ECON 2560 Winter 2015 Notes

Theory of Finance

- **Tuesday, January 6, 2015: Week 1**

Chapter 1: Goals and Governance of the Firm

Investment and Financing Decisions

- The Financial manager has to determine:
  - -What capital investment projects to invest in
    - -This is called the capital budgeting decision or the investment decision.
  - -How to pay for those assets
    - -This is called the financing decision

The Investment Decision

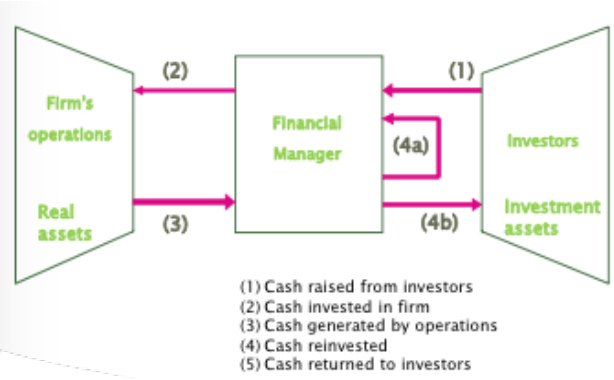
- The financial manager needs to place a value on the future benefits from the investment projects. In order to achieve this, he/she needs to account for the:
  1. Amounts of benefits
  2. Timing of the benefits, and
  3. The risks associated with the future benefits produced by the asset

-For 1) what human capital, property or plant. 2) Interested in the cost and achievement. 3) Want to know when they occur, how they occur and the size.

The Financing Decision

- In order to raise money for the investments and operations of the firm, the financial manager can resort to:
  - -Internally generated funds, or
  - -External financing sources.
- Two broad categories of external financing
  - -Debt financing
  - -Equity financing
- The choice between these two external sources is the subject matter of Capital Structure Decision.

-Borrow from the public at large
-Issue equity, sell new shares of stock, and generate new owners



Financial Manager is the firm.

- Real Assets
  - -Assets used to produce goods and services
- Financial Assets
  - -Financial claims to the income generated by the firm's real assets

What is a Corporation?

- A legal entity that allows the owners to have limited liability.

What is a Corporation?

- A legal entity that allows the owners to have limited liability.
- Shareholders are owners, but the corporations are run by the employees led by the CEO
- Although the separation of ownership and control adds flexibility to the operation, gives permanence to the corporation, it also creates agency problems.
- Corporations are the dominant form of business in the modern day. Corporations do more than 88% of business transactions.

-Business that is legally distinct from its owners.
-Owners are stockholders
-Stockholders not liable

- A corporation can sue or be sued
- Shareholders can sell shares
- Have Boards of Directors
- Can be costly, in time and money
- Must abide by the rules of stock exchanges and accounting standards and securities laws.
- Taxed twice – on company profits and also in the hands of shareholders
- Must share information with public

-Corporation is entity
-Shareholders hire a board of directors, board of directors over see the shares

Other Forms of Business Organization

- Sole Proprietorship
- Partnership (General and Limited)
- Hybrid forms (LLP, LLC, PC, etc.)
- Sole proprietorship is primary form of business that is easy to form and dissolve
- Partnerships are dominant forms for specialized business like medical clinics and law firms
- Hybrid forms have characteristics of corporations, and partnerships

Attributes	Sole Proprietorship	Partnership	Corporation
Who owns the business	The manager	Partners	Shareholders
Are Managers & owners separate?	No	No	Usually, yes
What is the owners' liability	Unlimited	General - unlimited Limited - limited	Limited
Owners and business taxed separately?	No	No	Yes

Who is the Financial Manager?

- Anyone responsible for a significant corporate investment or financing decision
- Under the Chief Financial Officer, there are usually broad categories of job descriptions:
  - -The Treasurer looks after the cash, raising new capital and maintaining relationship with stakeholders.
  - -The Controller prepares financial statements; manage internal accounting and looks after tax affairs

-Financial Manager is the important decision maker
-Controller is the accountant

Goals of the Corporation

- Shareholders want managers to maximize market value of the corporation

Goals of the Corporation

- Shareholders want managers to maximize market value of the corporation
- Increasing market value increases shareholder wealth
- Maximizing profit does not necessarily increase overall market value
- The objective should be to maximize the current share price
- Using unethical means to increase share price will only lead to failure

Do Managers Really Maximize Firm Value?

- The behaviour of the managers may not always be conductive to the health of the corporation.
- Managers have to consider all stakeholders
- Managers are hired as the agents of the owners
- When the personal goals of these agents create conflict in their roles in the corporation, they create Agency Problems.
  - -Managers may overindulge in unnecessary expenses
  - -They mat shy away from attractive projects
  - They may engage in empire building

-The principles are the shareholders
-The agents are the managers

The Agency Problem

- Agency problems can be reduced in several ways:
  - -Compensation plans (Employee stock options)
  - -Board of Directors
  - -Threat of takeovers
  - -Specialist monitoring
  - -Legal and Regulatory Requirements

-How do we compensate our managers; give them bonuses on how the stock is performing, stock options
-Stock options: allow them to buy stocks at a specific price, they can then proceed to sell them; the value of the stock options is valued at the price is trading at and the price bought at.
-Not maximizing at share price: when the shares are being sold at a lower price than they're worth
-Specialist monitoring: checking out the firm, going to the bank for short-term capital. Pay higher interests rates if not at acceptable form
-Legal and regulatory requirements: Firms have to reporting requirements, fill in revised financial statements, abide by certain standards; company gets audited at year-end

- **Thursday, January 8, 2015: Week 1**

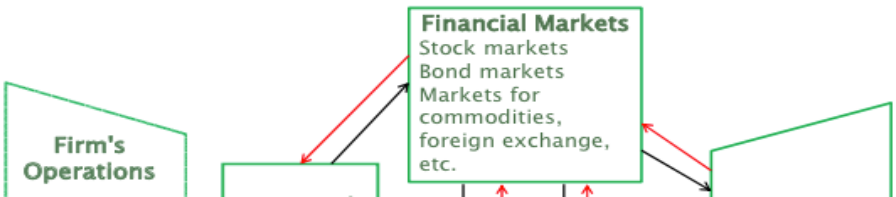
Chapter 2: Financial Markets and Institutions

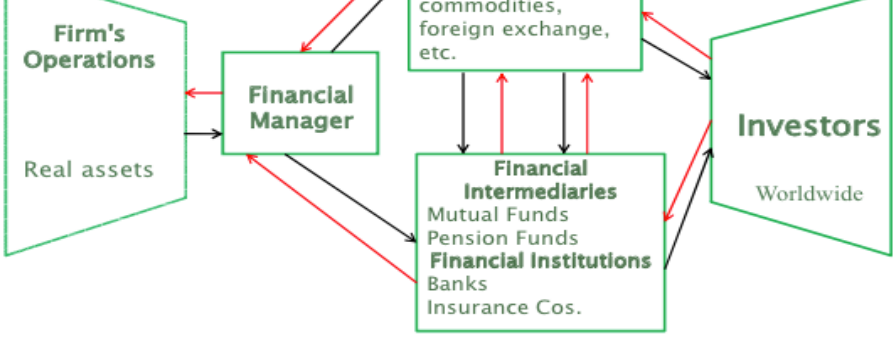
Importance of Financial Markets and Institutions

- Financial markets and institutions critical to the success of business
- Businesses can't grow without financing
- Modern financial system offers many types and channels of financing

-Firm wants to raise capital, therefore going to the financial market.

Flow of Savings to Corporations





The Financial Markets

- Definitions: A physical or network oriented market where financial securities are issued and traded.
- Primary Market: A new issue of stocks or bonds is known as primary issue. The market where these are traded is the primary market.
- Secondary Market: The sales and purchase of securities of existing issues among market participants is called the secondary transaction. The markets where this happens are called the secondary market.

-Financial market: physical or oriental market where financial securities are traded.
-Primary market: interaction between company and public.
-Secondary market: trading between individuals, firm is not involved.

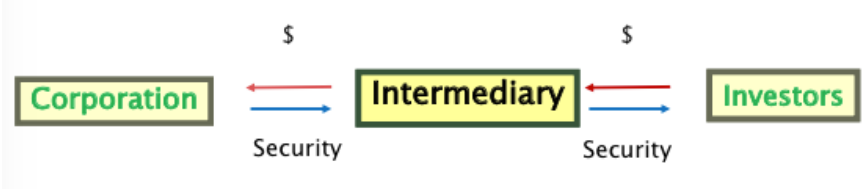
Other Financial Markets

- Fixed Income Market: A market where securities promising fixed amount of income, such as bonds, are traded among investors.
- Capital Market: A market where long term debt and equity securities are traded among investors.
- Money Market: A market where short-term securities are traded among investors.
- Derivative Market: A market where derivatives securities such as futures and options, are traded among investors.

-Capital Market: long term debt, company issues bonds, and says exactly what payments are associated with the bond.

Financial Intermediaries

- Financial Intermediary: The organizations that raise money fro investors and provide financing for corporations and other businesses.



-Going between the investors and the firm.
-Financial intermediary will invest in a portfolio of securities.

Financial Intermediaries

- Mutual Funds
- Exchange-traded funds (ETFs)
- Hedge Funds
- Private Equity Funds
- Pension Funds

-Mutual funds: lots of small investors, buy shares in a mutual fund, and on your behalf investing for you making you have a wide variety portfolio; get professional management
-Exchange traded-fund: pools funds from lots of investors and buys shares
-Hedge funds: aggressively managed funds; higher return, limited amount of investors but large sums
-Private equity funds: not quoted on exchanges, private

but large sums
-Private equity funds: not quoted on exchanges, private
-Pension funds: company will keep portion of income, invest in pension for retirement

Financial Institutions

- A financial institution does mare than just pool and invest savings. It raises financing by accepting deposits or selling policies.
- Insurance companies include health, life, property and casualty insurance companies. They make massive investments in corporate stocks and bonds.

-Financial institutions: gathering large amounts of money from people and investing the money for.
-If something happens to your house they will take care of it for you.

Functions of Financial Markets and Intermediaries

- Transporting cash across time
- Risk transfer and diversification
- Offering liquidity
- Creating a payment mechanism
- Providing information on commodity prices, interest rates and company stock values

-Transporting cash across time: borrow against your future income, example school tuition.
-Risk transfer: well-diversified portfolio, reducing risk buying insurance, transferring risk of your home to them
-Offering liquidity: you can get your cash, sell you shares and get cash, go to the bank and get money
-Creating a payment mechanism: bank cards and credit cards
-Providing information: investors look at the value and the return on the shares

Value Maximization and Cost of Capital

- Well functioning financial markets allow individuals and corporations to share risks and transport savings across time.
- The opportunity cost of capital is the minimum acceptable rate of return for capital investments.
- Capital investments by the firm should offer rates of return at least as high as those available in financial markets at the same level of risk.

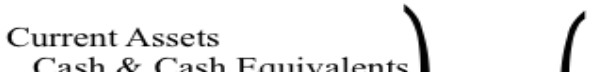
-The value of returns happening
-The opportunity cost of value is the minimum return on an investment; types of return (the rate)
-Depends on the risk; riskier investment you want a higher return
-Opportunity cost is what he firm wants to get on a return when investing

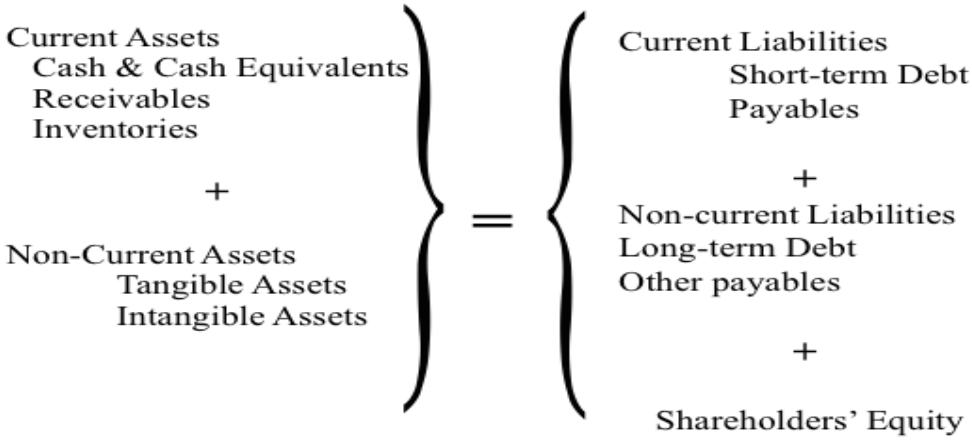
Chapter 3: Accounting and Finance

The Statement of Financial Position or Balance Sheet

- The financial statement that shows the value of the firm's assets and liabilities at a particular time.
- It shows the firm's:
  - -Current Assets: most liquid forms of assets
  - -Non-Current Assets: assets of an investment nature
  - -Current Liabilities: short term and current portion of long term debts
  - -Non-Current Liabilities: long term borrowings
  - -Shareholders' Equity: difference between total assets and total liabilities

The Statement of Financial Position (SFP)





Example: Statement of Financial Position

Assets
- Current assets
- Net fixed assets

Total Assets

Liability and Equity
- Current liabilities
- Debt
- Shareholder's equity
  - Capital stock
  - Retained earnings

Total Liabilities and Equity

- Current Assets: These are the most liquid assets. These could be:
  - -Cash and cash equivalents
  - -Accounts receivable
  - -Inventories
  - -Other current assets
- Non-Current Assets: Long-term assets, which are unlikely to be turned into, cash soon. These could be:
  - -Net fixed assets
  - -Intangible assets
  - -Other assets
- Net Fixed Assets: Long lived assets such as buildings, plant, equipment, etc.
  - -Also called fixed assets
  - -Shown of the balance sheet at their original cost net of accumulated depreciation
- Intangible Assets: Long lived assets such as brand names, patents, copyrights, manpower, etc. These assets have no physical reality, and are thus called intangible assets.
- Shareholders' Equity
  - -What is left over after all of firm's obligations (liabilities) have been paid off belongs to the shareholders, and is called shareholders' equity.
  - -This is can: capital and retained earnings
  - -Capital represents amounts raised from the sale of the company's shares to investors
  - -Retained earnings represents earnings, which the management has retained and reinvested in the firm

Book Value vs. Market Value
- Book value is determined by IFRS
- Shown at their historical cost adjusted for depreciation
- Market value is the price at which the firm can resell an asset
- Market value cannot equal book value

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- Market value cannot equal book value
- Example: According to IFRS, Jupiter Auto has equity worth $6 billion, debt worth $4 billion, assets worth $10 billion. The market values Jupiter's 100 million shares at $75 per share and the debt at $4 billion. What is the market value of Jupiter's assets?

Assets = Liabilities + Equity

Assets = $4 bn + $7.5 bn = $11.5 bn

Example: Linamar (LNR.TO)
Book Value of Equity Dec 31, 2013
$1,352,338,000
Price per share Dec. 31,2013: $44,19
Common shares outstanding 64,762,148 (footnote 18)
Market value of equity:
64,762,148 shares x $44.19/share = $2,861,839,320

Example: Net worth (Book value of equity)
= shareholders' equity + preferred stock
= book value of assets - book value of liabilities
= historical contributions of owners + original cash paid for shares + reinvested earnings

-*Book Values*: -*Historical values*
-*asset values adjusted for depreciation*
-*Market value*: - *resale value*
-*ability to generate cash flows*

<u>The Income Statement and Statement of Comprehensive Income</u>

- The financial statement that shows the revenues, expenses, and net income of a firm over a period of a time
- It shows the firm's:
  - -Sales of their products
  - -Operating expenses
  - -Financing expenses
  - -Taxes paid
  - -Net earnings

<u>Consolidated Statement of Earnings</u>

- Sales
  - -Cost of goods sold
  - -Fixed costs

EBITDA

- Depreciation: EBIT(earnings before interest and taxes)
- Interest: taxable income
- Tax: net income (breaks into dividends and retained earnings)

<u>Profit vs. Cash Flows</u>

- "Profits" subtract depreciation (a non-cash expense)
- "Profits" ignore cash expenditures on new capital (the expense is capitalized)
- "Profits" record income and expenses at the time of sales, not when the cash exchanges actually occur
- "Profits" do not consider changes in working capital

<u>The Statement of Cash Flows</u>

- This is the financial statement that shows the firm's cash receipts and cash payments over a period of time
  - -Three broad categories of cash flows are covered:
    - -Operating activities
    - -Investing activities

-Three broad categories of cash flows are covered:
-Operating activities
-Investing activities
-Financing activities

- Note that the Statement of Comprehensive Income shows the firm's accounting profits not its cash flows

Statement of Cash flows
-Profit subtract depreciation (non-cash expense)
-Profit do not consider changes in net working capital (NWC = current assets - current liabilities)
-Profit record income and expenses at time of sale, not when cash exchanges occur
-Profits ignore expenditures on new capital (expense is capitalized)

- **Tuesday, January 13, 2015: Week 2**

Chapter 3: Accounting and Finance

Cash Flow from assets, Financing Flow and Free Flow Cash

- A firm's cash flow from assets is the cash it generates through its operating activities, net of its investments in working capital and fixed assets
- ***CF from assets*** *– CF from operating activities + CF investing activities*
- Another term for cash flow from assets is Free Cash Flow. This is because the cash flow from assets is the cash available to pay out to the bond and shareholders
- Financing flow is the change in the company's cash plus the cash paid to investors
- ***Financing Flow*** *= Change in cash and cash equivalents – CF (or outflow) from financing activities*

Accounting Practice and Accounting Malpractice

- Although the depth of coverage of the IFRS is quite vast, accountants still have significant leeway to colour up the financial statements
  -Allowance for bad debts
  -Revenue recognition
- During the years 2000 to 2004, there were quite a few detections of such unholy practices by firms that led to big scandals and corporate failures

Taxes

- Corporate Taxes = Federal tax + Provincial tax
  -The federal tax rate is 16.5%
  -11% for small business of the first $400,000 taxable income
  -Provincial taxes vary across the country
- Interestpaid by a corporation is a tax deductible
  -Note that dividends are not
  -Thus, interest payments increase the amount of money to creditors and shareholders

-Corporate Taxes:
Corporate tax = federal + provincial
Large Corporation 15% + 11.5% (Ontario)
Small Business 11% +4.5%
-Personal Taxes
-Interest Income - taxed as ordinary income at marginal tax rate
$100 of interest income
29% marginal tax bracket
Tax - 0.29 x 100 = $29
Net Interest Income = 100 - 29 = $71

Personal Taxes

- Marginal Tax Rate: Tax paid on each extra dollar of income
- Average Tax Rate: total tax bill divided by total income

Personal Taxes

- Marginal Tax Rate: Tax paid on each extra dollar of income
- Average Tax Rate: total tax bill divided by total income
- For individual taxpayers, deferral and provincial taxes are calculated separately
- Taxes for individuals areprogressive
- Dividends are effectively taxed at a lower rate than interest income
- 50% of capital gains (less capital losses) are taxed

Dividend Income
-Dividend gets grossed up by 38%
-Grossed-up dividend taxed at marginal rate
-Tax credit of 15.0198% of grossed-up dividend
$100 dividend income
Taxable amount = 100 x 1.38 = $138
Tax = 0.29 x 138 = $40.02
Tax credit = 0.150198 x 138 = $20.73
Net Income = 100 - 40.02 + 20.73 = $80.71
Capital Gains= difference between what you sell stock for and what you pid for it.
-50% of capital gains income taxed at marginal rate
$100 of capital gains income
Taxable amount of gain = 0.5 x 100 = $50
Tax = 0.29 x 50 = $14.50
Net Income = 100 - 14.50 = $85.50

Chapter 5: The Time Value of Money

Future Value

- Simple Interest: interest earned only on the original investment
- Example: You invest $1000 in an account paying simple interest at a rate of 5% per year. How much will the account be worth in 10 years?

Answer:
Interest earned each year: 0.05 x 1000 = $50
Total interest earned in 10 years: 50 x 10 = $500
Balance at end of 10 years: 1000 + 500 = $1500

$$FV = PV + PV \times r \, t \text{ OR } FV = PV (1 + r \times t)$$

FV = future value
PV = amount invested or present value
r = interest rate per period
t = number of periods

- Compound Interest: Interest is earned on the value of money that is in the account at the beginning of the period. Thus, previous period's earned interest can also earn interest on the next period.

$$r = m [(FV / PV) ^ (1 / mt) – 1]$$
$$FV = PV (1 + r / m) ^ mt$$

Where m is the compounding number

- Monthly Compounding: 6% interest with monthly compounding means 6% / 12 months
- Example:You invest $1000 in an account earning compound interest at a rate of 5% per year. How much will the account be worth in 10 years?

Answer:
Interest earned in year 1: 0.05 x 1000 = $50
Balance at end of year 1: 1000 + 50 = $1050
= 1000 x 1.05
Interest earned in year 2: 0.05 x 1050 = $52.50
Balance at end of year 2: 1050 + 52.50 = $1102.50
= 1000 x (1.05)^2
…
Balance at end of year 10: 1000 x (1.05)^10
= $1628.89

…
Balance at end of year 10: 1000 x (1.05)^10
= $1628.89

FV = PV x (1 + r)^t

- Example: You invest $2000 in an account paying compound interest at a rate of 8% per year. How much will the account be worth in 5 years?

Answer:
FV = PV x (1 + r)^t
= 2000 x (1 + 0.08)^5
=$2,938.66

Present Value

- Example: How much do you need to invest into an account paying compound interest at the rate of 6% per year. In order to receive $3187.70 at the end of eight years?

Answer:
FV = 3187.70
t = 8 years
r = 6%
PV = 3187.70 / (1.06)^8
= $2,000

PV = FV / (1 + r)^t

- Example: You have been offered $1 million five years from now. If the interest rate is expected to be 4% per year, how much is this prize worth to you in today's dollars?

Answer:
FV = 1,000,000
r = 4%
t = 5
PV = 1,000,000 / (1.04)^5 = $821, 927
or PV = 1,000,000 x 0.822 = $822,000

- Example:Suppose you will receive payments of $6,000, $7,000, and $10,000 in 1, 5, and 9 year(s) from now, respectively. What is the total present value of this stream of payments if the interest rate is 8%?

Answer:
Ct1 = 6,000
Ct2 = 7,000
Ct3 = 10,000
T1 = 1
T2 = 5
T3 = 9
r = 0.08
PV = (Ct1 / (1 + r) ^ t1) +(Ct2 / (1 + r) ^ t2) + (Ct3 / (1 + r) ^ t3)
PV = (6,000 / (1.08) ^ 1) + (7,000 / (1.08) ^ 5) + (10,000 / (1.08) ^ 9)
PV = 15,322.13

- Example:Suppose you will receive payments of $3,000, $5,000, and $3,000 in 2, 4, and 8 year(s) from now, respectively. What is the total future value of all payments 10 years from now if the interest rate is 2%?

Answer:
Ct1 = 3,000
Ct2 = 5,000
Ct3 = 3,000
T1 = 2
T2 = 4
T3 = 8
r = 0.02
FV = (Ct1 / (1 + r) ^ (10 - t1)) + (Ct2 / (1 + r) ^ (10 - t2)) + (Ct3 / (1 + r) ^ (10 - t3))
FV = (3,000 / (1.02) ^ (10 - 2)) + (5,000 / (1.02) ^ (10 - 4)) + (3,000 / (1.02) ^ (10 - 8))

r = 0.02
FV = (Ct1 / (1 + r) ^ (10 - t1)) + (Ct2 / (1 + r) ^ (10 - t2)) + (Ct3 / (1 + r) ^ (10 - t3))
FV = (3,000 / (1.02) ^ (10 - 2) + (5,000 / (1.02) ^ (10 - 4) + (3,000 / (1.02) ^ (10 - 8)
FV = 12,266.99

FV = (Ct1 / (1 + r) ^ t1) + (Ct2 / (1 + r) ^ t2) + (Ct3 / (1 + r) ^ t3) + …

PV = (Ct1 / (1 + r) ^ (10 - t1)) + (Ct2 / (1 + r) ^ (10 - t2)) + (Ct3 / (1 + r) ^ (10 - t3))…

Finding the Interest Rate

- Discount bond: you buy the bond at a particular rate and the government will pay you in the future
- Example: Rearrange the expression PV = 680.58; 5 year period; FV = 1000 what is the discount rate?

Answer:
PV (1 + r)^t = FV
680.58 (1 + r)^5 = 1000
(1 + r) ^5 = 1000 / 680.58 = 1.4693
FV factor for 5 years at r using tables r = 8%
1 + r = (1.4693)^1/5 = 1.08
r = 0.08 or 8%

Finding the Investment Period

- Example: How long will it take for money to double at an interest rate of 6%?

Answer:
PV(1+ r)^t = FV
(1 + 0.06)^t = 2
FV factor at 6% is 2. Using tables, t = 12 years
ln(1.06)^t = ln 2
tln (1.06) = ln2
t = ln2 / ln (1.06)
t = 11.9 years

- Rule of 72: It takes approximately 72/r years for money to double 72/6 = 12 years

- **Thursday, January 15, 2015: Week 2**

Chapter 5:The Time Value of Money

Level Cash Flows: Perpetuities & Annuities

- Annuities:cash flows of equal amount every period for alimitednumber of periods(Loan payments for automobile, periodic earnings from lottery wins, etc.)
- Perpetuities: cash flows of equal amount every period for anunlimitednumber of periods(Property tax payments, preferred stocks, etc.)
- The PV of a perpetuity is calculated by dividing the level cash flow by the interest rate

PV of a Perpetuity = C / r

-This formula gives you the present value of a perpetuity *starting one period from now*

Annuities

- **Present Value –** the PV of a t period annuity with cash flow of C & discount rate r is:

PV of t-period Annuity = C x (1/r – 1/(r(1+r)^t))
PV = C [(1 / (r/m)) – (1 / (r/m)(1 + r/m)^mt)]
m = compounding period

-This formula gives you the PV of an annuity *starting one period from now* – regular annuity

- Annuity Factor (PVA): the term in the parentheses
- Example: Suppose you will receive payments of $10,000 at the end of each of the next 20 years. What is the present value of this stream of payments? The interest rate is 2%

- Example: Suppose you will receive payments of $10,000 at the end of each of the next 20 years. What is the present value of this stream of payments? The interest rate is 2%.

Answer:
C = 10,000
r = 0.02
t = 20
PV = C (1/r – 1 / (r (1 + r)^t))
PV = 10,000 (1/0.02 – 1 / (0.02 (1 +0.02)^20))
PV = 163,514.33

- Example: In order to create an endowment, which pays $150,000 per year, forever, how much money must be set aside today if the rate of interest is 5%?

Answer:
PV = 150,000 / 0.05 = $3,000,000 still in the account
-What if the first payment was at time 0?
PV = C + C/r = 150 000 + 150 000/0.05 = $3,150,000
-What is the PV of the perpetuity if the first payment is not until time 4?
It's a compound problem – apply more than one formula
PV3 = 150 000/0.05 = $3,000,000
PV0 = PV3 / (1+r)^3 = 3,000,000/ (1.05)^3 = $2,591,513
-What is the PV of an annuity of $150,000 per year for 3 years when the interest rate is 5%?
PV = 150 000 ((1/0.05) – (1/(.05)(1.05)^3)) = $408,487
PV of 3 years annuity = PV of perpetuity – PV of perpetuity that starts in year 4
= 3,000,000 – 2 592 513 = $408 487

- Example: You are purchasing a car. You are scheduled to make 3 annual installments of $12,000 per year, with the first payment one year from now. Given a rate of interest of 6%, what is the price you are paying for the car?

Answer:
PV = 12,000 ((1/0.06) – 1/(.06)(1.06^3))= $32,076 – ordinary annuity
Annuity Due = C + PV of ordinary annuity of t-1 periods
= C (1 + 1/r – 1/ r(1+r)^t-1) OR = C (1/r – 1/r(1+r)^t) x (1+r)
-There is *3 payments of 12 000 at the start of each of the next 3 years. If the interest rate is 6%, how much does the car cost?*
PV = 12 000 (1 + 1/0.06 – 1/(.06)(1.06)^2) = $34 001

- Example:A car dealer offers you a car loan with payments of 5,500, semi-annually, for 3 years. If the posted APR on the loan is 3%, what is the cost of the car?

Answer:
Compounding period m = 2 (semi-annually)
PV = C [(1 / (r/m)) – (1 / (r/m)(1 + r/m)^mt)]
PV = 5,500 [(1 / (0.03/2)) – (1 / (0.03/2)(1 + 0.03/2)^(2 x 3)]
PV = $31,334.53

- **Future Value –** the FV of a t period annuity with cash flow of C & a discount rate r is:

FV of t-period Annuity = C x ((1+r)^t – 1) / r)

- Example:Suppose you deposit $9,000 into your bank account at the end of each year for the next 9 years. If the interest rate were 6%, how much would you have accumulated at the end of 9 years?

Answer:
C = 9,000
r = 0.06
t = 9
FV = 9,000 [((1 + 0.06)^9 – 1) / 0.06]
FV = 103,421.84
-This formula gives you the PV of an annuity *starting one period from now*

- Future Value Annuity Factor (FVA): the term in the parentheses
- Annuities Due: a level stream of payments starting immediately

- Future Value Annuity Factor (FVA): the term in the parentheses
- Annuities Due: a level stream of payments starting immediately

$$PVAD(r,t) = 1 + PVA(r,t-1)$$

- Example:Suppose you save $4,000 at the end of each year for the next 20 years. If r=10%, how much will you have on the day you retire?

Answer:
FVA = 4000 ((1.10)^20 – 1) / 0.10) = $229,100
-How much can you spend each year in perpetuity?
PV Perpetuity = C / r
229,100 = C / 0.10
C = $22,910
-Suppose you want to use the money in 20 years, how much can you spend each year?
PV Annuity = C ((1/r) – (1/r (1 + r)^t))
229,100 = C ((1/10) – (1 / 0.10 (1.10)^20))
C= $26,910

- Example:Suppose you save $2,000 at the end of every month for your retirement. If you can earn 4% per year (APR) on your investments, how much will you have saved by the time you retire in 25 years?

Answer:
FV = C [(1 + (r/m))^mt -1] / (r/m)
FV = 2,000 [(1 + (0.04/12))^(12x25) -1] / (0.04/12)
FV = $1,028,259.09

$$FV = C [(1 + (r/m))^{mt} -1] / (r/m)$$

- Example: You are borrowing $10,000 at 15%-interest rate. Repay with 5 annual payments. What will the loan payments be?

Answer:
10 000 = C ((1/0.15) – (1/(.15)(1.15^5))
C = $2 983.15
-Suppose you decide to pay off the loan after 3 years. How much do you need to pay (in addition to the time 3 payment)?
Need to pay the PV of the remaining payments
PV = 2983.15 ((1/0.15) – (1/(.15)(1.15)^2))
PV = $4 849.14
-Suppose the loan has monthly payments rather than annual. What will the payments be?
r/month = 15% / 12 months = 1.25% per month
10 000 = C ((1/0.0125) – (1/(.0125)(1.0125^60))
C = $237.90

- Example:An investment promises to pay you $5,000 per year starting in 3 years. The cash flow from the investment is expected to increase by 2% per year forever. If alternative investments of similar risk earn a return of 8% per year, determine the maximum you would be willing to pay for this investment today.

Answer:
Present Value of the Payment: $PV_{t-1} = c / (r – g)$
PV = 5,000 / (0.08 – 0.02)
PV = 83,333.33
Present Value of $PV_0 = (PV_{t-1}) / (1 + r)^ (t-1)$
PV = 83,333.33 / (1.08)^ (0.02 – 1)
PV = $71,444.90

<u>Growth in Annuities & Perpetuities</u>

- A growing perpetuity with constant growth rate of "g" has a PV is:

$$PV \text{ of a Growing Perpetuity} = C / r - g$$

- A growing annuity with a growth rate of "g" has a PV that can be shown as:

$$PV \text{ of a Growing Annuity} = C / r – g (1 – (1+g/1+r)^t)$$

- Example: An investment promises to pay you $2,000 per year forever with the first payment today. If alternative investments of similar risk earn 7.66% per year, determine the maximum you would be willing to pay for this investment.

Answer:

payment today. If alternative investments of similar risk earn 7.66% per year, determine the maximum you would be willing to pay for this investment.

Answer:
PV = c + c/r
PV = 2,000 + 2,000 / 0.0733
PV = 28,109.66

$$PV = C + C / r$$

- **Tuesday, January 20, 2015: Week 3**

Chapter 5: The Time Value of Money

Inflation & the Time Value of Money

- Inflation: rate at which prices as a whole are increasing
- Nominal Interest Rate: rate at which money invested grows
- Real Interest Rate: rate at which the purchasing power of an investment increases

$$\text{Real Rate of Interest} = \text{Nominal Rate of Interest} - \text{Inflation Rate}$$

$$1 + \text{Real Rate} = (1 + \text{Nominal Rate}) / (1 + \text{Inflation Rate})$$

- Example:You invest in a condo that's expected to generate income of $12 000 next year. Discount rate = 8%

Answer:
1) What's the maximum you would be willing to pay for condo if it is expected to generate $12 000 net income every year indefinitely?
PV = C / r
PV = 12 000 / 0.08 = $150 000
2) Suppose cash flows are expected to grow at 3% per year. Now what would you pay?
PV = C / r – g
PV = 12 000 /0.08 - 0.03 = $240 000
3) Suppose condo expected to have life of 20 years and then be worthless. What would you pay?
PV= (C/r-g) x (1- (1+g/1+r)^t)
PV = (12000/0.08 - 0.03) x (1 – (1.03/1.08)^20) = $147 000
4) Suppose you expect to be able to sell condo for $50 000 in 20 years. What would you pay?
PV = 147 000 + (50 000 / 1.08^20) = $157 727

Effective Annual Interest Rates

- Effective Annual Interest Rate (EAR): interest rate that's annualized using compound interest
- Annual Percentage Rate (APR): interest rate that's annualized using simple interest

$$EAR = (1 + (APR/m))^m – 1$$

m - # of compounding per year

- Example:How much interest is earned on a $1 investment in 1 year?

Answer:
EAR = (1 + .12/12)^12 – 1 = 12.68%
-Using EAR for previous question:
1000(1.1268)^5 = $1817
-PV & PV with more frequent compounding
FV = PV (1+APR/m)^(mt)
PV = FV (1+APR/m)^(-mt)

Continuous Compounding (m -> infinity)

$$\lim FV = \lim PV(1+APR/m)^{(mt)}$$

$$FV = PV \times e^{(APRxt)}$$

$$PV = FV \times e^{-(APRxt)}$$

- Example: Invest $1000 for 5 years at 12% compounded continuously

Answer:
EAR = e^r -1 = e^0.12 -1 = 12.75%

Example: Invest $1000 for 5 years at 12% compounded continuously

Answer:
EAR = e^r -1 = e^0.12 -1 = 12.75%
FV = 1000 x e^(.12x5) = $1822 or
Fv = 1000 (1.275)^5 = $1822

Inflation Rate

- Inflation = % change in CPI
- Example: Total CPI 11/2014 = 125.4. Total CPI 11/2013 = 123.0

Answer:
Inflation = (125.4 – 123.0) / 123.0
= 0.0195 or 1.95%

- **Thursday, January 22, 2015: Week 3**

Chapter 6: Valuing Bonds

Clean Price = price x FV of bond (1,000)
Dirty Price = listed price + accrued interest

- Example: Bank of Montreal 4.55% coupon bond

Matures Aug. 1, 2017
Price Jan.20. 2015: 107.18
'Clean bond price' – quoted price
-Does not include accrued interest
'Dirty bond price' – price that is paid
- = Quoted price + accrued interest

Answer:
Coupon Payment (semi-annual) = (0.0455 x 1000) / 2 = $22.75
Last Coupon was paid Aug. 1, 2104
Settlement date = 3 days after bond deal executed
-Jan. 20, 2015 + 3 days = Jan 23, 2015
Accrued Interest = Coupon payment x (# days from last coupon to settlement date) / (# days in coupon period)
Days from coupon to settlement (Aug. 1, 2014 = Jan. 23, 2015)
30+30+31+30+31+23 = 175 days
Days in coupon period (Aug. 1, 2014 = Feb. 1, 2015)
30+30+31+30+31+31+1 = 184 days
Accrued Interest = 22.75 x (175/184) = 21.64
Total Cost: 107.18% x 1000 + 21.64 = $1093.44

Examples on Course link:

Example #1:
-PV annuity of $100,000 per year for 35 years
PV_{64} = C [1/r – 1/ r (1+r)^t]
= 100,000 [1/0.07 – 1/ 0.07(1.07)^35]
= $1,294,767
-Bring this value to time 65
$FV_{65} = PV_{64}$ x (1 + r)
FV_{65} = 1,294,767 x (1.07)
= $1,385,401
-Find payments of annuity from 22 – 65 with future value = $1,385,401
FV = C [((1 +r)^t -1) / r]
1,385,401 = C [((1.07)^45 – 1)/ 0.07)]
C = $5,591

Example #2:
-Borrow $300; today repay $320 in 14 days
-APR:
FV = PV (1 + APR/m)^mt

-Borrow $300, today repay $320 in 14 days
-APR:
FV = PV (1 + APR/m)^mt
320 = 300 (1 + APR/365)^365(14/365)
APR = [(320/300)^1/14 – 1] x 365
APR = 1.6865 or 168.65%
-EAR:
EAR = (1 + APR/365)^365 – 1
EAR = (1 + (1.6865/365)) – 1
EAR = 4.3796 or 437.96%

- **Tuesday, January 27, 2015: Week 4**

Chapter 6: Valuing Bonds

Bonds and the Bond Market

- Governments and corporations borrow money for the long term by issuing securities called bonds
- The interest payment paid to the bondholders is called the coupon
- The payment at the maturity of the bond is called the face value, principal or pay value
- The date on which the loan will be paid off is the maturity date
- The coupon rate is the annual interest payment divided by the face value of the bond
- The interest rate (or discount rate) is the rate at which the cash flows from the bond are discounted to determine its present value
- The coupon rate and the discount rate are NOT necessarily the same! When they are not, the price of the bond is not the same as its face value

Interest Rates and Bond Prices

- The price of a bond is the present value of all its future cash flows, that is, it is the present value of the coupon payment and the face value of the bond. In calculating the PV, the 'appropriate' opportunity cost has to be used.
- Example: Calculate the current price of a 7.0% annual coupon bond, with a $1,000 face value that matures in 3 years. Assume a required return of 5.0%.

Answer:
First coupon payment is $70 ➔ 7.0% of $1,000
Second payment is the same and the third payment is the final payment: a coupon of $70 plus the face value $1,000

- When the coupon rate is equal to the required return, the bond sells at face value (at par)
- When the coupon rate is higher than the required return, the bond sells above face value (at premium)
- When the coupon rate is lower than the required return, the bond sells below face value (at a discount)
- Semi-annual payments:a semi-annual payment implies that the annual coupon payment is paid in two equal installments, every 6 months.
  -The time line must be in a six-month period
  -You need to compute six-month required return
- Example:What is the price of a bond with a coupon rate of 7%, payable annually, a face value of $1000, 3 years to maturity, and a yield to maturity of 8%?

Answer:
Finding the present value of the coupon payments:
PV (coupon) = coupon [1/r – (1 / r(1 + r)^t)]
Coupon = 0.07 x 1000 = 70
Interest rate = 0.08
t = 3
PV = 70 (1/0.08 – (1 / 0.08(1.08)^3))

Interest rate = 0.08
t = 3
PV = 70 (1/0.08 – (1 / 0.08(1.08)^3))
PV = $180.40
Finding the present value of the face value of the bond:
PV (face) = 1000 / (1 +r)^t
PV = 1000 / (1.08)^3
PV = $793.83
Finding the price of the bond:
Price = PV (coupon) + PV (face)
Price = 180.40 + 793.83
Price = $974.23

PV (face) = 1000 / (1 +r)^t

PV (coupon) = coupon [1/r – 1(r(1 + r)^t)]

Price = PV (coupon) + PV (face)

Divide coupon by m and r by m and multiply t by 2; m being the number of compounding periods

Current Yield and Yield Maturity

- Current Yield: Annual coupon payment divided by bond price

Current Yield = Coupon Payment / Bond Price

- Example: You are buying a bond with coupon payments of $80 per year. At a price of $1,053.46

Answer:
Current Yield = $80 / $1,053.46 = 0.076 = 7.6%

- Yield to Maturity: Interest rate for which the present value of the bond's payments equals the price.
- Example: A 3-year, 8% annual coupon bond, with a face value of $1,000 sells for $1,053.46

Answer:
PV = ($80 / (1 + r)^1) + ($80 / (1 + r)^2) + (($80 - $1,000) / (1 + r)^3)
PV = $1,053.46

- Example:Consider a bond that has a price of $859.53, a coupon rate of 5%, a yield to maturity of 7%, a face value of $1000, and 10 years to maturity. What is the current yield? Enter your answer as a percentage. Do not include the percentage sign in your answer.

Answer:
Current Yield = coupon / price
Coupon = 0.05 x 1,000 = 50
Price = 859.53
= 50 / 859.53
= 5.82%

Bond Rates of Return

- Rate of Return: Earnings per period per dollar invested.
- Example:You buy a $1,000 par, 3-year, 8% annual coupon bond for $1,053.46. One year later, you sell it for $1,100.

Answer:
Rate of Return = coupon / price + price change / price
= 80 / 1053.46 + 1100 – 1053.46 / 1053.46
= 7.6% + 4.4%
= 12.0%

Rate of return = (coupon income + price change) / investment

- Example:What is the price of a bond with a coupon rate of 7%, payable semi-annually, a face value of $1000, 4 years to maturity, and a yield to maturity of 9%?

Answer:
Finding the present value of the coupon payments:
PV (coupon) = coupon / 2 [1/(r/2) – 1/(r/2 (1+r/2)^2t)]

Answer:
Finding the present value of the coupon payments:
PV (coupon) = coupon / 2 [1/(r/2) – 1/(r/2 (1+r/2)^2t)]
Coupon = 0.07 x 1000 = 70
r = 0.09
t = 4
PV = 70/2 [1/(0.09/2) – 1(0.09/2(1+0.09/2)^(2x4)]
PV = $230.86
Finding the present value of the face value of the bond:
PV (face) = 1000 / (1 + r/2)^2t
PV = 1000 / (1 +0.09/2)^(2 x 4)
PV = $703.19
Finding the price of the bond:
Price = PV (coupon) + PV (face)
Price = 230.86 + 703.19
Price = $934.04

Taxes and Rates of Return

- Taxes reduce the rate of return on an investment
- Example: You bought a bond for $1,000. Your receive $80 in interest, before tax. You receive $47 in capital gains, before tax. Your marginal tax rate is 35%

Answer:

- **Thursday, January 29, 2015: Week 4**

The Yield Curve

- A graph of the relationship between time to maturity and yield to maturity, for bonds that differ only in their maturity dates
- Real Return Bond: The bonds with variable nominal coupon payments, determined by a fixed real coupon payment and the inflation rate
- Fisher Effect: The nominal interest rate is determined by the real interest rate and expected rate of inflation
- Expectations Theory: An explanatory theory that shows why there are different shapes of the yield curve

The Yield Curve and the Interest Rate Risk

- Interest rate risk: is the risk in bond prices due to fluctuations in interest rates
- Different bonds are affected differently by interest rate changes
- Longer-term bonds get hit harder than the shorter-term bonds. Lower coupon bonds get hit harder than bonds with higher coupons
- Liquidity premium
- Example: Suppose market interest rates increase from 5% to 6%

Answer:
4% coupon bond
Price at 5%: $875.38
Price at 6%: $770.60
% Change = (770.60 – 875.38) / 875.38
= -0.01197 or -11.97%

12% coupon bond
Price at 5%: $1872.35
Price at 6%: $1688.20
% Change = (1688.20 – 1872.35) / 1872.35
= 0.0984 or 9.84%

% Change = (Price 1 – Price 2) / (Price 2)

-*Expectations Theory:* *The shape of the yield curve is determined by expectations about future short-term interest rates*

-*Expectations Theory:* *The shape of the yield curve is determined by expectations about future short-term interest rates.*

-Buying a 2-year bind is expected to yield the same return as buying two successive one0year bonds

-*Liquidity Preference Theory:* *Investing in long-term bonds is riskier than investing in short-term bonds because long-term bond prices are more variable (higher interest rate risk)*

• Example: r_1 = 1 year spot rate = 0.99%

r_2 = 2 year spot rate = 1.12%

f_2 = forward rate (implied return in 2nd year)

${}_1r_2$ = expected future one year spot rate

Answer:

$(1 + r_1)(1 + f_2) = (1 + r_2)^2$

$(1.0099)(1 + f_2) = (1.0112)^2$

$f_2 = 0.0125$ or 1.25%

Expectations Theory:

Forward rate = expected future spot rate

$1.25\% = {}_1r_2$

Liquidity Preference Theory:

Forward rate > expected future spot rate

$1.25\% > {}_1r_2$

$$(1 + r_1)(1 + f_2) = (1 + r_2)^2$$

Corporate Bonds and the Risk of Default

- Both corporations and the Government of Canada borrow money by issuing bonds
  - -Corporate borrowers can run out of cash and default on their borrowings
  - -The Government of Canada cannot default – it just prints more money to cover its debts
- Default risk (or credit risk) is the risk that a bond issuer may default on its bonds
- The default premium or credit spread is the difference between the promised yield on a corporate bond and the yield on a Canada bon with the same coupon maturity
- The safety of a corporate bond can be judged from its bond rating
- Bond ratings are provided by companies such as:
  - -Dominion Bond Rating Service (DBRS)
  - -Moody's
  - -Standard and Poor's
- Bonds rated BBB and above are called investment grade bonds
- Bonds rate BB and below are calledspeculative grade, high yield, or junk bonds

- Example:Default Premium

Bell Canada: 8.88% coupon bond

Maturity April 17, 2026

Jan. 21, 2015: Price 136.38

YTM 4.67%

Government of Canada = 8.00% coupon bond

Maturity June 1, 2027

Jan 21, 2015: Price 170.34

YTM 1.67%

Answer:

Default Premium for Bell Canada Bond:

4,67 – 1.67 = 3.0%

- **Tuesday, February 3, 2015: Week 5**

Chapter 7: Valuing Stocks

Chapter 7: Valuing Stocks

Stocks and Stock Markets

- Common Stock: Ownership shares in publicly held corporation
- Primary Market: Place where the sale of new stock first occurs
- Initial Public Offering (IPO): First offering of stock to the general public
- Seasoned Issue: Sale of new shares by a firm that has already been through an IPO
- Secondary Market: Market in which already issued securities are traded by investors

Reading Stock Market Listings

- P/E Ratio: Price per share divided by earnings per share
- Dividend: Periodic cash distribution from the firm to the shareholders (Dividends represent that share of the firm's profits which are distributed)
- Retained Earnings: Profits that are retained in the firm and reinvested in its operations

Market Values, Book Values, Liquidation Values

- Book Value: Net worth of the firm according to the balance sheet
- Liquidation Value: Net proceeds that would be realized by selling the firm's assets and paying off its creditors
- Market Value Balance Sheet: Financial statement that uses market value of assets and liabilities
- Going concern value: Means that a well managed, profitable firm is worth more than the sum of the value of its assets
- Example: Asses sold separately have liquidation value of $11 million. Compared to the same assets functioning as a firm have going concern value of $15 million.
- The difference between a firm's actual market value and its; liquidation or book value is attributable to its "going concern value"
- Factors of "Going Concern Value"
  - -Extra earning power
  - -Intangible assets
  - -Value of future investments

Valuing Common Stocks

- Expected Return: The percentage yield that an investor forecasts from a specific investment over a set period of time

$$\text{Expected Return} = r = (Div_1 + P_1 - P_0) / P_0$$

$$\text{Expected Return} = r = Div_1 / P_0 + (P_1 - P_0) / P_0$$

Where Div_1 / P_0 is Dividend Yield and $(P_1 - P_0) / P_0$ is Capital Gains Yield

Expected Return = Dividend Yield + Capital Gain

- Example: Assume that Blue Sky Corp's shares are selling for $50 now. They are expected to produce $2 dividends during the year and is to be sold at $53 at the end of the year. What is the expected return from the Blue Sky's shares?

Answer:

Expected Return = r = Div1 / P0 + (P1 – P0) / P0
= 2 / 50 + (53 – 50)/ 50
= 0.04 + 0.06
= 0.1 or 10%

- Example:Suppose similar risk stocks have an unexpected return of 12%. What will happen to the price of the stock?

Answer:

Price will fall until this stock has an of 12%
r = 0.12 = D1 +P1 –P0 / P0

Answer:
Price will fall until this stock has an of 12%
r = 0.12 = D1 +P1 –P0 / P0
r = 2 +53 – P0 / P0
P0 = $(D_1 + P_1) / (1 + r)$
= 2 +53 / (1+0.12)
= 55 / 1.12
= $49.11

$$P0 = (D_1 + P_1) / (1 + r)$$

Price and Intrinsic Value

- The Dividend Discount Model: Share value equals the present value of all expected future dividends. Thus, if the discount rates is 'r', we can write:

$$P0 = Div_1 / (1 + r)^1 + Div_2 / (1 + r)^2 + Div_H + P_H / (1 + r)^H$$

Simplifying the Dividend Discount Model

- Zero Growth Case: If the dividend paid by the corporation is not expected to change, and then we treat the dividend as a perpetuity. The present value of all dividends, then, is

$$P_0 = Div_1 / r$$

- Constant Growth Case:Dividends grow at a constant rate, g, in perpetuity. (Treat as a growing perpetuity). If the dividend paid by the stock is expected to grow at a constant rate, then the cash flows are treated like perpetual flows with a growth rate. In that case, the PV of the cash flow will be:

$$P_0 = D_1 / r\text{-}g$$

Must have g < r
Because you cant have a negative price

- Example: Company expected to pay a dividend of $3 next year. Dividends are expected to stay constant in perpetuity. The discount rate is 15%

Answer:
$P_0 = D_1 / r$
= 3 / 0.15
=$20

- Example:Currently, Queen Inc. pays no dividends. However, analysts forecast that in 3 years Queen Inc. will pay its first annual dividend of $0.67 and dividends will grow at 7% per year thereafter. If stocks with similar risk to the equity of Queen Inc. currently earn 11%, estimate the current share price of Queen Inc.

Answer:
Find price of the stock at time T-1
$P_{t-1} = DIV_t / (r - g)$
= 0.67 / (0.11 – 0.07)
= 16.75
Find the price of the stock today
$P_0 = P_{t-1} / (1 + r)^{(t-1)}$
= 16.75 / (1 + 0.11)^(3-1)
= 13.59467576

Estimating Expected Rates of Return

- Expected Rate of Return from the DDM: Rearranging the constant growth DDM formula gives:

$$r = D_1 / P_0 + g$$

Where D_1 / P_0 is the dividend yield and g is the growth rate

Simplifying the Dividend Discount Model

- Non-Constant Growth Case: Many companies grow at a rapid or irregular rates for several years before finally settling down

- Non-Constant Growth Case: Many companies grow at a rapid or irregular rates for several years before finally settling down
  -Before the growth rate settles down, we have to calculate each dividends separately
  -When the growth rate does settle down, we can find the future stock price using the constant growth formula
  -At the end, we have to find the present values of all the dividends and the future price
- Example: A firm is expected to increase dividends by 20% in one year and by 15% in two years. After that dividends will increase at a rate of 5% per year indefinitely. If the last dividend was $1 and the required return is 20%, what is the price of the stock?

Answer:

Growth Stocks and Income Stocks

- Plowback Ratio:The fraction of earnings retained by the firm
- Payout Ratio:The fraction of earnings a company pays out in dividends
- Calculating "g" (growth rate): The growth rate for a company can be computed by multiplying the return on equity by the plowback ratio:

  g = ROE x Plowback Ratio
- Example:The growth rate is 2% and the payout ratio is 22%. What is the return on equity? Enter you answer as a percentage. Do not include the percentage sign in your answer.

Answer:
g = ROE x Plowback Ratio
= 0.02 x (1 – 0.22)
= 0.02 x 0.78
= 2.56%

- **Thursday, February 5, 2015: Week 5**

Growth Stocks and Income Stocks

- The Present value of Growth Opportunities (PVGO): The net present value of a firm's future investments
- Sustainable Growth Rate: Steady rate at which a firm can grow: plowback ratio X return on equity
- Price-Earning Ratio: Stock price/EPS

No Free Lunches on Bay Street

- Efficient Market: A market where prices reflect all available information. No free lunched.
- Weak from Efficient: A market where prices rapidly reflect all information contained in the history of past prices and volumes
- Semi-Strong from Efficiency: A market where prices rapidly reflect all publicly available information
- Strong Form Efficiency: A market where prices reflect all information that could be used to determine true value of assets

Market Anomalies &Behavioural Finance

- Market Anomalies: There are always some puzzles or apparent exceptions of the efficient market theory
- Earning Announcement Puzzle: Studies found that stock prices apparently did not reflect all available information at the ends of the earnings announcement days
- New Issues Puzzle: Researchers found that early gains buying IPOs often turn into losses

- **Tuesday, February 10, 2015: Week 6**

losses

- **Tuesday, February 10, 2015: Week 6**

Chapter 11: Introduction to Risk, Return, and the Opportunity Cost of Capital

Rates of Return: A Review

- Measuring Rate of Return: The total return on an investment is made up of:
  - -Income (dividend or interest payments)
  - -Capital gains (or losses)

Percentage Return = (Capital Gain + Dividend) / Initial Share Price

Capital Gain Yield = Capital Gain / Initial Share Price
Dividend Yield = Dividend / Initial Share Price
1 + real rate = 1+ nominal rate / 1+ inflation rate

- Market Index: A measure of the investment performance of the overall market
- S&P/TSX Composite Index: Index of the investment performance of a portfolio of the major stocks listed on the Toronto Stock Exchange
- S&P/TSX Composite Total Return Index (TSXT): Measure of the composite index based on the prices plus dividends paid by the stocks in the S&P/TSX index

Eighty-Five Years of Capital Market History

- The historical record shows that investors have received a risk premium for holding risky assets
- In general, we can say:

Rate of return on any security = Rate of return on T-bills + Market risk premium

- Market risk premium has been in the neighborhood of 6.9%. Thus, in 2011, we can expect a market return of: 1% + 6.9% = 7.9%

Measuring Risk

- Volatility of returns is what is considered as risk. Volatility is measured by:
  - -Variance: the average value of squared deviations from the mean
  - -Standard Deviation: the square root of the variance
- T-bills have the lowest average rate of return, and the lowest level of volatility
- Stocks have the highest average rate of return and the highest level of volatility
- Bonds are in the middle

Risk and Diversification

- Diversification: Strategy designed to reduce risk by spreading the portfolio across many investments. This is possible because assets possess two kinds or risks:
- Unique Risk: Risk factors affecting only that firm. Also called diversifiable or non-systematic risk
- Market Risk: Economy-wide sources of risk that affect the overall stock market. Also called systematic or on-diversifiable risk

Total Risk = Unique risk + Market risk

- Covariance: The degree to which the returns on two stocks are related. Probability-weighted average of the products of each deviation fro the scenario

Covariance between x and y
Standard Deviation of x times standard deviation of y

- $P > 0$ ➔ positive correlation; variables move in the same direction
- $P < 0$ ➔ negative correlation; variables move in the opposite direction
- $P = 0$ ➔ no correlation
- If you hold two stocks with a correlation coefficient less than 1, then the risk of the portfolio can be reduced below the risk of holding either stock by itself. Adding stocks to the portfolio, decreases the risk of the portfolio
- Portfolio Risk: The risk of a portfolio depends on the weights assigned to the assets,

stocks to the portfolio, decreases the risk of the portfolio

- Portfolio Risk: The risk of a portfolio depends on the weights assigned to the assets, their individual risks and the correlation coefficient(s) between them

Portfolio

- W_A = proportion invested in A
- W_B = proportion invested in B

$$W_A + W_B = 1$$

- Portfolio Return:

$$Rp = W_A r_A + W_B r_B$$

Where r_A = return on A, and r_B = return on B

- Portfolio Standard Deviation:

$$\sigma_p = \sqrt{(W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \sigma_A \sigma_B p)}$$

Where $\sigma_A \sigma_B p$ = ODV (A, B)

- Example: A portfolio comprising of 70% of its value in stock A and 30% in Stock B will have the following characteristics. Notice the drop in the amount of risk

		Rate of Return		
Scenario	Probability	A	B	Portfolio
Recession	0.2	-10.0%	15.0%	-2.5%
Normal	0.5	10.0%	8.0%	9.4%
Boom	0.3	20.0%	-15.0%	9.5%
Expected Return		9.0%	2.5%	7.1%
Standard Deviation		10.4%	11.8%	4.8%

Answer:

COV (A, B) = $p_i (x_i - x)(y_i - y)$

= 0.2 (-10 – 9)(15 – 2.5) + 0.5 (10 – 9)(8 – 2.5) + 0.3 (20 – 9)(-15 – 2.5)

= -102.5

Find Correlation Coefficient

P = COV (A, B) / ($\sigma_A \sigma_B$)

= -102.5 / [(10.4)(11.8)]

Find Portfolio Standard Deviation

$\sigma_p = \sqrt{(W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \sigma_A \sigma_B p)}$

$= \sqrt{(0.7)^2(10.4)^2 + (0.3)^2(11.8)^2 + 2(0.7)(0.3)(10.4)(11.8)(-0.835)}$

= 4.8%

$$COV (A, B) = p_i (x_i - x)(y_i - y)$$

$$P = COV (A, B) / (\sigma_A \sigma_B)$$

- **Thursday, February 12, 2015: Week 6**

Chapter 12: Risk, Return, and Capital Budgeting

Measuring Market Risk

- The market portfolio is used as a benchmark to measure the risk of individual stocks
- Beat: Sensitivity of a stock's return to the return on the market portfolio. Beat is a measure of a market risk

$$\text{Beta of Stock j} = B_j = COV(r_j r_m) / \sigma_m^2$$

Where COV(j,m) = covariance of the stock's return with the market's return

σ= standard deviation of the market

- The Other way…

$$\text{Beta of Stock j} = B_j = (p_{jm} \sigma_j) / \sigma_m$$

Where p_{jm} = correlation of the stock's return with the market's return

σ_j = standard deviation of the stock

σ_m = standard deviation of the market

- Portfolio Beta: the weighted average of the betas of the individual assets; with the weights being equal to the proportion of wealth invested in each asset

$$B_p = W_1 B_1 + W_2 B_2$$

- Portfolio Beta: the weighted average of the betas of the individual assets, with the weights being equal to the proportion of wealth invested in each asset

$$B_p = W_1B_1 + W_2B_2$$

Risk and Return and Capital Asset pricing Model, CAPM

- Market Risk Premium: The risk premium of the market portfolio. It is the difference between market return and the return on risk free asset
- Benchmark Betas: Since the return on a T-bill is fixed and unaffected by what happens in the market; the beta of the risk-free asset is zero
  - -The beta of the market portfolio is 1
  - -The beta of a risk-free asset is 0
- **Only market risk is relevant in measuring the risk of an asset or project**
- Security Market Line (SML): The graph showing the relationship between the market risk of the security and its expected return is called the Security Market Line (SML)
- According to the CAPM, expected rates of return for all securities and all portfolios lie on the SML

Capital Budgeting & Project Risk

- Company vs. Project Risk: The project cost of capital depends on the use to which the capital is being put. Therefore, it depends on the risk of the project and not the risk of the company
- Example: IMAX is considering 3 projects:

  Project 1: an expansion project with the same overall risk as the company itself
  Project 2: introduction of a new product line and its risk exceeds that of the company itself
  Project 3: has no risk and involves a guaranteed sale to the government
  What cost of capital will we use for each project? (If IMAX were proposing an expansion project, you would discount its estimated cash flows at 12.75%)

Answer:

The discount rate must reflect the risk of the project's cash flows
-Since Project 1 has the same risk as IMAX, its cash flows should be discounted at the company cost of capital of 12.75%
-Since Project 3 is risk-free, its cash glows should be discounted at the T-bill rate
-Since Project 2 is more risky than IMAX, its cash flows should be discounted at a rate higher than 12.75%

Company vs. Project Risk

- Discount the cash flows of a project cost of capital
  - -This need not be the firm's cost of capital
  - -Project cost of capital is based on the project risk
- Determinants of Project Risk:
  - -Projects with high fixed costs tend to have high betas
  - -Investments can have high risk but low beta
  - -Pure Play Approach: Estimating project cost of capital by using the cost of the capital of another company involved in the same type of project
  - -Don't add fudge factors to discount rates

$$r_{je} = a_j + B_j r_{mt} + e_{je}$$

Where $a_j + B_j r_{mt}$ = return explained by macro events in the market,
e_{je} = return related to the unique risk of the stock

Regression Results – Measuring Beta

$$B_j = COV(r_{ji} r_m) / \sigma_m^2 = p_{jm} \sigma_j / \sigma_m$$

- Example: Suppose standard deviation of a stock's return is 30%. Standard deviation of market's return is 20%. Covariance of stock's return with market's return 420.

Answer:

Correlation of stock's return with market's return:

Answer:

Correlation of stock's return with market's return:

$P = COV(r_{jj}r_m) / \sigma_j \sigma_m = 420 / (30 \times 40) = 0.7$

$B_j = COV(r_{jj}r_m) / \sigma_m^2 = 420 / (20)2 = 1.05$

$B_j = (p_{jm}\sigma_j) / \sigma_m = (0.70(30) / 20 = 1.05$

The stock's move in sync with the market; has beta of 1.05, which is close to 1

- Portfolio Beta is weighted average of beta's of the asset in the portfolio
- W_i = proportion invested in asset I, I = 1, 2, …, n

$$\Sigma W_i = 1$$

B_i = beta of asset 1

$$B_p - W_i B_i$$

- Example: Portfolio with \$100 invested in a stock with $B_i = 1.5$ and \$50 invested in a stock with B = 0.6. What is the portfolio beta?

Answer:

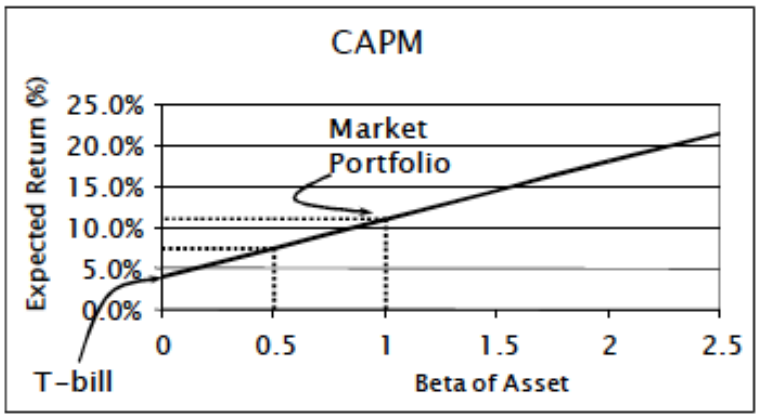
$B_p = W_1B_1 + W_2B_2$

$B_p = (100 / 100 + 50)(1.50) + (50 / 100 + 50)(0.6)$

$= 1.2$

Market Risk Premium

- Market risk premium = $r_m - r_f$
- Where r_m = return on market portfolio
- Where r_f = risk-free rate
- Beta of risk-free asset is 0: $B_f = 0$
- Beta of market portfolio is 1: $B_m = 1$



- SML = Security market line

$$CAPM: r_j = r_f + B_j (r_m - r_f)$$

Where $B_j (r_m - r_f)$ = risk premium for security j

- Example: Part 1: Calculate the required return on a stock with a beta of 0.5 if Treasury Bill's have a return of 4% and the market return is 11%

Answer:

$r_j = r_f + B_j (r_m - r_f)$

$r_j = 4 + 0.5(11 - 4)$

$= 7.5\%$

- Example: Part 2: Suppose another stock has a beta of 2.3 and is expected to yield a return of 16%.

Answer:

Find required return

$r_j = r_f + B_j (r_m - r_f)$

$r_j = 4 + 2.3(11 - 4)$

$= 20.1\% \quad > 16\%$

Want to get rid of stock (beta 2.3) as it does not have a high enough required return. Below SML (stock is overvalued).

Below SML (stock is overvalued).

- **Tuesday, February 24, 2015: Week 7**

Chapter 13:

- Example: Company with $4 million in debt paying 6% return, $2 million in preferred stock paying a 12% return, $6 million in common stock paying 18% return. Tax rate = 35%

Answer:
$WACC = D/V(1-T_c)R_D + (P/V)R_P + (E/V)R_E$
$V = D + P + E$
$V = 4 + 2 + 6 = 12$
$WACC = 4/12(1-0.35)(6) + 2/12(12) + 6/12(18)$
$=12.3\%$
Consider a $100,000 expansion project that earns 12.3% after tax in perpetuity ($12 300/yr)
Pre tax profit = 12,300 / (1-0.35)
=$18,923

- Example 1: Long term bonds pay 9% coupon annually and matures in 10 years and have a yield to maturity of 8%

Answer:
Market value of debt: (with $100 million face value)
D = 9 [(1/0.08) – (1 /(0.08)(1.08)^10)] + (100M/(1.08)^10)
=$107 million

Preferred Stock Ex. 1 cont.

- Example: 1 million shares, 6% preferred stock currently selling for $60/share

Answer:
Market value of preferred stock:
P = # of shares x price
= 1 million x $60 = $60 million

Common Stock Ex. 1 cont.

- Example: 10 million shares, market value is $50/share

Answer:
Market value of common stock:
E = # of shares x price
=10 million x $50 = $500 million
V = 107 + 60 + 500
V = $667 million

Price Adjustment

- Example: Risk free rate = 6%, expected return on market portfolio is 14%, stock beta = 0.625 and sells for $100/share. Stock is expected to pay a dividend o $1 next year and to sell for $110 in one year

Answer:
Required Return:
$r_j = 6 + 0.625(14-6)$
$= 11\%$
Expected Return:
r = (1 + (110 -100)) / 100
= 11%

- Example: Gold is discovered on the company's land – increases expectations but not risk. Expected to pay a dividend of $5 and the stock price will increase to

- Example: Gold is discovered on the company's land – increases expectations but not risk. Expected to pay a dividend of $5 and the stock price will increase to $120 in one year

Answer:

Expected Return:

$r = (5 + (120 - 100)) / 100$

$=25\%$

Stock is now underpriced – price will increase until the ER falls back to 11%

$r = 0.11 = (5 + (120 - P_o) / P_o$

Po = $112.61

- **Thursday, February 26, 2015: Week 7**

Review

- **Tuesday, March 3, 2015: Week 8**

Chapter 8: Net Present Value and other Investment Criteria

Investments

r = 10%

	C_0	C_1	C_2	C_3
A	-1000	400	600	0
B	-1000	400	600	600
C	-1000	700	500	300
D	-1000	500	500	500

B is better than A

A is no good

C gets money sooner than D

NPVA = -1000 + (400/1.10) + (600/1.102) = -$140 REJECT

NPVB = -1000 + (400/1.10) + (600/1.102) + (600/1.103) = $310 ACCEPT

NPVC = -1000 + (700/1.10) + (500/1.102) + (300/1.103) = $275 ACCEPT

NPVD = -1000 + (500/1.10) + (500/1.102) + (500/1.103) = $243 ACCEPT

Payback Period

	Cumulative Cash Flows				
	0	1	2	3	Payback
A	(1000)	(600)	0		2 years
B	(1000)	(600)	0		2 years
C	(1000)	(300)	200		1.6 years
D	(1000)	(500)	0		2 years

Payback: * 1 year + (300 / 500 = 1.6

Ignores time value of money

Ignores cash flows after payback period

Payback periods is arbitrary

Discounted Payback

Cumulative discounted cash flows = 10%

	0	1	2	3	Discounted Payback
A	(1000) +400/1.1	(636) + 600/1.12	(140)		Never
B	(1000)	(636)	(140)	310	2.4 years
C	(1000)	(304)	50		1.9 years
D	(1000)	(545)	132	243	2.3 years

B: 2 + (140 / (600(1.10^3) = 2 + (140 / 450) = 2.4

C: 1 + (364 / 4.4) = 1.9

D: 2 + (132 (500 (1.10^3) = 2.3

D: $2 + (132 (500 (1.10^3) = 2.3$

IRR:
Find the discount rate that makes NPV = 0

A: r = 0%	<10% cost of capital	REJECT
B: r = 25.7%	>10%	ACCEPT
C: r = 27.6%	>10%	ACCEPT
D: r = 23%	>10%	ACCEPT

Borrowing vs. Lending
IRR can't tell the difference between borrowing and lending

	C_0	C_1	IRR	NPV (10%)
J	(100)	150	50%	36
K	100	(150)	50%	-36

- **Thursday, March 5, 2015: Week 8**

Chapter 8: Net Present Value and other Investment Criteria

Net Present Value
- The Capital Budgeting decision of the firm is concerned with finding out investments that maximize the value of the firm
- Example: Suppose, you are given the opportunity to buy a building today for $450,000 and a guarantee of being able to sell it next year for $500,000. Should you take it?
  a) No risk discount cash flows at risk free rate of 5%
  b) Risky investment opportunity the same as stock market that's expected to yield 10%

Answer:
a) NPV = -450,000 + (500,000/1.05) = $26,190
b) NPV = -450,000 + (500,000/1.10) = $4,545

- What discount rate do we use to value this stream of cash flows?
- What else could we have done with the $450,000?
- What other opportunity are we *giving up* by investing in the building?
- What if the interest rate on the risk-free T-bill is 5%?

NPV = PV of cash flows – Initial Investment

- Expected rate of return given up by investing in a project is the opportunity cost of capital

$$NPV = C_0 + (C_1 / (1 + r)_1) + (C_2 / (1 + r)_2) + \ldots + (C_t / (1 + r)_t)$$

Where:
C_1 = Cash flow at time i
r = Opportunity cost of capital

Risk and Net Present Value
- The discount rate is used to discount a set of cash flows must match the risk of the cash flows
- Example: Instead of being risk-free, what if the building investment in the previous examples was estimated to be as risky as the stock market yielding 10%?

Answer:

- Valuing Long Lived Projects:
  -The NPV rule works for projects of any duration
  -The critical problems in any NPV problem are to determine: The amount and timing of the cash flows. The appropriate discount rate

-The critical problems in any NPV problem are to determine: The amount and timing of the cash flows. The appropriate discount rate

- Net Present Value Rule: Managers increase shareholders' wealth by accepting all projects that are worth more than they cost. Therefore they should accept all projects with a positive net present value

Other Investment Criteria

- Other criteria are sometimes used by firms when evaluating investment opportunities
  - -Some of these criteria can give wrong answers
  - -Some of these criteria simply need to be used with care if you are to get the right answer!
- Payback: is the time period it takes for the cash flows generated by the project cover the initial investment in the project. If the payback period is less than a specified cutoff point, the project is a go.

Discounted Payback Period

- Discounted Payback Period: is the time period it takes for the discounted cash flows generated by the project to cover the initial investment in the project. The acceptance rules is still the same – the discounted payback should be less than a pre-set cutoff point
- Although better than payback, it still ignores all cash flows after an arbitrary cutoff date
- Therefore it will reject some positive NPV projects

Other Investment Criteria – IRR

- Internal Rate of Return (IRR): is the discount rate at which the NPV of the project equals zero. A project is acceptable if the IRR is more than the cost of capital of the project

Internal Rate of Return (IRR)

- IRR Calculation: If we solve for the "r" in the equation below we will find the IRR
- Example:A project costs $100, has a cash flow of $320 in year one, and then has disposal costs of $240 at time 2. Find IRR and determine when the project is acceptable

Answer:

-100 --------320---------- -240

IRR: $0 = -100 + 320/(1+r) + -240/(1+r)^2$

IRR = 20% and 100% (Have to guess the range and check)

*Accept of opportunity cost of capital is between 20% and 100%

IRR Potential Pitfalls

Borrowing vs. Lending

- Let's say project J involves lending $100 at 50% interest. Project K involves borrowing $100 at 50% interest. Which one will you chose?
- According to the IRR rule, both projects have a 50% rate of return and are thus equally desirable
- However, you lend in Project J, and earn 50%; you borrow in Project K, and pay 50%
- Pick the project where you earn more than the opportunity cost

IRR Potential Pitfalls

- Multiple Rates of Return: projects with cash flows that change direction more than once will have more than one discount rates at which the NPV will be zero. That means, there are multiple IRRs for non-conventional projects

More Examples of Mutually Exclusive Projects

means, there are multiple IRRs for non-conventional projects

More Examples of Mutually Exclusive Projects

- The Investment Timing Decision: Sometimes you have the ability to defer an investment and select a time that is more ideal at which yo make the investment decision. The decision rule is to choose the investment date that results in the highest NPV today
- Example: You can buy a computer system today for $50,000. Based on the savings it provides to you, the NPV of this investment - $20,000. However, you know that these systems are dropping in price every year. When should you purchase the computer?

Scale Problem

- IRR does not consider the size of the investment

Project	C_0	C_1	C_2	IRR	NPV
A	(2000)	500	2070	15%	165
B	(764)	500	500	20%	104
A - B	(1236)	0	1570	12.7%	61

- Opportunity cost of capital is 10%
- Consider incremental cash flows = difference between A and B

Equivalent Annual Cost (EAC)

- Cost per period with some PV as cost of machine

Machine D

	C_0	C_1	C_2	C_3	PV
D	5000	1500	1500	1500	8425
EAC		C	C	C	8425

PV = C x PVAF (3 years, 15%)
$8,425 = C [(1/0.15) – (1 / (0.15(1.15)^3))]$
C = 3,690

Machine E
$PV = 11,352 = C [(1/0.15) – (1 / (0.15(1.15)^5))]$
C = 3,387
Choose machine E since it has a lower equivalent annual cost

Replacement Decision

- Example:Old machine: will last more than 3 years and costs $5,000 per year to run. New machine: costs $8,000 to buy it and casts $2,000 per year to run. Has a lifetime of 4 years. Opportunity cost of capital is 15%

Answer:
PV of costs of new machine:
$PV = 8000 + 2000 [(1/0.15) – (1/(0.15(1.15)^4))]$
= 13,710
What are the equivalent annual costs?
PV = 13,710 = C x PVAF (4 years, 15%)
$C = 13,710 / [(1/0.15) – (1/((0.15)(1.15)^4))]$
C = 4,802
New machine is cheaper to run
(4,802 < 5,000) REPLACE NOW

- **Tuesday, March 10, 2015: Week 9**

Chapter 9: Using Discounted Cash Flow Analysis to Make Investment Decisions

Identifying Cash Flows

- In order to evaluate investment projects, we have to use cash flows rather than

Identifying Cash Flows

- In order to evaluate investment projects, we have to use cash flows rather than accounting profit
- Using these cash flows, we have to show whether the NPV is positive or not
- Example: A project costs $2,000 today and has an opportunity cost of capital of 10%. It has a 2-year life. It will produce cash revenues of $1,500 and $500 in years 1 and 2 respectively. The asset can be depreciated at $1,000 per year.

Answer:

Accounting Flows

	Year 1	Year 2
Cash Income	1500	500
Depreciation	(1000)	(1000)
Accounting Income =	500	(500)

Accounting NPV = $500/1.10 + -500/(1.10)^2 = 41$ ACCEPT

Cash Flows

	Year 0	Year 1	Year 2
Cost	(2000)	0	0
Cash Income	0	1500	500
Cash Flow =	(2000)	1500	500

NPV of Cash Flows = $-2000 + 1500/1.10 + 500/(1.10)^2 = -223$ REJECT

- Discount incremental cash flows:
  - -Include all indirect effects
  - -Ignore sunk costs
  - -Include opportunity costs
  - -Account for working capital investment
  - -Remember shutdown cash flows
  - -Beware of allocated overhead costs

Incremental Cash Flow = cash flow with project – cash flow without project

Real vs. Nominal Values

	Year 0	Year 1	Year 2	Year 3
Real Cash Flows	-200	70	80	90

Nominal Discount rate is 10%

Expected inflation rate is 3%

NPV = $-200 + 70/1.10 + 80/(1.10)^2 + 90/(1.10)^3 = -2.6$ REJECT

Convert to nominal cash flows and discount at nominal rate

$C1 = 70(1.03) = 72.10$

$C2 = 80(1.03)^2 = 84.87$

$C3 = 90(1.03)^3 = 98.35$

NPV = $-200 + 72.10/1.10 + 84.87/(1.10)^2 + 98.35/(1.10)^3 = 9.57$ ACCEPT

Convert to real discount rate and discount real cash flows

Real rate = (1 + nominal rate / 1 + inflation rate) – 1

= (1.10 / 1.03) – 1

=0.068 or 6.8%

NPV = $-200 + 70/1.068 + 80/(1.068)^2 + 90/(1.068)^3 = 9.57$ ACCEPT

Example:

Income Statement

Revenues	25,000
Expenses	(10,000)
Depreciation	(5,000)
Taxable Income	10,000
Tax (30%)	(3,000)
Net Income	7,000

Calculating Operating Cash Flows

Net Income 7,000

Calculating Operating Cash Flows

1) Include only cash items

CF = Revenues – Expenses – Taxes
= 25,000 – 10,000 – 3,000
= $12,000

2) Start with net income and add back non-cash

CF = Net income + Depreciation
= 7,000 + 5,000
=$12,000

3) Include depreciation only for the tax savings it generates

CF = (Revenues – Expenses)(1 – Tc) + Tc x Depreciation
= (25,000 – 10,000)(1 – 0.30) + (0.30)(5,000)
= $12,500

- **Thursday, March, 12, 2015: Week 9**

- Example:Bendog's Franks is looking at a new system with an installed cost of $440,000. This equipment is depreciated at a rate of 20 percent per year (class 8) over the project's five-year life, at the end of which the sausage system can be sold for $60,000. The sausage system will save the firm $130,000 per year in pre-tax operating costs, and the system requires an initial investment in net working capital of $34,000. If the tax rate is 34% and the discount rate is 10%, what is the NPV of this project?

Answer:

Using straight-line method

Depreciation = (440,000 – 60,000) / 5 = 76,000 per year

Operating Cash Flow: (including depreciation):

CCF = Savings (1-Tc) + Tc x Depreciation
= 130,000(1- 0.34) + (0.34)(76,000)
= 111,640 (in each years 1-5)

Net Present Value:

NPV = -(440,000 + 34,000) +111,640 x PVAF (5 years, 10%) + (60,000 + 34,000)/$(1.10)^5$
=$7,570.04 ACCEPT

Chapter 10: Project Analysis

Sensitivity Analysis

- Example: Determine the NPV of the project given changes in the cash flow components using an 10% cost of capital. Assume that all variables remain constant, except the one you are changing.

  Project Forecasts:

Sales volume/year	3,000 units
Price/unit	$12
Variable cost/unit	$7
Fixed costs/year	$2,000
Investment Cost	$50,000

  There are no taxes
  The investment has an infinite life
  The discount rate is 10%

Answer:

Sales Revenues	3,000 x $12 = $36,000
Variable Costs	3,000 x $7 = $21,000
Fixed Costs	(2,000)
No Taxes	0
Cash Flow	$13,000

NPV = C_0 + CF/r NOTE: investment is perpetuity

Cash Flow $13,000

NPV = C_0 + CF/r NOTE: investment is perpetuity
NPV = -50,000 + 13,000/0.10
= 80,000

Sensitivity Analysis

What if the sales volume is only 1,000 units an everything else is at the expected value?
Cash Flow = Sales volume (Price – Variable Cost) – Fixed Cost
CF = 1,000(12 – 7) – 2000 = $3,000
NPV = -50,000 + (3,000/0.10) = -$20,000
Scenario Analysis: Sales volume reduced by 20% price reduced to $11
Sales volume = 0.80 x 3,000 = 2,400 units
Cash Flow = 2,400 (11 - 7) – 2000 = $7,600
NPV = -50,000 + (7,600/0.10) = $26,000
***0.80 = 1-0.20 (Reduced by 20%)

- **Tuesday, March 17, 2015: Week 10**

Chapter 14: Introduction to Corporate Financing and Governance

Creating Value with Financing Decisions

- Smart investment decisions make shareholders wealthier
- Competition in financial markets very intense
- Few protected niches in financial markets
- True Value is a price that incorporates all the information currently available to investors
- It is difficult to find cheap financing because investors demand fair terms

Common Stock

- Authorized Share Capital: maximum number of shares which a company is permitted to issue as specified in the firm's articles of incorporation
- Issued Shares: shares that have been issued by the company
- Outstanding Shares: issued shares which are held by investors
- Par Value: value of security shown on certificate
- Additional Paid-in capital or contributed surplus: difference between issue price and par value of stock
- Retained Earnings: earnings not paid out as dividend

Book Value vs. Market Value

- Book value is a backward-looking measure. It tells you how much capital the firm raised from its shareholders in the past
- Market value is forward looking. It is a measure of the value of investors place on the shares today. It depends on the future dividends, which shareholders expect to receive.
- Dividends: Shareholders hope to receive dividends on their investment
  - -However, there is no obligation on the firm to pay dividends
  - -The decision to pay dividends is up to the Board of Directors

Shareholders Rights

- Shareholders own the company and this, have control of the company's affairs
- On most matters, shareholders have the right to vote on appointments to the Board of Directors
- The Board of Directors (agents) are supposed to manage the company in the interests of the shareholders (principles)
- Voting Procedures
  - -In most cases companies, a majority voting system elects the Directors
  - Shareholders cast one vote for each share they own

- Voting Procedures

  -In most cases companies, a majority voting system elects the Directors
  Shareholders cast one vote for each share they own
  Assume there are 5 candidates for the Board. If you owned 100 shares, you would cast a total of 500 votes, but to a maximum of 100 votes for each candidate.

Classes of Stock

- Most companies issue just on class of stock
- Some companies have two or more classes of shares outstanding

  -They differ in their right to vote and/or to receive dividends
- Common shares without full voting rights are called restricted shares

  -Non-voting shares have no vote at all
  -Subordinating voting shares have fewer votes per share
  -Multiple voting shares carry multiple votes

Corporate Governance

- Although shareholders own the company, they usually do not manage it. This principle of separation of ownership and control of a firm is prevalent around the world
- Separation of ownership and control creates potential conflict between the shareholders (owners) and their agents (the managers)
- Several mechanisms have evolved to mitigate this conflict

  -The Board oversees management and can fire them
  -Management remuneration can be tied to performance
  Poorly performing firms may be taken over and the managers replaced by a new team

Preferred Stock

- Preferred Stock: stock that takes priority over common stock in regard to dividends
- Net worth: book value of a company's common equity plus preferred stock

  -Most preferred equity promises a series of fixed payments to investors
  -Floating-rate preferred stock pays dividends that vary with short-term interest rates
- Redeemable: Company has right to acquire shares at a set amount known as the call price
- Convertible: shares can be converted into another class of shares at a predetermined price for a certain period of time
- Rarely confer full voting privileges

Corporate Debt

- Debt has the unique feature of allowing the borrowers to walk away from their obligation to pay, in exchange for the assets of the company
- Default risk: the likelihood that a firm will walk away from its obligation, either voluntarily or involuntarily
- Bond ratings: are issued on debt instruments to help investors assess the default risk of a firm
- Prime Rate: Benchmark interest rate charged by banks
- London Interbank Offered Rate (LIBOR): Rate at which international banks lend to each other
- Secured Debt: Debt that has first claim on specified collateral in the event of default
- Subordinate Debt: Debt that may be repaid in bankruptcy only after senior debt is repaid
- Funded debt: debt with more than one year remaining to maturity
- Protective Covenants: restriction on a firm to protect bondholders
- Sinking Fund: fund established to retire debt before maturity

- Protective Covenants: restriction on a firm to protect bondholders
- Sinking Fund: fund established to retire debt before maturity
- Callable Bond: bond that may be repurchased by the firm before maturity at a specified call price
- Investment Grade: Bonds rated above Baa or BBB
- Junk Bond: bond with a rating below Baa or BBB
- Eurodollars: Dollars held on deposit in banks outside the US
- Eurobond: bond that is marketed internationally
- Foreign bond: bond issued in the currency of its country but the borrower if from another country

Characteristics of Corporate Debt

- Interest Rate
- Maturity
- Repayment Provision
- Seniority
- Security
- Default Risk
- Country and Currency

Public vs. Private Placements

- Public Issue: firm issues its debt to anyone who wishes to buy it
- Private Placement: issue is sold directly to a small number of institutional investors
- Innovations in the debt market:
  - -Indexed bonds
  - -Asset backed Bonds
  - -Reverse Floaters

Convertible Securities

- Warrants are sometimes known as a "sweetener" because they make the bond issue more attractive to potential investors
  - -They give an investor a chance to lock-in a purchase price for a security
- Convertible bonds mar be exchanged at the option of the holder for a specified amount of another security, usually common shares
  - -The investor has the choice of converting or holding the bond as is

Patterns of Corporate Financing – External vs. Internal Funding

- Firms have two broad sources of cash:
- Internal Funding
  - -Rather than paying dividends, the firm san plow back part of its profits
- External Funding
  - -Firms can raise money from external sources by issuing debt or equity

Formula for Cash Flow

$$\text{Cash Flow} = \text{Sales} - \text{Variable cost} - \text{Fixed cost} - \text{Dep})(1 - Tc) + \text{Dep}$$

Formula for Net Present Value

$$NPV = -\text{ initial cost} + \text{cash flow } (1/r + 1/r(1+r)^t)$$

- Example: A store will cost $700,000 to open. Variable costs will be 38% of sales and fixed costs are $300,000 per year. The investment costs will be depreciated straight-line over the 8-year life of the store to salvage value of zero. The opportunity cost of capital is 13% and the tax rate is 40%. Find the operating cash flow if sales revenue is $750,000 per year. Find the Net present value.

Answer:

Finding operating cash flow:

Cash Flow = Sales – Variable cost – Fixed cost – Dep)(1 – Tc) + Dep

Answer:
Finding operating cash flow:
Cash Flow = Sales – Variable cost – Fixed cost – Dep)(1 – Tc) + Dep
= (700,000 – 285,000 – 300,000 – 87,500)(1-0.4) + 87,500
=$134,000
* Variable cost = 38% of sales (750,000)
* Depreciation = $700,000 / 8 = 87,500
Finding net present value:
NPV = - initial cost + cash flow $(1/r + 1/r(1+r)^t)$
= -700,000 + 134,000 $(1/0.13 + 1/0.13(1+0.13)^8)$
= $-56,964.78

- **Thursday, March 19, 2015: Week 10**

Chapter 15: Venture Capital, IPOs, and Seasoned Offerings

Venture Capital

- Venture Capital: the money invested to finance a new firm
- Venture capitalists are investors who are prepared to back an untried company in return for a share of the profits
- An angel investor is a wealthy individual who invests in early-stage ventures
- Venture capitalists know that the success of a business depends on the efforts its owner-managers put in
- Typically, restrictions are placed on the management and venture capitalists advance the funding to the firm in stages rather than all upfront
- Venture Capital Companies – companies that provide capital to new innovative companies

The Initial Public Offering (IPO)

- Initial Public Offering (IPO): first offering of stock to the general public
- Underwriter: Firm that buys an issue of securities from a company and resells it to the public
- Spread: Difference between public offer price and price paid by underwriter
- The sale of an IPO is usually managed by an underwriting firm, which purchases the issue for resale to investors
- Underwriters also provide procedural and financial advice to the issuing firm
- The costs of an issue can be significant
  - -Direct costs include the preparation of a prospectus, legal and administrative fees and the underwriter's fees
  - -Indirect cost is the underpricing of the issue
- A firm can use a rights issue to sell its shares to existing shareholders
- It can use a general cash offer to sell its shares to the public
- Or, the firm can use a private placement and sell its securities to a small group of institutional investors

Rights Offering Example

- Example: ABC Corp has 9 million shares outstanding. $15/share market price. And 3 rights need to buy a share for $12 (subscription price). What will be the value of a share after the rights issue (ex. Right) and what will be the value of a right?

Answer:
What is the value of equity before the offering?
9M shares x $15/share = $135 M
How many new shares will be sold?
9M rights / 3 rights/share = 3 M new shares
How much money is being raised?
3M shares x $12/share = $36 M
Value of equity after offering?

How much money is being raised?
3M shares x $12/share = $36 M
Value of equity after offering?
$135 M + $36 M = $171 M
Value per share after offering (ex – rights)?
$171 M / (9M + 3M shares) = $14.25/share
Value of a right?
$15/share - $14.25/share = $0.75

- Example:MM's proposition I: Debt irrelevance proposition. In a world without taxes the value of a firm is not affected by its capital structure. Consider two firms identical except for capital structure. One firm is all equity Vu = Eu. The other firm has debt $V_L = E_L + D_L$. Each firm has the same earnings, X. Interest rate on debt r_D.

Answer:
Vu = 1,000,000
X = 150,000
Firm L has: $D_L = 600,000$
$E_L = 400,000$
$V_L = 1,000,000$
$r_D = 10\%$
Income Statements

	Firm U	Firm L
EBIT	150,000	150,000
Interest		60,000 (600,000 x 10%)
Net Income (to shareholders)	150,000	X - $r_D D_L$ 150,000 – 60,000 = 90,000

Invest $1,000 in Firm U
Income = (1,000 / 1,000,000) x 150,000 = $150
Return = 150 / 1,000 = 0.15 or 15%
Invest $1,000 in vertical slice of Firm L
Investment in debt = (600,000 / 1,000,000) x 1,000 = $600 of debt
Investment in equity = (400,000 / 1,000,000) x 1,000 = $400 of equity
Income from debt = (600 / 600,000) x 60,000 = $60 in interest
Return = 60 / 600 = 0.10 or 10%
Income from equity= (400 / 400,000) x 90,000 = $90 in dividends
Return = 90 / 400 = 0.225 or 22.5%
Return from investment in Firm L = (600 / 1,000) x 10% + (400 / 1,000) x 22.5% = 15%
Can buy the vertical slice if you want debt and equity

- Example: There is a 21% chance that the amount of oil in a prospective field is 6 million barrels and a 79% chance of 15 million barrels. If the actual amount of oil is 6 million barrels, the present value of the cash flows from drilling will be $2 million. If the amount is 15 million barrels, the present value will be $7 million. The cost to drill the well is $6 million. Suppose, a test that costs $175,000 can verify the amount of oil under the ground, is it worth paying for the test? What is the net present value of not testing? What is the net present value of testing? Should the company perform the test to verify the amount of oil under the ground?

Answer:
With no test:
Expected NPV = $6 million + 21%($2 million) + 79%($7 million) = $-50,000
With the test, if the test found 6 million barrels, the NPV of drilling is
-$6 million + $2 million = $-4,000,000
If the test found 15 million barrels, the NPV of drilling is
-%6 million + $7 million = $1,000,000
The alternative of not drilling in either scenario provides a NPV of zero. If the NPV

-%6 million + $7 million = $1,000,000
The alternative of not drilling in either scenario provides a NPV of zero. If the NPV under either scenario is greater than zero, we will drill under that scenario. Otherwise we will choose to not drill.
The expected NPV with the test is:
NPC (test) = -$175,000 + 21%(0) + 79%($1,000,000)
= $615,000
Since the expected NPV with the test is greater than the expected NPV without the test, we will choose the test.

- Example: Solo Inc. is proposing a rights offering. Presently there are 525,000 shares outstanding at $83 each. There will be 75,000 new shares offered at $55 each. What is the market value of the company after the offering is complete? How many rights will it take to buy one share? What is the ex-rights price? What is the value of a right?

Answer:
The market value of the company after the offering:
= Number of old shares x Current price
= 525,000 shares x $83/share + 75,000 shares x $55/share
=$47,700,000
The number of rights to buy one share:
= Original shares / Number of new shares
= 525,000 rights / 75,000 shares
= 7 rights/share
The ex-rights price:
= Dividing the value of the company / Total number of shares
= $47,700,000 / (75,000 + 525,000) shares
=$79.5
Value of the right:
= Original share price – value of the share after the rights offering
= $83 - $79.5
= $3.5

- **Tuesday, March 24, 2015: Week 11**

Chapter 16: Debt Policy

How Borrowing Affects Value in a Tax Free Economy

- Modigliani and Miller (MM): when there are no taxes and well functioning capital markets exits, the market value of a company does not depend on its capital structure. In other words, managers cannot increase form value by changing the mix of securities used to finance the company.
- MM Assumptions:
  - -Capital markets have to be 'well functioning'
  - -Investors can borrow/lend on the same terms as firms
  - -Investors can trade securities without restrictions
  - -Capital markets are efficient
  - -There are no taxes or costs of financial distress
- The shareholders themselves can replicate whatever a company achieves by changing its structure. MM called it 'home-made leverage'
- Restructuring does not affect operating income
  - -The operating risk, or business risk, of the firm is unchanged
  - -However, with more debt in the capital structure, the EPS becomes more risky. The financial risk of the firm increases
- MM's Proposition II
  - -The required return on a firm's equity increases as the firm's debt-equity ratio increases

$$r_{equity} = r_{assets} + D/E \times (r_{assets} - r_{debt})$$

-The required return on a firm's equity increases as the firm's debt-equity ratio increases

$$r_{equity} = r_{assets} + D/E \times (r_{assets} - r_{debt})$$

Capital Structure and Corporate Taxes

- Debt financing has an important advantage
- If the company pays tax, interest is a tax deductible expense
- The tax savings decrease the business risk
- Financial Risk: Risk to shareholders resulting from the use of debt
- Financial Leverage: Increase in the variability of shareholder returns that comes from the use of debt
- Interest Tax Shield: Tax savings resulting from deductibility of interest payments
- Tax Shield Calculation:

$$\text{Annual Tax Shield} = \text{Corporate Tax Rate} \times \text{Interest}$$
$$= T_c \times (r_{debt} \times \text{Amount of Debt})$$
$$= T_c \times (r_{debt} \times D)$$

$$\text{Pv of Perpetual Tax Shield} = \text{Annual Tax Shield} / r_{debt}$$
$$= [T_c \times (r_{debt} \times D)] / r_{debt}$$
$$= T_c \times D$$

- MM's Modified Proposition I

-In a world with corporate taxes but no financial distress costs, the value of a firm increases with leverage

-Such increase comes from the fact that there is a tax savings involved with leverage

Value of Levered Firm = Value of all – Equity financed firm + PV of tax shield

- MM's Modified Proposition II

-The increased required ROE indicates the fact that there is some increased level of risk that comes with leverage

$$r_{equity} = r_{assets} + D/E \times (1 - Tc) \times (r_{assets} - r_{debt})$$

- Corporate Taxes and the WACC

-Once the tax benefit is recognized, the WACC formula becomes:

$$WACC = (1 - Tc)\, r_{debt} (D / D + E) + r_{equity} (E / D + E)$$

Costs of Financial Distress

- Costs of Financial Distress: costs arising from bankruptcy or distorted business decisions before bankruptcy

Overall Mkt. Value = Value if all Equity Financed + PV Tax Shield – PV Costs of Financial Distress

- Bankruptcy Costs: The fees involved in a bankruptcy proceeding are paid out of the remaining value of the firm's assets. If there is a possibility of bankruptcy, the current market value of the firm is reduced by the present value of these potential costs
- Indirect Costs of bankruptcy: difficulty of running a company while it is going through bankruptcy
- Financial distress without bankruptcy: Firms may incur substantial costs even if they can postpone bankruptcy. Thus financial distress costs will be there

Explaining Financing Choices

- The Trade-Off Theory: Financial managers choose the level of debt which will balance the firm's interest tax shields against its costs of financial distress
- The Pecking Order Theory: states that firms prefer to issue debt rather than equity if internal finance is insufficient. This is because debt issues are less likely to be interpreted by market as a bad omen

internal finance is insufficient. This is because debt issues are less likely to be interpreted by market as a bad omen

- Financial Slack: means having cash, marketable securities, readily saleable real assets and ready access to the debt markets or to bank financing

Bankruptcy Procedures

- Bankruptcy: the reorganization or liquidation of a firm that can not pay its debts
- Workout: agreement between a company and its creditors establishing the steps the company must take to avoid bankruptcy.
- Liquidation: sale of a bankrupt firm's assets
- Reorganization: restructuring of financial claims on a failing firm to allow it keep operating

- **Thursday, March 25, 2015: Week 11**

Chapter 16: Debt Policy Cont.

- Because capital structure does not affect value when there are o taxes, investors can reproduce the return on equity of any capital structure they like
- Example: Suppose investor would prefer to invest in the equity of a firm with these assets, but only 20% debt.

$V = \$1,000,000$
$D_L = \$600,000$
$E_L = \$400,000$
$X = \$150,000$
$r_D = 10\%$
Answer:

	Firm L	Firm *
Debt	600,000	200,000
Equity	400,000	800,000
Value	**1,000,000**	**1,000,000**

Income Statement

	Firm L	Firm *
EBIT	150,000	150,000
Interest	(60,000)	(20,000)
Net Income	**90,000**	**130,000**
r_E	90,000 / 400,000 = 22.5%	130,000/ 800,000 = 16.25%

Put alpha of investment in equity Firm L, 1 – alpha in debt of Firm L.
Return on Investment = alpha(22.5%) + (1 – alpha)(10%) = 16.25
12.5 alpha + 10 = 16.25
alpha = 0.5
Therefore, 50% goes into debt, and 50% goes into equity for Firm L

Debt and Taxes

- Example: Two firms with identical assets. Each firm has earnings of $1,000. Firm U is all equity financed. Firm L is $1,000 of debt paying 10% interest. Corporate tax rate is 30%

Answer:
Income Statements

	Firm U	Firm L
EBIT	1,000	1,000
Interest	0	(100)
Taxable Income	**1,000**	**900**
Tax (30%)	(300)	(270)
Net Income	**700**	**630**

Tax (30%)	(300)	(270)
Net Income	**700**	**630**
Total Income to Sock and bond holders	**700**	**730** (*$30 of interest shield)
Interest Tax Shield		30

Suppose with no debt, $r_E = 15\%$

$V_U = 700 / 0.15 = \$4{,}667$

With debt, D = 1,000

Tax Shield = $30 per year

Suppose debt will be held for 5 years and then the firm will go back to all equity:

$V_L = V_U$ + PV of tax shield

$30 tax shield is 5-year annuity

PV of tax shield = 30 [(1/0.10) – (1 / 0.10(1.10)^5)] = 114

$V_L = V_U$ + PV tax shield

$V_L = 4{,}667 + 114 = \$4{,}781$

Suppose debt is permanent:

PV of tax shield = annual tax shield / r_D

= 30 / 0.10 = 300

$V_L = 4{,}667 + 300 = 4{,}967$

$D_L = \$1{,}000$

$E_L = V – DL = 4{,}967 – 1{,}000 = 3{,}967$

With permanent debt: $V_L = V_U + TcD$

Maximize value of firm by becoming all debt

$D = V_U / (1 – Tc)$

- Example: VU = $4,667 Tc = 30%

Answer:

Maximum value

$D = V_U / (1 – Tc)$

= 4,667 / (1 – 0.30)

= 6,667

With no debt:

$r_A = r_E = 15\%$

With debt:

$V_L = 4{,}967$ $E_L = 3{,}967$ $D_L = 1{,}000$ $r_D = 10\%$

MM Modified Proposition II

$r_E = r_A + D/E\ (1 – Tc)(r_A – r_D)$

= 15% + 1,000/3,967(1 – 0.10)(15% - 10%)

= 15.88%

Check: stockholders get net income = $630

r_E = 630 / 3,967 = 0.1588 or 15.88%

WACC = $D/V(1 – Tc)r_D + E/V(r_E)$

= 1,000/4,967 (1 – 0.30) (10%) + 3,967/4967 (15.88%)

= 14.09%

- **Tuesday, March 31, 2015: Week 12**

Chapter 18: Payout Policy

How Dividends are Paid

- Cash dividend: payment of cash by the firm to its shareholders
- Regular cash dividends are generally paid quarterly
- Extra dividends are one-time dividends and unlikely to be repeated
- Declaration Date: date on which the board of directors declares the dividend for the

- Extra dividends are one-time dividends and unlikely to be repeated
- Declaration Date: date on which the board of directors declares the dividend for the next quarter
- Ex-dividend Date: date that determines whether the stockholder is entitled to a dividend payment; anyone holding stock before this date is entitled to a dividend
- Record Date: person who owns stock on this date received the dividend
- Payment Date: date on which firm actually mails out dividend checks
- Stock Dividend: distribution of additional shares, instead of cash, to the firm's shareholders
- Stocks Split: Issue of additional shares to a firm's shareholders
- Reverse Split: Issue of new shares in exchange for old shares, which results in the reduction of outstanding shares
- Dividend Reinvestment Plan (DRIP): Enables shareholders to reinvest dividends into additional new shares
- Share Purchase Plan: allows shareholders to make cash contributions toward the acquisition of new shares
- Example: XYZ Inchas 2 million shares currently outstanding at a price of $15 per share. The company declares a 50% stock dividend. How many shares will be outstanding after the dividend is paid? After the stock dividend what is the new price per share and what is the new value of the firm?

Answer:

Share Repurchase

- Dividend vs. Stock Repurchase
- Stock Repurchase: Firm buys back stock from its shareholders

-Note that a cash dividend and a share repurchase leave a shareholder in the same financial position

How Do Companies Decide on Dividend Payments?

- Dividend Payout Ratio: Percentage of earnings paid out as dividends
- Information Content: dividend increases send good news about the future cash flow and earnings
- Dividend cuts send bad news

Why Dividends May Reduce Firm Value

- If dividends are taxed more heavily than capital gains, then a policy of paying high dividends would hurt firm value
- In Canada, both capital gains and dividends are taxed at a lower rate than interest and other types of income

- Managers look to future cash flows when setting the dividend
- MM proved in perfect and efficient capital markets dividend policy is irrelevant
- However, in the absence of perfect capital markets, dividend policy might be relevant, especially due to tax issues

Stock Dividend/Stock Split

- Example: Company has 2 million shares outstanding. Price is $15/share. Company declares a 50% stock dividend. (If you have 40 stock you'll get 2 more; half)

Answer:
Original value of equity:
2M shares x $15/share = 30 million
New shares Issued:
2M shares x 0.50 = 1 million
Total shares after stock dividend:
2M + 1M = 3 million shares
Price per share after dividend:

Total shares after stock dividend:
2M + 1M = 3 million shares
Price per share after dividend:
30M / 3M shares = $10/share
3-for-2 stock split:
shares after = 3/2 x original shares
new price = 2/3 x original shares

- Example: Firm declares $1/share cash dividend ($100,000 total)

Answer:
After dividend

Cash	$50,000	Debt	$0
Assets	850,000	Equity	900,000
Value	$900,000	Value	$900,000

Shares Outstanding	$100,000
Price per share	900,000
Shares	100,000

= $9/share = 10 – 1
Firm instead declares a 10% share repurchase ($100,000 total):
After repurchase

Cash	$50,000	Debt	$0
Assets	850,000	Equity	900,000
Value	$900,000	Value	$900,000

Shares outstanding 100,000 – 0.10 x 100,000 = 90,000
Price per share = $900,000 / 90,000 = $10/share
Suppose the firm has earnings of $200,000 with cash dividend:
EPS= $200,000 / 100,000 = $2
P/E = $9/$2 = 4.50
With share repurchase:
EPS = $200,000 / 90,000 = $2.22
P/E = $10 / $2.22 = 4.50
*One reason why a firm might do a repurchase; to increase the earnings per share