at a specific time:
  - Cash inflow, positive amount; or
  - Cash outflow, negative amount.

- **Project** is a series of cash flows.
  - Cash inflows represent revenue.
  - Cash outflows: initial investment and expenses.

- **Firm** is a group of projects.
  - Role of management is to choose best projects.
Cash Flows and Projects: Examples

- An entrepreneur starts a bicycle store.
  - Initial investment is cash outflow ($500)
  - Future net revenue is cash inflow ($1000/month, 24 months)

- An investor purchases a bank Certificate of Deposit (CD)
  - Deposit is cash outflow ($10,000)
  - Redemption is cash inflow ($12,000 in 2 years)

- A lottery ticket:
  - Investment cost: Cash outflow of $1
  - Jackpot: Cash inflow of $14,000,000 (with some probability…)

- So projects can range from real investments, to pure monetary investments, to gambles (the lottery ticket).
### Cash Flows: Numbers with Dates

<table>
<thead>
<tr>
<th></th>
<th>Bike Shop</th>
<th>Bank CD</th>
<th>Lottery Ticket</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cash Outflow</strong></td>
<td>-$500</td>
<td>-$10000</td>
<td>$1</td>
</tr>
<tr>
<td><strong>Cash Inflow</strong></td>
<td>$1000/month</td>
<td>$12000 in 2 years</td>
<td>$0 or $14 Million</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>24 Months</td>
<td>2 Years</td>
<td>1 Week</td>
</tr>
</tbody>
</table>
Whatever the source of the funds, finance only concerns itself with the actual cash flows.
Starting a Business

Assuming you have a good idea, how do you “start a business”?

Simplest method: just make and sell your product, and report income on your personal tax return (Schedule C).
- **Sole proprietorship** if one owner
- **(General) partnership** if more than 1 owner.

Main disadvantage:
- Owner(s) personally liable for all business liabilities.
  - Debts
  - Law suits…
Other Organizational Forms

- Personal liability can be avoided by forming a corporation (or limited liability company - LLC).
- This is pretty simple:
  - File some forms, and pay c. $100 in fees,
  - Open a bank account,
  - Pay in money to contribute capital to the corporation and buy “shares” (common stock or equity)
  - … and you’re a CEO!
- The number of shares owned by different people determines their percentage ownership in the corporation.
- What’s the hardest part of starting a company?
Raising Additional Capital

What if your firm needs more money than you have available?

Get money from someone else:
- Credit cards (Apple computer), or bank loans.
- Friends or family.
- Wealthy individuals, “angel investors”.
- Even wealthier venture capitalists.
- General public (IPO, secondary offering).

See “Venture Capital” article.
In most cases, this does not occur as a gift…

What must the firm give away in return?
- Ownership/control
- Promises to make future cash payments – “securities”

The commonest securities issued include
- **Common stock** (also known as *shares* or *equity*)
- **Preferred Stock** (sometimes convertible)
- **Bonds**
## Comparison of Corporate Securities

<table>
<thead>
<tr>
<th>Ownership/Control rights</th>
<th>Common Stock (Equity)</th>
<th>Preferred Stock</th>
<th>Bonds (Debt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership/Control rights</td>
<td>Owners of firm. Hire/fire managers</td>
<td>Generally cannot vote (but, …)</td>
<td>No control except in case of bankruptcy</td>
</tr>
<tr>
<td>Cash flows</td>
<td>Dividends</td>
<td>Dividends (fixed)</td>
<td>Interest (fixed)</td>
</tr>
<tr>
<td>Tax status of cash flows</td>
<td>Not deductible</td>
<td>Not deductible</td>
<td>Deductible</td>
</tr>
<tr>
<td>Priority of cash flows</td>
<td>Last in line</td>
<td>Before equity, after all others.</td>
<td>First in line</td>
</tr>
</tbody>
</table>
Preferred Stock and Convertible Securities

- Until recently, preferred stock was pretty much only issued by regulated firms (e.g. public utilities). Why?

- Preferred stock, or **convertible** preferred stock is currently a common form of financing for new businesses. Why?

- How convertible preferred stock/bonds work:
  - If firm prospers, investor converts security to stock.
  - If firm does badly, investor stays with bond/preferred.
Holders of convertible preferred stock have the right (but not an obligation) to convert their preferred stock into common stock.

**Warrants** are often issued along with other securities.
- These give the holder the right to buy a specified number of shares at a specified price

Many companies offer some compensation in the form of **employee stock options**
All of these are examples of **options**, themselves a type of **derivative security**.

**Definition:** A derivative is any security whose value derives from another security.
Call Options.

- **American**: gives the holder the right to purchase one share at a fixed (strike) price at any time on or prior to a pre-fixed (expiration) date.

- **European**: gives the holder the right to purchase one share at a fixed price on the expiration date.

A **put option** is the same as a call, but its owner has the right to *sell* one share at a fixed (strike) price.
Terminology

- **Strike Price**: the price at which the option holder can purchase the stock.
- **Expiration Date**: the final date at which the option can be used.
- **Exercising an Option**: to use the option to purchase stock.
- **Warrant**: A call option issued by a firm to either its employees or investors.
On expiration how much is a call option worth?

- **Case 1:** Strike price is *greater* than the price of stock.
  - In this case the investor can obtain a share of the stock for less money by purchasing it in the open market. So the option should *not* be exercised.

  \[ \Rightarrow \text{Option’s value} = 0. \]

- **Case 2:** Strike price is *less* than the price of stock.
  - In this case exercising the option is less expensive than purchasing it in the open market. So the option *should* be exercised.

  \[ \Rightarrow \text{Option’s value} = \text{Market Price of the Stock} - \text{Exercise Price}. \]
On expiration how much is a put option worth?

- **Case 1:** Strike price is *greater* than the price of stock.
  - The investor can *sell* a share of the stock for more money than in the open market. So the option should be exercised.
  
  $\Rightarrow$ *Option’s value* = *Exercise Price - Market Price of the Stock*

- **Case 2:** Strike price is *less* than the price of stock.
  - Exercising the option is worse than selling the stock in the open market. The option *should be not* exercised.

  $\Rightarrow$ *Option’s value* = 0.
Evaluating individual investment projects

- Use of Present Value (PV)
- Role of capital markets in using PV
- Role of consumption, borrowing, and lending with PV
An Investment Decision

You can pay $3.5M today to construct a building in 1 year.
   - The interest rate “r” to borrow $3.5 M for 1 year is 10%.
   - The building will be worth $4.0 M next year.
   - Is it profitable to build this structure?

First attempt: $4.0M is bigger than $3.5M, so go ahead.
What’s wrong with this answer?
   - The dates for construction cost and completed value differ
   - Need to compare them on a consistent basis
     » Convert the $4.0 M building value at date 1 to a present value, or
     » Convert the $3.5 M construction cost at date 0 to a future value.
   - We get the same result either way.
Future value (FV) method: ($C_0$ is $ borrowed)
- FV of $C_0$ = loan repayment amount = 3.5 x 1.10 = $3.85
- The building value (4.0) > FV of $C_0$ (3.85), so do the project.

Present value (PV) method: ($C_1$ is investment return)
- PV of $C_1$ = amount we need to invest today to have $C_1$ next year.
  - PV = $C_1 / (1+r) = 4.0 / 1.1 = $3.64.$
  - The PV ($3.64) > construction cost ($3.50), so do the project.

- PV is generally computationally more convenient,
  
especially when project investment returns cover a sequence of future periods
Net Present Value (NPV)

- NPV = Project PV – Investment Cost
  - If Investment cost is $3.50 and PV = $3.64, then
    \[ \text{NPV} = 3.64 - 3.50 = 0.14 > 0 \]

- General formula: \( \text{NPV} = C_0 + C_1/(1+r) \).
  - \( C_0 \) is generally an investment cost, therefore negative.

- **NPV rule**: Carry out project if NPV > 0.

- Equivalently, the **Rate of Return rule**: Carry out project if return > \( r \)
  - In our example, return = \((4.0 - 3.5) / 3.5 = 14.3\% > 10\%\).

- This rule makes intuitive sense, but when and why does it work?
Indifference Curves

$ Tomorrow (C_1) - (Next year’s cash inflows)$

More of both is better

Utility 3
Utility 2
Utility 1

$ Today (C_0) - (Money in the bank)$
Project choice without capital markets

<table>
<thead>
<tr>
<th>Mr. A</th>
<th>Prefers P2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. B</td>
<td>Prefers P1</td>
</tr>
</tbody>
</table>

- Mr. A prefers Project 2
- Ms. B prefers Project 1

Graph showing project choice: Project 1 and Project 2 with budget lines for Mr. A and Ms. B.
Mr. A prefers project 2.
Ms. B prefers project 1.

Without knowing an investor’s consumption preferences, and absent a capital market, it is impossible to say one project is superior to another.
The capital market budget line

Slope of line is \(-(1 + r)\)

- Individual is lending in this range (less \(C_0\), more \(C_1\))
- Initial position for individual \((C_0, C_1)\)
- Individual is borrowing in this range (more \(C_0\), less \(C_1\))
Project choice with capital markets

Today

Mr. A
Ms. B

Still prefers P2
Also prefers P2

Project 2 has the higher PV

1A (A borrows)
2A (A lends)

PV of P1
PV of P2

Project 1
Project 2
Present Value and Capital Markets

- With a capital market all investors agree on the ranking of projects.
- The highest Present Value (PV) project is best.
- Thus, if an investment advisor only knows each project’s PV she can rank them for her clients.
Importance of Interest Rate

At lower interest rate, both prefer Project 1.
Consumption Shifting Example

\[ r = 10\% \]

Project 1

Project 2

(3,000, 20,000)

(8,000, 8,000)

Borrow 2,000

Save 2,000

PV 21,182

PV 15,272
Calculating Present Value

- PV is what we consume today if we consume nothing next period.
- For project 1, we need to borrow enough today that we pay back 20,000 next period.
  - Borrow 20,000 / 1.1 = 18,182.
- So PV (Project 1) = 3,000 + 20,000 / 1.1 = 21,182
  PV (Project 2) = 8,000 + 8,000 / 1.1 = 15,272

- In general, \[ PV = C_0 + C_1 / (1+r) \]