Revision of Fundamental Concepts

Gestão Financeira II

Undergraduate Courses

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Instituto Superior de Economia e Gestão
UNIVERSIDADE TÉCNICA DE LISBOA

Introduction

1. Financial Statement Analysis (BD Chapter 2)
2. Arbitrage and the Law of One Price (BD Chapter 3)
3. The Time Value of Money (BD Chapter 4)
4. Interest Rates (BD Chapter 5)

Financial Statement Analysis

- Remember the Balance Sheet. Example:

GLOBAL CONGLOMERATE CORPORATION

Consolidated Balance Sheet
Year Ended December 31 (in $ millions)

Assets	2009	2008
Current Assets		
Cash	21.2	19.5
Accounts receivable	18.5	13.2
Inventories	15.3	14.3
Other current assets	2.0	1.0
Total current assets	57.0	48.0
Long-Term Assets		
Land	22.2	20.7
Buildings	36.5	30.5
Equipment	39.7	33.2
Less accumulated depreciation	(18.7)	(17.5)
Net property, plant, and equipment	79.7	66.9
Goodwill and intangible assets	20.0	20.0
Other long-term assets	21.0	14.0
Total long-term assets	120.7	100.9
Total Assets	**177.7**	**148.9**

GLOBAL CONGLOMERATE CORPORATION

Consolidated Balance Sheet
Year Ended December 31 (in $ millions)

Liabilities and Stockholders' Equity	2009	2008
Current Liabilities		
Accounts payable	29.2	24.5
Notes payable/short-term debt	3.5	3.2
Current maturities of long-term debt	13.3	12.3
Other current liabilities	2.0	4.0
Total current liabilities	48.0	44.0
Long-Term Liabilities		
Long-term debt	99.9	76.3
Capital lease obligations	—	—
Total debt	99.9	76.3
Deferred taxes	7.6	7.4
Other long-term liabilities	—	—
Total long-term liabilities	107.5	83.7
Total Liabilities	**155.5**	**127.7**
Stockholders' Equity	**22.2**	**21.2**
Total Liabilities and Stockholders' Equity	**177.7**	**148.9**

- Net Working Capital = Current Assets – Current Liabilities
- Book Value of Equity
  - Book Value of Assets – Book Value of Liabilities
- Market Value of Equity (Market Capitalization)
  - Market Price per Share x Number of Shares Outstanding

$$\text{Market-to-Book Ratio} = \frac{\text{Market Value of Equity}}{\text{Book Value of Equity}}$$

$$\text{Debt-Equity Ratio} = \frac{\text{Total Debt}}{\text{Total Equity}}$$

$$\text{Enterprise Value} = \text{Market Value of Equity} + \text{Debt} - \text{Cash}$$

- Remember the Income Statement. Example:

GLOBAL CONGLOMERATE CORPORATION

Income Statement
Year Ended December 31 (in $ millions)

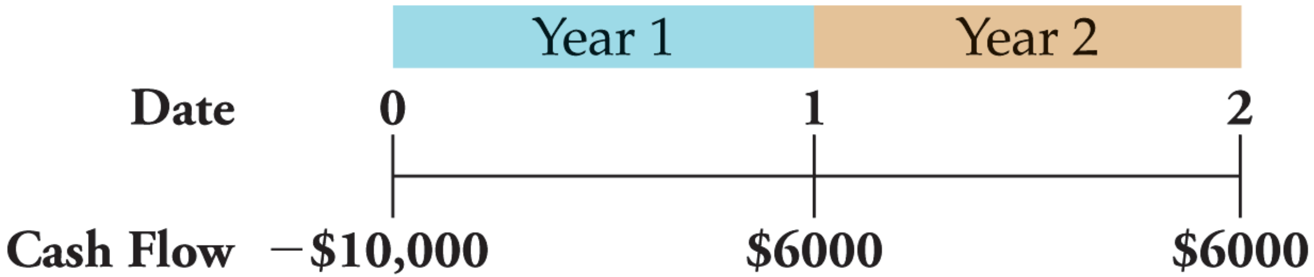
	2009	2008
Total sales	186.7	176.1
Cost of sales	(153.4)	(147.3)
Gross Profit	33.3	28.8
Selling, general, and administrative expenses	(13.5)	(13.0)
Research and development	(8.2)	(7.6)
Depreciation and amortization	(1.2)	(1.1)
Operating Income	10.4	7.1
Other income	—	—
Earnings before interest and taxes (EBIT)	10.4	7.1
Interest income (expense)	(7.7)	(4.6)
Pretax income	2.7	2.5
Taxes	(0.7)	(0.6)
Net Income	2.0	1.9
Earnings per share:	$0.556	$0.528
Diluted earnings per share:	$0.526	$0.500

Arbitrage

- Arbitrage
  - The practice of buying and selling equivalent goods in different markets to take advantage of a price difference.
  - An **arbitrage opportunity** occurs when it is possible to make a profit without taking any risk or making any investment.
- Normal Market
  - A competitive market in which there are no arbitrage opportunities.
- Law of One Price
  - If equivalent investment opportunities trade simultaneously in different competitive markets, then they must trade for the same price in both markets.

Time Value of Money

- The Timeline:
  - A timeline is a linear representation of the timing of potential cash flows.
  - Drawing a timeline of the cash flows will help you visualize the financial problem.
  - Example: Assume that you are lending $10,000 today and that the loan will be repaid in two annual $6,000 payments.



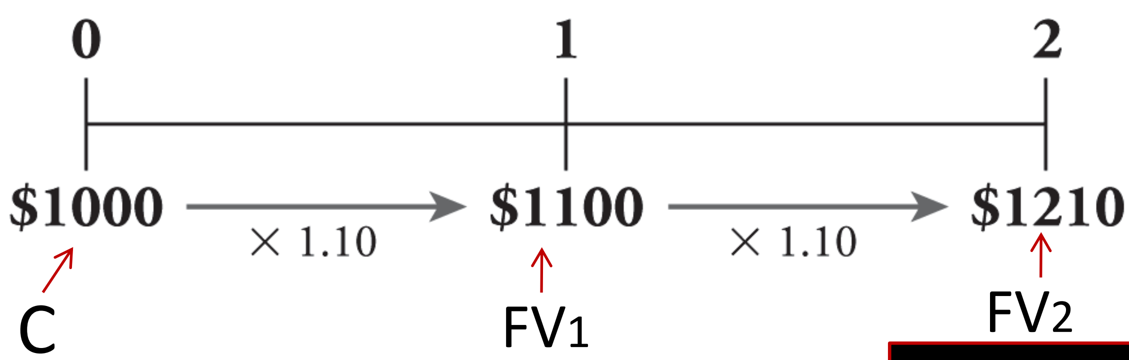
- Three Rules of Time Travel:

Rule 1	Only values at the same point in time can be compared or combined.	
Rule 2	To move a cash flow forward in time, you must compound it.	Future Value of a Cash Flow $FV_n = C \times (1+r)^n$
Rule 3	To move a cash flow backward in time, you must discount it.	Present Value of a Cash Flow $PV = C \div (1+r)^n = \frac{C}{(1+r)^n}$

- Future Value of a Cash Flow, after n periods, at interest rate r (Compounding):

$$FV_n = C \times \underbrace{(1+r) \times (1+r) \times \cdots \times (1+r)}_{n \text{ times}} = C \times (1+r)^n$$

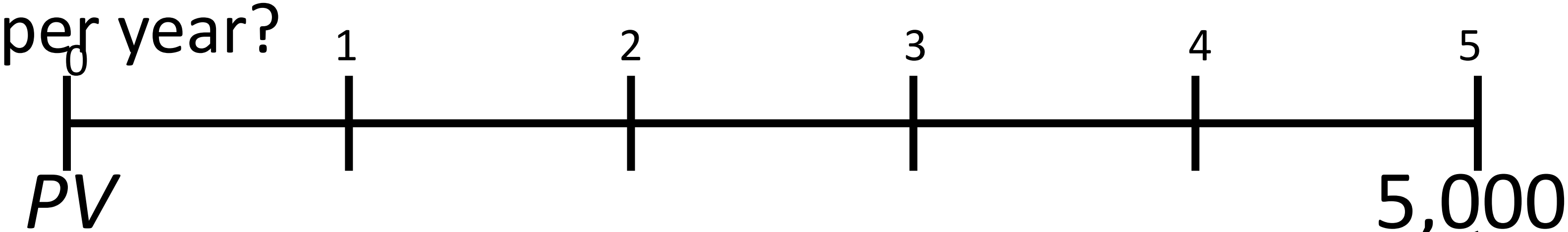
- Example: You believe you can earn 10% on the \$1,000 you have today, but want to know what the \$1,000 will be worth in two years. The time line looks like this:



- Present Value of a Cash Flow, n periods before, assuming interest rate r (Discounting):

$$PV = C \div (1+r)^n = \frac{C}{(1+r)^n}$$

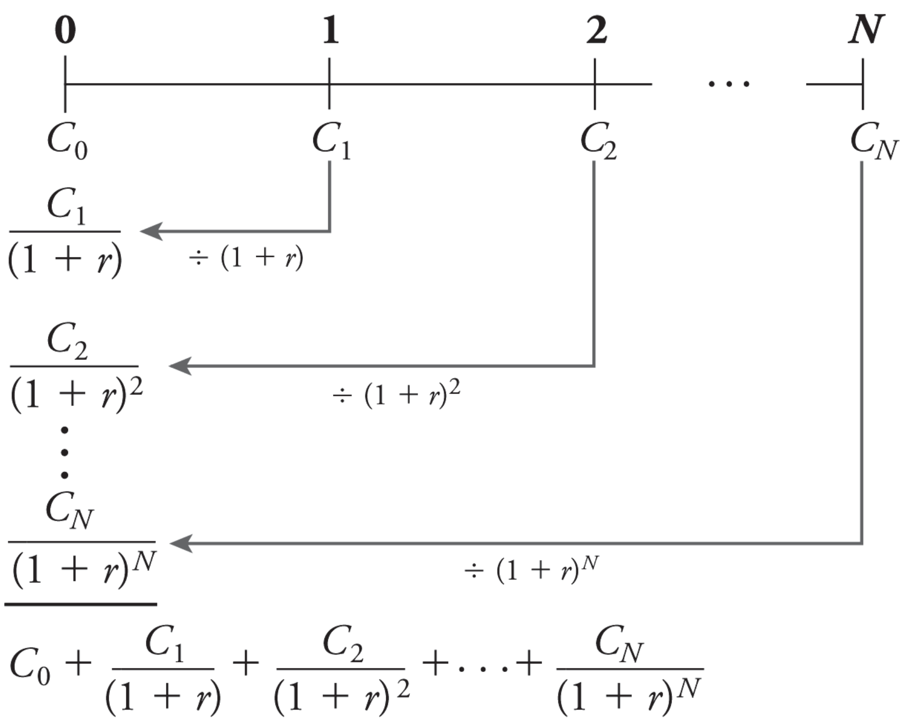
- Example: How much does an investor have to set aside today in order to have $5,000 in 5 years, at 10% per year?



$$PV = \frac{5{,}000}{(1.1)^5} = 3{,}104.61$$

- Present Value of a Stream of Cash Flows:

$$PV = \sum_{n=0}^{N} PV(C_n) = \sum_{n=0}^{N} \frac{C_n}{(1+r)^n}$$

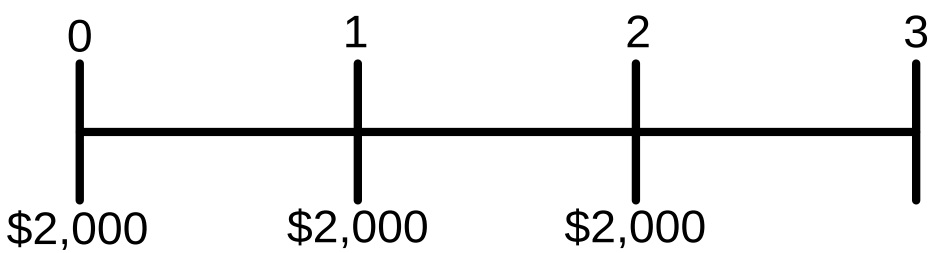


Example: Suppose you are promised the following stream of annual cash flows:
C1=€5,000
C2=€5,000
C3=€8,000
The interest rate is 10%. What is the Present Value of the cash flow stream?

$$PV_0 = \frac{5{,}000}{(1+0.1)^1} + \frac{5{,}000}{(1+0.1)^2} + \frac{8{,}000}{(1+0.1)^3} =$$
$$= €14{,}668.20$$

- PV=€14,668.20

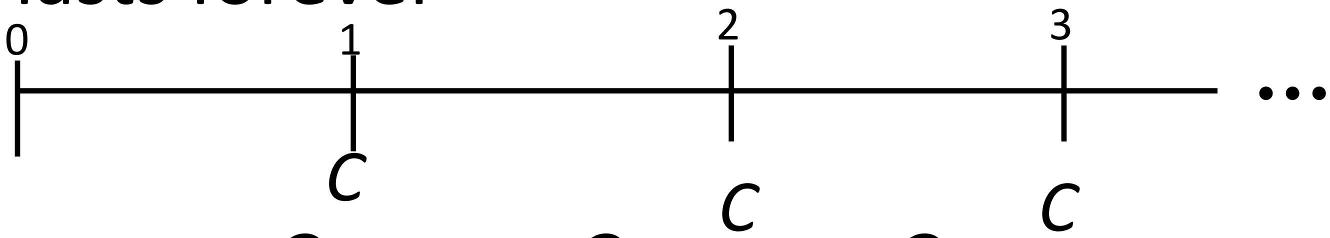
- Future Value of a Stream of Cash Flows with present value PV, after n periods, with interest rate r: $FV_n = PV \times (1 + r)^n$
- Example: What is the future value in three years of the following cash flows if the compounding rate is 10%?



$$PV_0 = \frac{2{,}000}{(1+0.1)^0} + \frac{2{,}000}{(1+0.1)^1} + \frac{2{,}000}{(1+0.1)^2} = $$
$$= €5{,}471.07$$

$$FV_3 = €5{,}471.07 \times (1+0.1)^3 =$$
$$= €7{,}282$$

- Perpetuity: A constant stream of cash flows that lasts forever



$$PV = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \ldots$$

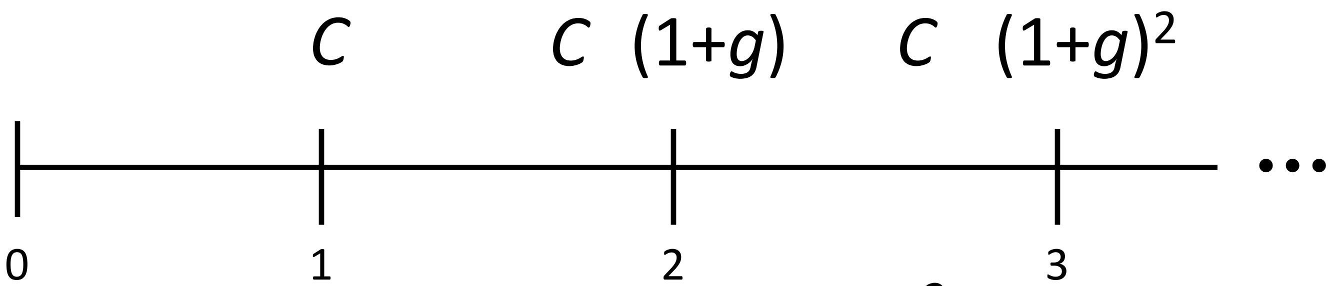
$$\boxed{PV = \frac{C}{r}}$$

Example: What is the present value of a perpetuity of $15 if the discount rate is 5%?

$$PV = \frac{15}{0.05} = 300$$

- The PV is $300.

- A Growing Perpetuity is a stream of cash flows that grows at the same rate g , and lasts forever.



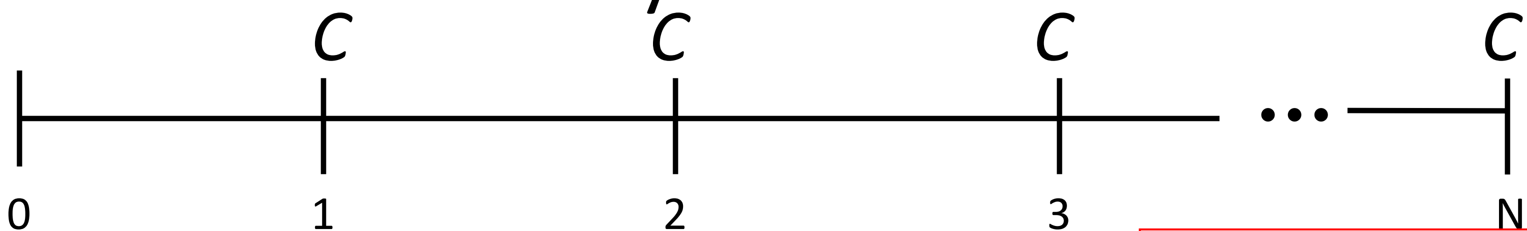
$$PV = \frac{C}{(1+r)} + \frac{C \times (1+g)}{(1+r)^2} + \frac{C \times (1+g)^2}{(1+r)^3} + \dots$$

$$\boxed{PV = \frac{C}{r-g}}$$

- Example: What is the present value of a perpetuity of \$25 that starts in one year's time, and grows forever at 5%? Consider the discount rate is 10%

$$PV = \frac{25}{0.1 - 0.05} = 500$$

- An Annuity is a constant stream of cash flows with a fixed maturity N.



$$PV = \frac{C}{(1+r)} + \frac{C}{(1+r)^2} + \frac{C}{(1+r)^3} + \ldots + \frac{C}{(1+r)^N} \qquad \boxed{PV = \frac{C}{r}\left[1 - \frac{1}{(1+r)^N}\right]}$$

- The Future Value of an Annuity is:

$$FV \text{ (annuity)} = PV \times (1+r)^N$$

$$= \frac{C}{r}\left(1 - \frac{1}{(1+r)^N}\right) \times (1+r)^N$$

$$= C \times \frac{1}{r} \quad (1+r)^N - 1$$

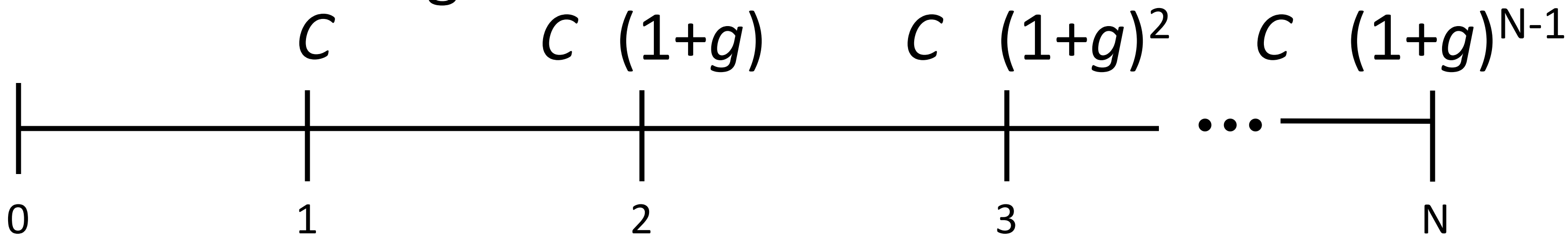
- Example: You are the lucky winner of the $30 million state lottery. You can take your prize as 30 payments of $1 million per year (starting today). What is the present value of this lottery prize, considering a discount rate of 8%?

$$PV_0 = \overbrace{\$1{,}000{,}000}^{\boxed{C_0}} + \$1{,}000{,}000 \times \overbrace{\frac{1}{0{,}08}\left[1 - \frac{1}{(1+0.08)^{29}}\right]}^{\boxed{\text{29-year annuity starting in year 1}}} =$$

$$= \$1{,}000{,}000 + \$1{,}000{,}000 * 11.15841 =$$

$$= \$1{,}000{,}000 + \$11{,}158{,}406 = \$12{,}158{,}406$$

- A Growing Annuity is a stream of N cash flows that grow at a constant rate g.



$$PV = \frac{C}{(1+r)} + \frac{C \times (1+g)}{(1+r)^2} + \frac{C \times (1+g)^2}{(1+r)^3} + \ldots + \frac{C \times (1+g)^{N-1}}{(1+r)^N}$$

$$PV = \frac{C}{r-g}\left[1 - \left(\frac{1+g}{1+r}\right)^N\right]$$

Interest Rates

- The Effective Annual Rate (EAR):
  - Indicates the total amount of interest that will be earned at the end of one year. Considers the effect of compounding
    - Also referred to as the effective annual yield (EAY) or annual percentage yield (APY)
    - It’s the kind of rate we used in the previous slides.

- It is necessary to adjust the EAR to Different Time Periods.
- General Equation for Discount Rate Period Conversion:

$$\boxed{\text{Equivalent n-period Discount Rate} = (1 + EAR)^{n} - 1}$$

- Example: Earning a 5% return annually is **not** the same as earning 2.5% every six months. The Equivalent Semi-annual discount rate would be:

$(1.05)^{0.5} - 1 = 1.0247 - 1 = .0247 = 2.47\%$

•Note: *n* = 0.5 since we are solving for the six month (or 1/2 year) rate

- The **Annual Percentage Rate (APR)**, indicates the amount of simple interest earned in one year.
  - **Simple interest** is the amount of interest earned *without* the effect of compounding.
  - The APR is typically less than the effective annual rate (EAR).

•*The APR itself cannot be used as a discount rate.*

•The APR with *k* compounding periods is a way of quoting the actual interest earned each compounding period:

$$\text{Interest Rate per Compounding Period} = \frac{\text{APR}}{k \text{ periods / year}}$$

- Converting an APR to an EAR

$$1 + EAR = \left(1 + \frac{APR}{k}\right)^{k}$$

  - The EAR increases with the frequency of compounding. Example:

Table 5.1 Effective Annual Rates for a 6% APR with Different Compounding Periods

Compounding Interval	Effective Annual Rate
Annual	$(1 + 0.06/1)^1 - 1 = 6\%$
Semiannual	$(1 + 0.06/2)^2 - 1 = 6.09\%$
Monthly	$(1 + 0.06/12)^{12} - 1 = 6.1678\%$
Daily	$(1 + 0.06/365)^{365} - 1 = 6.1831\%$

- Inflation and Real Versus Nominal Rates

  - **Nominal Interest Rate:** The rates quoted by financial institutions and used for discounting or compounding cash flows

  - **Real Interest Rate:** The rate of growth of your purchasing power, after adjusting for inflation

$$\text{Growth in Purchasing Power} = 1 + r_r = \frac{1 + r}{1 + i} = \frac{\text{Growth of Money}}{\text{Growth of Prices}}$$

  - The Real Interest Rate is:

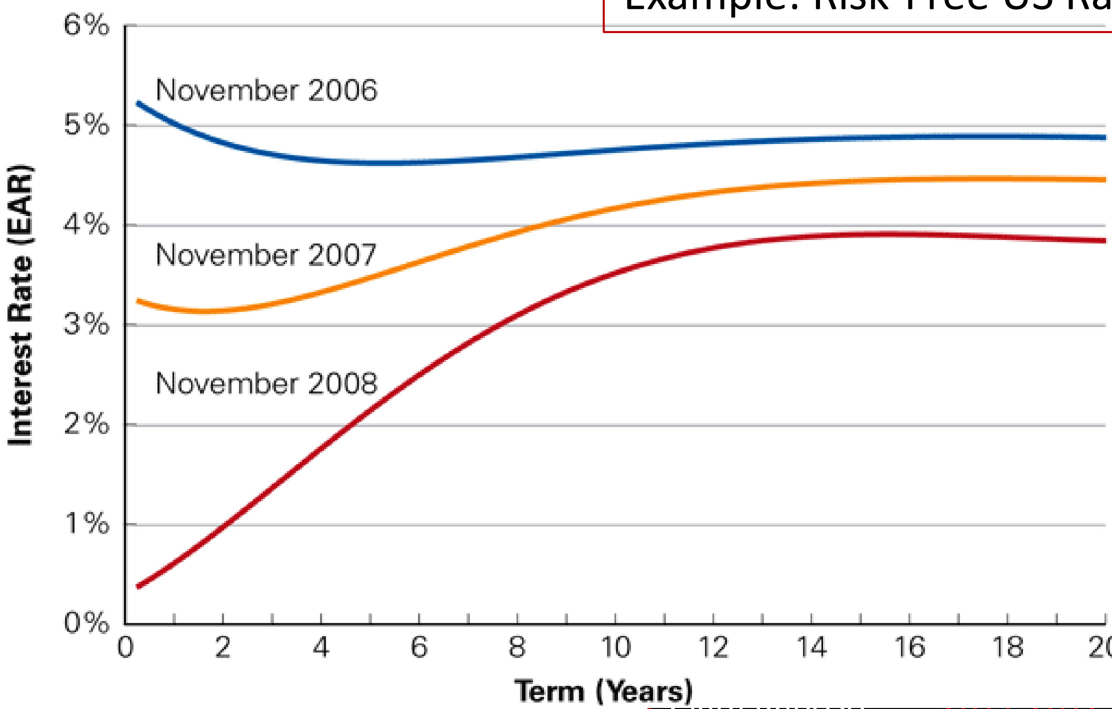
$$\boxed{r_r = \frac{r - i}{1 + i} \approx r - i}$$

- Term Structure and the Yield Curve:
  – **Term Structure:** The relationship between the investment term and the interest rate

  – **Yield Curve:** A graph of the term structure

Example: Risk-Free US Rates

Term (years)	Date Nov-06	Nov-07	Nov-08
0.5	5.15%	3.20%	0.44%
1	5.02%	3.15%	0.60%
2	4.83%	3.14%	0.96%
3	4.71%	3.20%	1.35%
4	4.64%	3.32%	1.75%
5	4.62%	3.47%	2.13%
6	4.62%	3.63%	2.49%
7	4.65%	3.78%	2.81%
8	4.68%	3.93%	3.09%
9	4.71%	4.06%	3.32%
10	4.75%	4.17%	3.51%
15	4.87%	4.44%	3.90%
20	4.88%	4.45%	3.84%



- The term structure can be used to compute the present and future values of a risk-free cash flow over different investment horizons.

$$PV = \frac{C_n}{(1 + r_n)^n}$$

- Present Value of a risk-free Cash Flow Stream Using a Term Structure of Discount Rates:

$$PV = \frac{C_1}{1 + r_1} + \frac{C_2}{(1 + r_2)^2} + \cdots + \frac{C_N}{(1 + r_N)^N} = \sum_{n=1}^{N} \frac{C_N}{(1 + r_n)^n}$$

- Example: Compute the present value of a risk-free three-year annuity of \$500 per year, given the following yield curve:

November-09

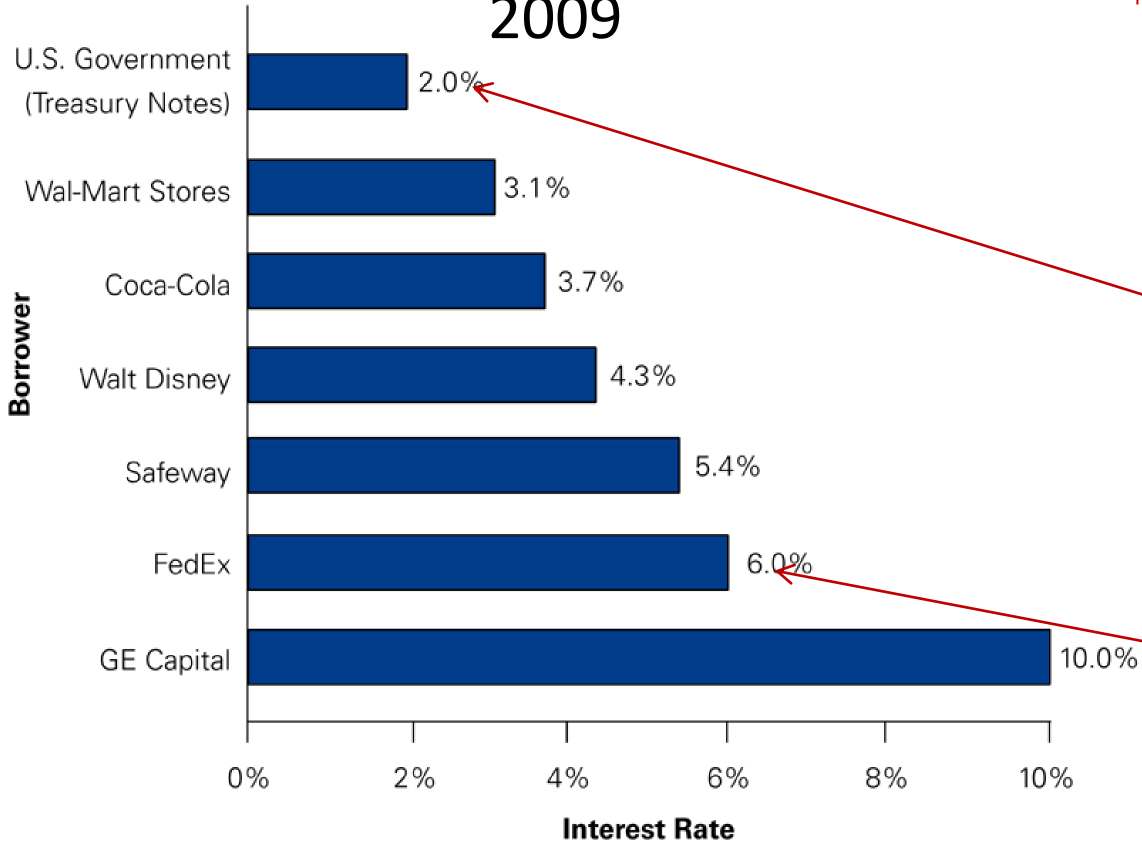
Term (Years)	Rate
1	0.261%
2	0.723%
3	1.244%

$$PV = \frac{\$500}{1.00261} + \frac{\$500}{1.00723^2} + \frac{\$500}{1.01244^3}$$

$$PV = \$498.70 + \$492.85 + 481.79 = \$1,473.34$$

- Interest Rate Expectations
  - The shape of the yield curve is influenced by interest rate expectations.
    - An inverted yield curve indicates that interest rates are expected to decline in the future.
      - Because interest rates tend to fall in response to an economic slowdown, an inverted yield curve is often interpreted as a negative forecast for economic growth.
- Risk and Interest Rates
  - U.S. Treasury securities are considered "risk-free." All other borrowers have some risk of default, so investors require a higher rate of return.

Figure 5.4 Interest Rates on Five-Year Loans for Various Borrowers, March 2009



- Example: Suppose the U.S. government owes your firm \$1,000 to be paid in five years. What's the PV of this cash flow?

$$PV = \frac{\$1{,}000}{1.02^5} = \$905.73$$

- What if it were FedEx owing your firm \$1,000?

$$PV = \frac{\$1{,}000}{1.06^5} = \$747.26$$