:: Valuation Tools - FCF
   :: Valuation by “replication”
   :: Discount Factors when the C is risky
   :: What is the “C” - Incremental Business Cash Flows
   :: Examples of DCF with Working Capital

:: Next up: Value-based Management - Business Models NPV

:: Administration
   :: Assignment 2 - Mini Case on Capital Budgeting - 11.11.2013
   :: Recitation Friday 11.8.2013 Cooper 10am
   :: Midterm - 11.15.2013
Where we are Going: DCF (today)

\[ V_0 = \sum_{t=0}^{\infty} \frac{E_0[\tilde{c}_t]}{(1 + E[r])^t} \]

\[ 0 \quad 1 \quad 2 \quad \ldots \quad t \]

\[ c_0 \quad \tilde{c}_1 \quad \tilde{c}_2 \quad \ldots \quad \tilde{c}_t \]

Random Variables

Business Model
Where we came from: DCF (last day)

\[ V_0 = \sum_{t=0}^{\infty} \frac{c_t}{(1+r)^t} \]
Where we are Coming From: Replication

:: Giant Eagle can spend $1,975.0 to redesign the parking lot at the Squirrel Hill store. The result will be to increase store profits by $1,907.7 next year if the economy is in recession and $2,366.0 next year if the economy is booming. Probability of booming is 50%.

:: Financial Markets

One-year US Treasury Bill costs $98.00 now and pays $100.00 in one year.

:: S&P 500 Index costs $1,745.70 now and in one year will be $1,636.07 next year in a recession and $2,136.07 if the economy is booming.
Where we are Coming From: Replication

NPV = $2,000 - $1,975 = 25$

80% Stocks
20% Bonds
Business Model

:: Describing the cash-flows
  :: When (modified)

:: Risk-factors (random variables)
  :: “scenarios”

:: Probabilities

:: [More on “what” cash flows soon]
Discounted Cash Flows

- Replication is “state-by-state” duplication of the cash-flows
  - Easy to see why/how we all agree

- But this is practically hard to implement
  - Discounted cash-flows is a duplication of a few key features (moments) of the cash-flows
  - Which features (moments)?

1. ETC
2. Cost of Capital / Measure of Risk
Discounted Cash Flows - Risk-Adjusted DCF

:: Summarize project cash-flows:

1. Expected cash-flows (per period)

2. Expected rate of return on a financial asset of similar risk
   :: “opportunity cost of capital”
   :: “required” rate of return
   :: “cost of capital”
   :: “risk-adjusted” discount rate
   :: “weighted average cost of capital”

3. Calculate (Present) Value by DCF
Discounted Cash Flows - Risk-Adjusted DCF

:: Giant Eagle can spend $1,975.0 to redesign the parking lot at the Squirrel Hill store. The result will be to increase store profits by $1,907.7 next year if the economy is in recession and $2,366.0 next year if the economy is booming. Probability of booming is 50%.

:: Financial Markets
  :: Financial Market investment with similar risk has an expected return of 6.841%.
  :: This is called the “opportunity cost of capital”

:: [More on estimating later - Meeting 8]
\[ \text{Cost (1975)} \]

\[ \text{Bush Bar} \]

\[ 1907.2 \times 2366.0 \]

\[ E[c] = 0.5(1907.7) + 0.5(2366.0) \]

\[ = 2136.8 \]

\[ V \]

\[ 2000 \times \frac{E[c]}{1 + r} = \frac{2136.8}{1.06841} \]
Discounted Cash Flows - Risk [1]

:: Focus on Expected Cash-flow

= Probability weighted sum of cash flow scenarios

≈ Most likely outcome

:: Toss a coin:
   :: Heads: $1,000,000
   :: Tails: $0

\[ \mathbb{E}[C] = 500,000 \]

\[ \mathbb{E}[C] = 500,000 \times 1,000,000 \]
Discounted Cash Flows - Risk [2]

- Expected rate of return on a financial asset of similar risk
- “required” rate of return
- “cost of capital”
- “risk-adjusted” discount rate

Financial Model: Use the CAPM

\[ E[r_i] = r_f + \beta_i (E[r_m] - r_f) \]
Where we are Going: DCF (today)

$$V_0 = \sum_{t=0}^{\infty} \frac{E_0[\tilde{c}_t]}{(1 + E[r])^t}$$
Business Model - What Cash Flows

:: What is the “C” in DCF?

:: Key:
  :: Cash flow
  :: “Business”
  :: Incremental

SHAREHOLDERS VALUE CASH

NOT THE "FUNDING" (interest +)
Business Model - Free Cash Flows - (of the business)

:: The income statement reports sales and costs for the year. The cash flow reports on the movement of cash. Both of these tell us what happened with business in the year.

:: Measures of “business” earnings

:: (1) NOPAT

= Amount of after-tax profit generated by the company’s business operations

:: (2) Free Cash-Flows

= Amount of after-tax cash-flow generated by the company’s business operations
Business Model - Free Cash Flows - (of the business)
Business Model - Free Cash Flows - (of the business)

Market Value of Operations

Future Free Cash Flow
- Profitability and Efficiency
  - Profit margins (ROS)
  - Capital (asset) efficiency
  - ROIC
  - Economic profits
- Growth Opportunities
  - New customers
  - New products and services
  - Innovation and R&D
- Sustainability
  - Barriers to entry
  - Specialized skills or processes
  - Patent protection
  - Brand loyalty

Discounted by

Opportunity Cost of Capital
- Capital Markets
  - Interest rates
  - Risk of the company’s business
  - Capital structure (debt and equity)
Business Model - Free Cash Flows - (of the business)

:: Free Cash Flows of the Business

Cash flows from the business operations

:: Include all business cash flows

:: All investments and re-investments (not just income statement items)

= Cash flows available to pay capital provides

:: Ignore interest income and expense, and divides, etc.

:: You can think of discount rate as capturing the opportunity cost of capital
# Business Model - Free Cash Flows - (of the business)

<table>
<thead>
<tr>
<th></th>
<th>(NYSE:AEO)</th>
<th></th>
<th>(NYSE:ANF)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FREE CASH FLOW</strong></td>
<td>2013</td>
<td>2012</td>
<td>2013</td>
<td>2012</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>3,476</td>
<td>3,120</td>
<td>4,511</td>
<td>4,158</td>
</tr>
<tr>
<td>Cost of Revenue</td>
<td>(2,085)</td>
<td>(1,975)</td>
<td>(1,694)</td>
<td>(1,639)</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>1,391</td>
<td>1,145</td>
<td>2,817</td>
<td>2,519</td>
</tr>
<tr>
<td>Corporate Expenses</td>
<td>(826)</td>
<td>(707)</td>
<td>(2,211)</td>
<td>(1,994)</td>
</tr>
<tr>
<td>Depreciation</td>
<td>(128)</td>
<td>(143)</td>
<td>(224)</td>
<td>(233)</td>
</tr>
<tr>
<td>Other</td>
<td>(43)</td>
<td>(25)</td>
<td>(7)</td>
<td>(102)</td>
</tr>
<tr>
<td>Operating Income (EBIT)</td>
<td>395</td>
<td>269</td>
<td>374</td>
<td>190</td>
</tr>
<tr>
<td>Estimated Tax</td>
<td>(135)</td>
<td>(98)</td>
<td>(133)</td>
<td>(61)</td>
</tr>
<tr>
<td>Net Operating Profit After Tax (NOPAT)</td>
<td>259</td>
<td>171</td>
<td>242</td>
<td>129</td>
</tr>
<tr>
<td>Discontinued Ops (after tax)</td>
<td>(32)</td>
<td>(24)</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>NOPAT</strong></td>
<td>227</td>
<td>147</td>
<td>242</td>
<td>130</td>
</tr>
</tbody>
</table>

|                           |          |          |                  |          |
| Depreciation/Amortization | 128      | 143      | 224             | 233      |
| Changes in Working Capital | 37       | (93)    | 200             | (95)     |
| Other Non-Cash Items      | 78       | 37       | 23              | 100      |
| Capital Expenditures      | (95)     | (100)    | (340)           | (319)    |
| Acquisitions (or sales) & other | -      | -      | -               | -        |
| **FREE CASH FLOW**        | 375      | 135      | 349             | 49       |
### Business Model - Free Cash Flows - (of the business)

<table>
<thead>
<tr>
<th></th>
<th>American Eagle Outfitters Inc. (NYSE:AEO)</th>
<th>Abercrombie &amp; Fitch Co. (NYSE:ANF)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FREE CASH FLOW</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt issues (repayment)</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Interest (after tax)</td>
<td>(7)</td>
<td>7</td>
</tr>
<tr>
<td>Cash Distributed to bondholders</td>
<td>(4)</td>
<td>12</td>
</tr>
<tr>
<td>Repurchases (issue) equity</td>
<td>88</td>
<td>318</td>
</tr>
<tr>
<td>Dividends</td>
<td>403</td>
<td>58</td>
</tr>
<tr>
<td>Cash Distributed to stockholders</td>
<td>491</td>
<td>375</td>
</tr>
<tr>
<td>Change in Cash balance</td>
<td>(210)</td>
<td>60</td>
</tr>
<tr>
<td>Investment in financial (non-op)</td>
<td>96</td>
<td>(93)</td>
</tr>
<tr>
<td>Misc</td>
<td></td>
<td>(3)</td>
</tr>
<tr>
<td>Tax on interest effect</td>
<td>3</td>
<td>(3)</td>
</tr>
<tr>
<td>Other [plug]</td>
<td>(1)</td>
<td>(3)</td>
</tr>
<tr>
<td>Free Cash Flows</td>
<td>375</td>
<td>349</td>
</tr>
<tr>
<td></td>
<td>135</td>
<td>49</td>
</tr>
</tbody>
</table>
Business Model - Free Cash Flows - Incremental

- Total Debt
- Enterprise Value (Market Value of the Company)
  - Market Value of Operations
  - Market Value of non-operating Assets (Cash)

- Future Free Cash Flow
  - Discounted by Opportunity Cost of Capital

- Profitability and Efficiency
  - Profit margins (ROS)
  - Capital (asset) efficiency
  - ROIC
  - Economic profits

- Growth Opportunities
  - New customers
  - New products and services
  - Innovation and R&D

- Sustainability
  - Barriers to entry
  - Specialized skills or processes
  - Patent protection
  - Brand loyalty

- Capital Markets
  - Interest rates
  - Risk of the company’s business
  - Capital structure (debt and equity)
Business Model - Free Cash Flows - Incremental

Market Value of Operations

Future Free Cash Flow

Profitability and Efficiency
- Profit margins (ROS)
- Capital (asset) efficiency
- ROIC
- Economic profits

Growth Opportunities
- New customers
- New products and services
- Innovation and R&D

Sustainability
- Barriers to entry
- Specialized skills or processes
- Patent protection
- Brand loyalty

Opportunity Cost of Capital

Capital Markets
- Interest rates
- Risk of the company's business
- Capital structure (debt and equity)
Business Model - Free Cash Flows - Incremental

Market Value of Operations

Future Free Cash Flow
- Growth Opportunities
  - New customers
  - New products and services
  - Innovation and R&D

Opportunity Cost of Capital
- Capital Markets
  - Interest rates
  - Risk of the company’s business
  - Capital structure (debt and equity)
Business Model - Free Cash Flows - Incremental

:: Compare:

1 $1100 in year 1 and $1210 in year 2 (and zero after that)

2 $1100 in year 1 and $1331 in year 2 (and zero after that)

Use a discount rate of 10%
### Business Model - Free Cash Flows - Incremental

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>...</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1100</td>
<td>1210</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
2000 = \frac{1100}{1.1} + \frac{1210}{(1.1)^2}
\]

<table>
<thead>
<tr>
<th></th>
<th>1100</th>
<th>1331</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

\[
1100 = \frac{1100}{1.1} + \frac{1331}{(1.1)^5}
\]

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>121</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

\[
100 = \frac{121}{(1.1)^2}
\]
Business Model - Free Cash Flows - Incremental

:: You can value each piece of the cash flow

:: [Discount rate is 10%]

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>(50.0)</td>
<td>(55.0)</td>
<td>-</td>
</tr>
<tr>
<td>Revenue</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating costs</td>
<td>(33.0)</td>
<td>(36.3)</td>
<td></td>
</tr>
<tr>
<td>Operating Cash Flow</td>
<td>44.0</td>
<td>84.7</td>
<td></td>
</tr>
<tr>
<td>Total Cash-Flow</td>
<td>(50.0)</td>
<td>(11.0)</td>
<td>84.7</td>
</tr>
</tbody>
</table>
Business Model - Free Cash Flows - Incremental

:: Focus on **incremental** cash-flows

== What changes based on your decision

:: Consider all cash-flows. (and only Once!)

:: Remember “working capital” changes

:: Forget sunk costs

:: Include opportunity costs

:: Remember to account for taxes
Business Model - Free Cash Flows - How to

[You will see lots of variations in layout. In general, the more it looks like an “income statement” or “cash-flow statement” the easier it is to communicate]
Business Model - Free Cash Flows - Working Capital

- Working Capital that is part of the business includes:
  - Inventory
  - Accounts receivable
  - Accounts Payable
  - Customer pre-payments
  - ... 

- Remember: exclude working capital that is “financing”
  - Cash and short term financial investment
  - short term borrowings
Boeing has a jet that sells for $10 million per jet (paid at delivery). Sales are about 1 per month. (Gross) Margins on each jet are 30%.

How much could you reduce the price of the jet if the customer agrees to pay 12 months early?
Business Model - Free Cash Flows - Working Capital

:: Boeing has a jet that sells for $10 million per jet (paid at delivery) Sales are about 1 per month. (Gross) Margins on each jet are 30%

:: How much could you reduce the price of the jet if the customer agrees to pay 12 months early?

Other info

:: The jet program is very long term
:: Tax Rate is 30%
:: Opportunity cost of capital is 8.9%
:: Current operating capital (invested capital) for this line of business is $250
| Month | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | ... |
|-------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|...

$-10 \text{ old price}$ $9 \text{ new price}$

$99999999$

(1) Lower sales per month

$0.3 \text{ Tax}$

$(0.7)$ per month (for ever)
### Business Model - Working Capital - Incremental FCF

<table>
<thead>
<tr>
<th>usual sign</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Sales</td>
<td></td>
<td></td>
<td>(12)</td>
<td></td>
</tr>
<tr>
<td>- COGS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Fixed Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Depreciation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>= EBIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Tax</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>= NOPAT</td>
<td></td>
<td></td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>+ Depreciation [add back]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Capital Expenditures</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ or - Working Capital (change)</td>
<td>+123</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>= Free Cash Flows</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Per Year**

\[
\frac{8.4}{10} = 0.84 \quad (94.38)
\]
Value Based Management - Evaluating Growth

:: Goal of corporation is to maximize value

:: Maximize value means using Net Present Value [NPV] as the decision criterion

:: The reason
   :: Everyone likes more wealth
   :: Everyone can use financial markets to adjust timing and risk characteristics to suit (portfolios)

Calculate Value with DCF

:: What: (1) Incremental (2) Business (3) Cash Flows

:: How: (1) Expected Cash Flows (2) discounted at risk adjusted discount rate (or opportunity cost of capital)
Still to do...

- Most of project analysis is “business”
  - so we need some practice

- Equity valuation
  - How do share prices reflect business value?

- Financial Markets
  - What determines the cost of capital?

- Financial Markets
  - financial prices are important, are they “sensible”?  

- Capital Structure
  - How do the the “non-business” (financial) decisions affect share prices and shareholder wealth?