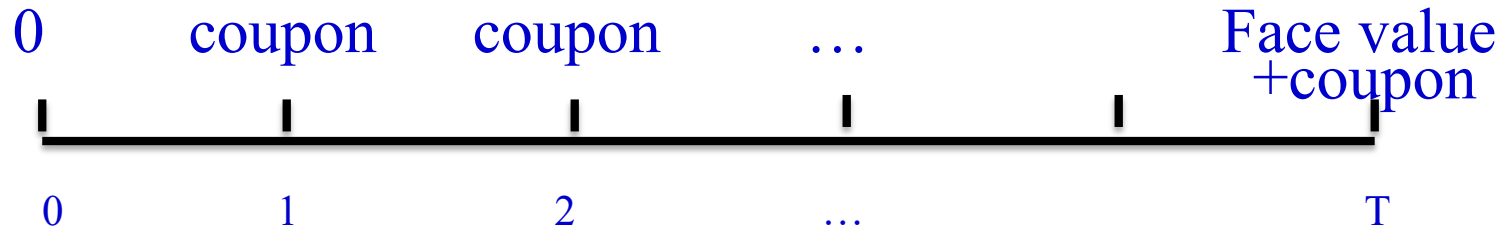
FIN2010 Financial Management

Lecture 7: Stock Valuation

Review—Bond Price

- Bond:



- Fair valuation = PV of future cash flows
  - If hold until maturity, cash flows = t coupons + principal
  - Proper discount rate: often use yields of similar bonds

$$\text{Fair value} = Coupon * \frac{1-\frac{1}{(1+r)^t}}{r} + \frac{par\ value}{(1+r)^t}$$

- Three key relationships in bond valuations
- Market price: determined by supply and demand.

Review—Yield

- Yield: discount rate that equates the PV(future cash flows) and the market price
  - Expressed in APR
  - Can be different from actual return
  - price ↓⇒ Yield ↑
- Determinants of Bond Prices and Yield
  - Promised cash flow streams
  - Required return.
    - Interest rate risk
    - Default risk
    - Liquidity risk
    - Call feature
    - Reinvestment risk
    - Maturity

Agenda

- Stock pricing overview
- Method 1: dividend discount model
- Method 2: comparable pricing
- Method 3: discounted free cash flow model
- Final word

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Asset Valuation- What is Value?

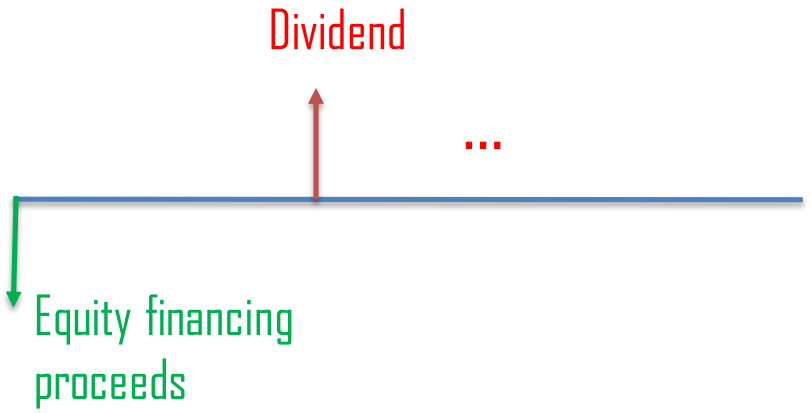
- **Book value**: accounting value of the asset. Objective and backward looking
- **Market value**: the market price at which the asset trades in an open marketplace. Objective, equal to the price we need to pay, and changing all the time.
- **Intrinsic/fair value**: what the price of a security should be worth. Subjective.

- Asset valuation: use models to determine fair value and then make investment decisions.

What is a Stock?

- Corporate's perspective:

What we own (Asset)	What we owe (Debt) What is left over (Equity)



- Investor's perspective:
  - Cash flow:

  - Rights: vote, claim to dividend
  - What do I have no control of?
    - Cannot make day-to-day decisions
    - Cannot force the company to pay dividends

Stock Valuation—Overview

- Key: predicting unknown cash flows in the future and determining required return
  - Discounted dividend model: forecast what dividend investors will get
  - Discounted free cash flow model: forecast how much a firm can earn (free cash flow)
  - Comparable pricing: use the prices of comparable firms

- But predicting the future is hard! No one can accurately predict the future. As an investor or financial analyst, we can only try our best.

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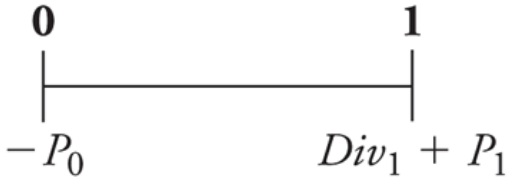
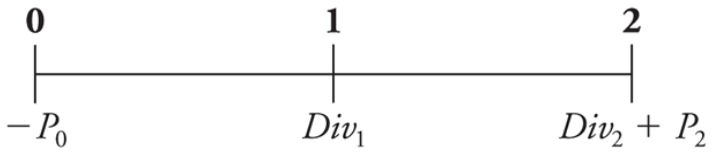
The Dividend Discount Model

- What is the price if we plan to hold the stock for one year?



$$P_0 = \left(\frac{Div_1 + P_1}{1 + r_E} \right)$$

- What is the price if we plan to hold the stock for two years?



$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2}$$

  - r_E: discount rate. Also called cost of equity in stock valuation

The Dividend Discount Model

- What if you plan to hold the stock for N years?

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{P_N}{(1 + r_E)^N}$$

- In cases when a firm is expected to operate forever, we can let N go to infinity and write it as follows:

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \frac{Div_3}{(1 + r_E)^3} + \cdots = \sum_{n=1}^{\infty} \frac{Div_n}{(1 + r_E)^n}$$

- *The price of any stock is equal to the present value of the expected future dividends it will pay.*

The Dividend Discount Model

- The challenge: virtually impossible to forecast an infinite number of dividends
  - Therefore, we tend to make simplified assumptions about the future dividends
- Based on the assumptions we make, the DDM is classified into three categories:
  - ***Zero growth model****:* dividends are constant over time
  - ***Constant growth model****:* dividends grow at a constant rate
  - ***Variable growth model***: dividends change for a number of years and then stabilize to a sustainable growth rate

Zero Growth Model

Zero growth model: the firm's future dividends will be a constant number forever.

- Zero Growth stock is a perpetuity: $P_0 = Div / r_E$
  Where r_E is the required return on equity

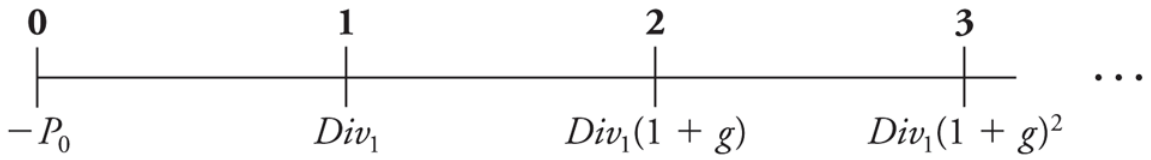
Example – Zero Growth Model

Suppose you are thinking of purchasing the stock of Moore Oil, Inc. You expect the stock to pay a $0.50 dividend every quarter and the required return is 10% per year. What is the price?

$P_0 = .50 / (10\% / 4) = \$20$

Constant Growth Model

- Constant Dividend Growth: the firm's future dividends will grow at a constant rate, *g*, forever



$$P_0 = \frac{Div_1}{r_E - g}$$

- The value of the firm depends on the current dividend level, the cost of equity, and the growth rate
- Insights:
  - g ↑, price↑ — Firms with higher growth potential have higher stock price
  - r_E ↑, price↓ — When investors demand higher return, a stock has lower stock price. Investors often demand higher return for riskier stock.

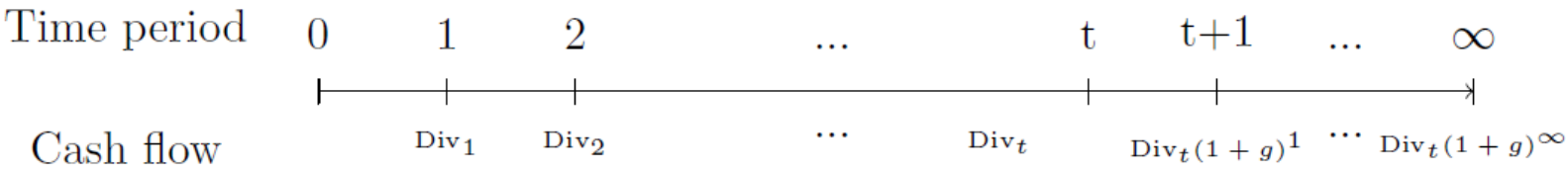
Example – Constant Growth Model

- Consolidated Edison, Inc. is a regulated utility company that services the New York City area. Suppose Con Edison plans to pay $2.60 per share in dividends in the coming year. If its equity cost of capital is 6% and dividends are expected to grow by 2% per year in the future, estimate the value of Con Edison's stock.

$$P_0 = \frac{Div_1}{r_e - g} = \frac{2.6}{6\% - 2\%} = \$65$$

Variable Growth Model

- Dividend is unstable in the first stage, and then it grows at a sustainable constant rate in the second stage.



$$\text{Value of stock} = \text{PV of dividend in the 1st stage} + \text{PV of dividend in the 2nd stage.}$$

$$= \frac{\text{Div}_1}{1+r} + \frac{\text{Div}_2}{(1+r)^2} + \ldots + \frac{\text{Div}_t}{(1+r)^t} + \frac{\frac{\text{Div}_t(1+g)}{r-g}}{(1+r)^t}$$

Example – Discounted Dividend Model

- Example: Assume that there are 3 companies, and they all just paid exactly the same annual dividend of $2.25 a share. In addition, the future annual rate of growth in dividends for each of the 3 companies has been estimated as follows. What are the fair prices if the discount rate is 10%?

Firm A	Firm B	Firm C	
g=0	g=6%	Year 1	$2.53
		Year 2	$2.85
i.e., dividends are expected to remain at $2.25/share	for the foreseeable future	Year 3	$3.20
		Year 4	$3.60
		Year 5 and beyond	g=6%

Solution:

- Firm A: price $= \frac{2.25}{10\%} = 22.5$
- Firm B: price $= \frac{2.25*(1+6\%)}{10\%-6\%} = 59.63$
- Firm C: price= $\frac{2.53}{(1+10\%)^1} + \frac{2.85}{(1+10\%)^2} + \frac{3.2}{(1+10\%)^3} + \frac{3.6}{(1+10\%)^4} + \frac{\frac{3.6*(1+6\%)}{10\%-6\%}}{(1+10\%)^4} = 74.68$

Which Model to Choose?

Zero growth model :

- Generally used to price preferred stock

Variable growth model:

- Appropriate for companies expected to experience rapid or variable rates of growth for a period and then settle down to a more stable growth rate thereafter
- This, in fact, is the growth pattern of many young companies, so the model has considerable application in practice.

The constant-growth model:

- Best suited for common stocks of mature, dividend-paying companies
- They are probably large companies (or even some mature mid-cap companies) that have demonstrated an ability to generate steady rates of growth.
- The growth rates may not be identical from year to year, but they tend to move within a relatively narrow range.

What is the Appropriate g?

- The math in dividend discount model is easy. Real life is complicated.
- Biggest challenge: how to determine $div,\ r_E,\ \ g$
- Will discuss in depth how to determine r_E and div in future lectures.
- Here we briefly discuss a simple model of g and try to get a sense of what is driving stock price

Dividend Growth Rate

- **Method 1**: Calculate the growth rate of dividends in the past. Shortcoming: backward looking.
- **Method 2**: look at the key forces that actually drive the g. One commonly used approach:
  - Assumption: the ROE (return on equity) and the dividend payout ratio (b) are constant. Retention ratio (rr) = 1 – payout ratio (b)

$$\begin{aligned}
\text{Dividend growth(g)} &= \frac{\text{Div}_{t+1} - \text{Div}_t}{\text{Div}_t} \\
&= \frac{\text{ROE} * \text{Equity}_{t+1} * b - \text{ROE} * \text{Equity}_t * b}{\text{ROE} * \text{Equity}_t * b} \\
&= \frac{\text{Equity}_{t+1} - \text{Equity}_t}{\text{Equity}_t} \\
&= \frac{\text{Equity}_t + \text{Equity}_t * \text{ROE} * (1-b) - \text{Equity}_t}{\text{Equity}_t} \\
&= ROE * (1-b) \\
&= ROE * rr
\end{aligned}$$

$$g = ROE * rr = ROE * (1-b)$$

Insights from the Simple Model

- Apply the simple model of g into constant growth model:

$$P_0 = \frac{Div_1}{r_e - g} = \frac{ROE * Equity * b}{r_e - ROE\ (1-b)}$$

- Although the model is simple, it does provide some insights:
  - Higher ROE, higher stock price. More profitable firms have higher prices
- If a firm wants to increase its share price, should it ↑ or ↓ b?
  - In other words: should it cut investment (increase its dividend) or increase investment (cut dividend)?
  - The answer will depend on the profitability of the firm's investments

$$\frac{\partial P}{\partial b} = \frac{ROE\ * Equity\ (r - ROE)}{[r - ROE * (1-b)]^2}$$

  - ➢ When r<ROE, increasing dividend (decreasing investment) will decrease stock price
  - ➢ When r>ROE, increasing dividend (decreasing investment) will increase stock price
  - ➢ Increasing efficient investment leads to a price increase

Limitations of the Dividend Discount Model

- Cannot be used on stocks that do not pay dividends
- Div, r and g can only be estimated with error
- Results are extremely sensitive to r and g (small changes in r and g can lead to large changes in the estimated stock price)
- Forecasting g requires forecasting the ROE and dividend payout rate, which could be hard to predict

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Method of Comparable

- We estimate the value of the firm based on the value of other comparable firms
- Another application of the Law of One Price: similar stocks should be price similarly
- Similar firms: similar in future growth and risk
  - Same industry
  - Similar size and maturity level

Method of Comparable- Valuation multiples

- Stock shares do not have the same unit
  - Two firms are both worth $100M:
    (1) Firm A issued 1M shares, so each share is worth $100
    (2) Firm B issued 10M shares, so each share worth ?
- To adjust for the differences in scale, we calculate the share value in terms of a **valuation multiple**
  - Stock price= (…) Per share * price / (...) per share (multiples)
  - *Analogous to:*
  - House price= # of square meters/house * price/square meter

Valuation Multiples

- Most commonly used scale measure:
  - Earnings per share (EPS) = $\frac{Net\ income}{\#\ of\ shares}$
  - P/E Ratio (市盈率): the multiple
  - Stock's fair value=EPS*appropriate P/E ratio
- Appropriate P/E ratio: often use similar firms' P/E ratio.
- Other commonly used valuation multiples
  - Stock's fair value=cash flow per share * appropriate price/cash flow per share
  - Stock's fair value=sales per share * appropriate price/sales per share
  - Stock's fair value=book value per share *appropriate price/book value per share

Example-Valuation Multiples

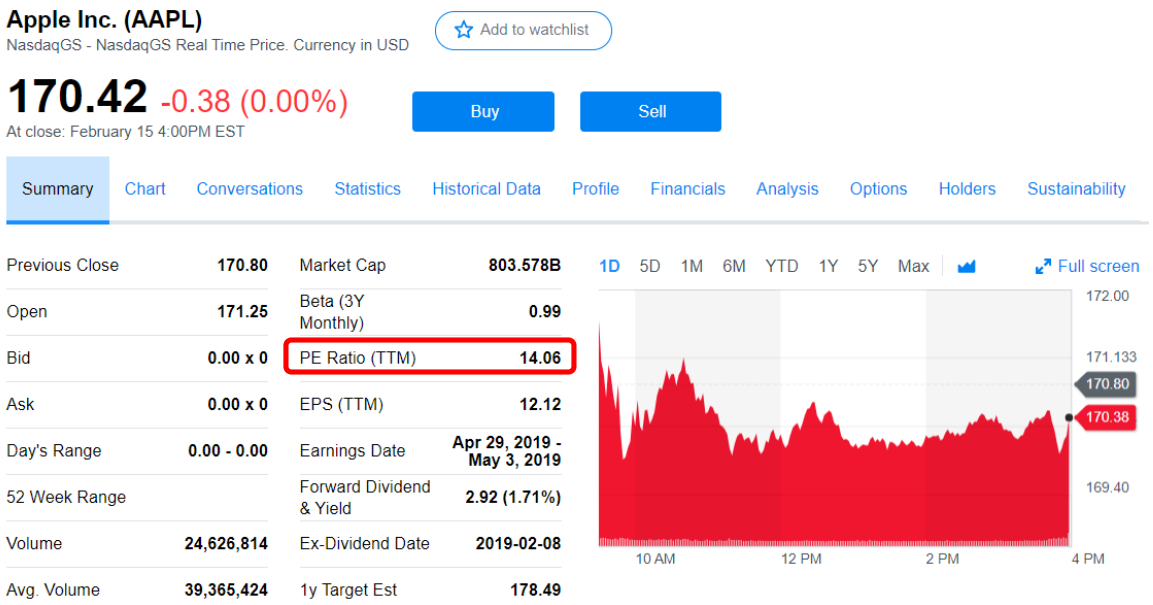
- Suppose furniture manufacturer Herman Miller, Inc., has earnings per share of $1.38. If the average P/E of comparable furniture stocks is 21.3, estimate a value for Herman Miller using the P/E as a valuation multiple. What are the assumptions underlying this estimate?

- Solution: P_0= $1.38 *21.3= $29.39

- Underlying assumptions: Herman Miller is similar to an average firm in the industry

Where can We Find P/E Ratios?

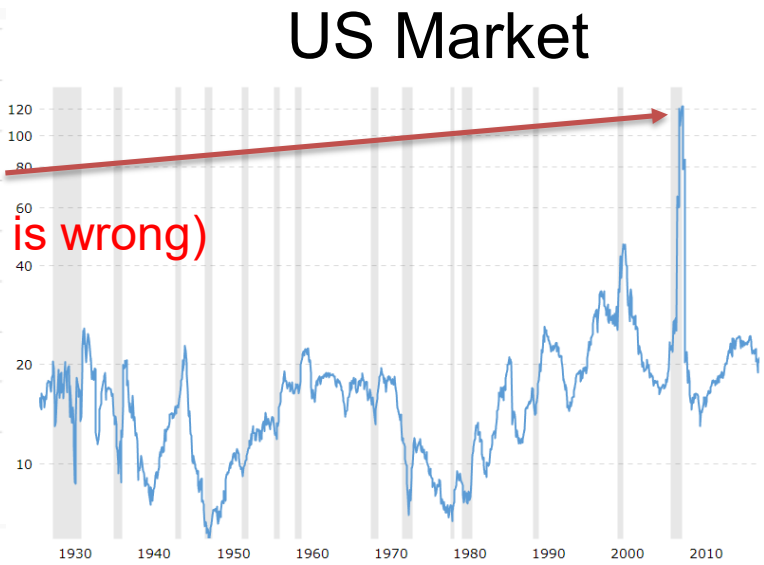
- Yahoo Finance: [Apple Inc.]

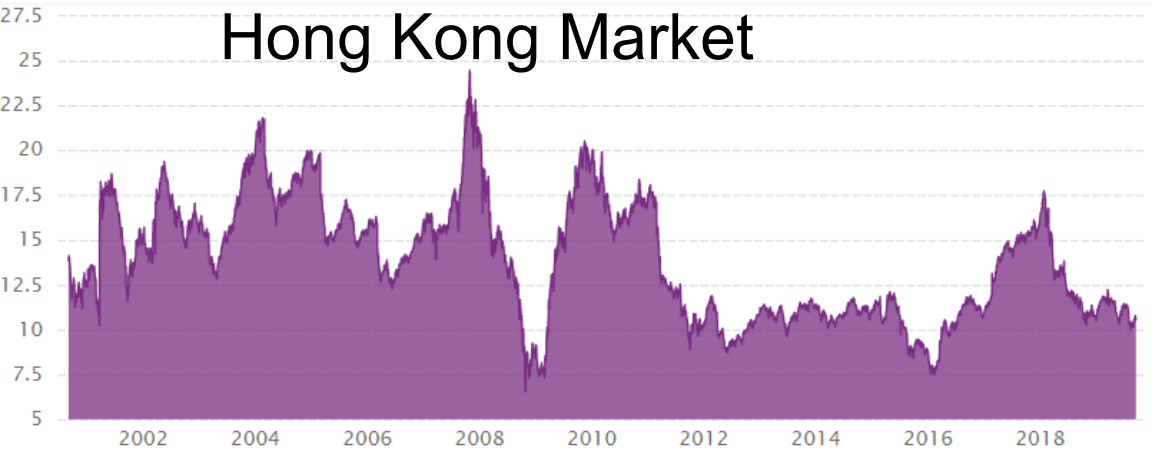


- Sina Finance: [贵州茅台]

Historical P/E Ratios of Different Markets

Bubble period
(Whole market is wrong)





Limitations of Comparable Pricing Method

- There is no clear guidance on how to
  - Choose similar firms
  - Adjust for differences in expected future growth rates, risk, or differences in accounting policies
- This method values a firm relative to similar firms in the market. However, the similar firms may be wrongly priced themselves, which may lead to a wrong valuation of the targeted firm
  - In contrast, discounted dividend model have the advantage that they can incorporate specific information about the firm's cost of capital or future growth

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Discounted Free Cash Flow Model

(We will discuss this in detail in the 2nd half of the semester)

- Intuition: enterprise value = PV(free cash flow of the firm)
  - Enterprise value = equity value + debt value →
    - Equity value = firm value – debt value
  - Logic: the cash generated by a firm can be paid out as dividends (although its manager may decide not to).
- Pros:
  - Very flexible. Can be used to analyze any firm (esp. for startups, which are difficult to value using the other 2 methods).
  - Can justify any price
- Cons:
  - Need to make a LOT of assumptions, which might be difficult to justify.

DFCF Model Example

- Aswath Damodaran's valuation of Tesla

	Base year	*1*	*2*	*3*	*4*	*5*	*6*
Revenue growth rate		70.00%	70.00%	70.00%	70.00%	70.00%	56.55%
Revenues	$ 1,328.70	$ 2,258.78	$ 3,839.93	$ 6,527.88	$ 11,097.40	$ 18,865.58	$ 29,534.07
EBIT (Operating) margin	-1.64%	-0.23%	1.18%	2.60%	4.01%	5.43%	6.84%
EBIT (Operating income	$ (21.86)	$ (5.21)	$ 45.46	$ 169.63	$ 445.34	$ 1,023.93	$ 2,020.72
Tax rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.00%
EBIT(1-t)	$ (21.86)	$ (5.21)	$ 45.46	$ 169.63	$ 445.34	$ 1,023.93	$ 1,879.27
- Reinvestment		$ 659.64	$ 1,121.38	$ 1,906.35	$ 3,240.79	$ 5,509.35	$ 7,566.30
FCFF		$ (664.84)	$ (1,075.92)	$ (1,736.72)	$ (2,795.45)	$ (4,485.42)	$ (5,687.03)
NOL	$ 1,070.00	$ 1,075.21	$ 1,029.74	$ 860.11	$ 414.78	$ -	$ -
Cost of capital		10.03%	10.03%	10.03%	10.03%	10.03%	9.63%
Cumulated discount factor		0.9088	0.8260	0.7507	0.6822	0.6200	0.5656
PV(FCFF)		$ (604.23)	$ (888.67)	$ (1,303.68)	$ (1,907.10)	$ (2,781.02)	$ (3,216.43)

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Stock Valuation Techniques: The Final Word

- No single technique provides a final answer regarding a stock's true value. All approaches require assumptions or forecasts that are too uncertain to provide a definitive assessment of the firm's value.
  - Most real-world practitioners use a combination of these approaches and gain confidence if the results are consistent across a variety of methods
  - Other methods: total payout model, dividend and earnings approach
  - Additional analysis: sensitivity analysis, scenario analysis…

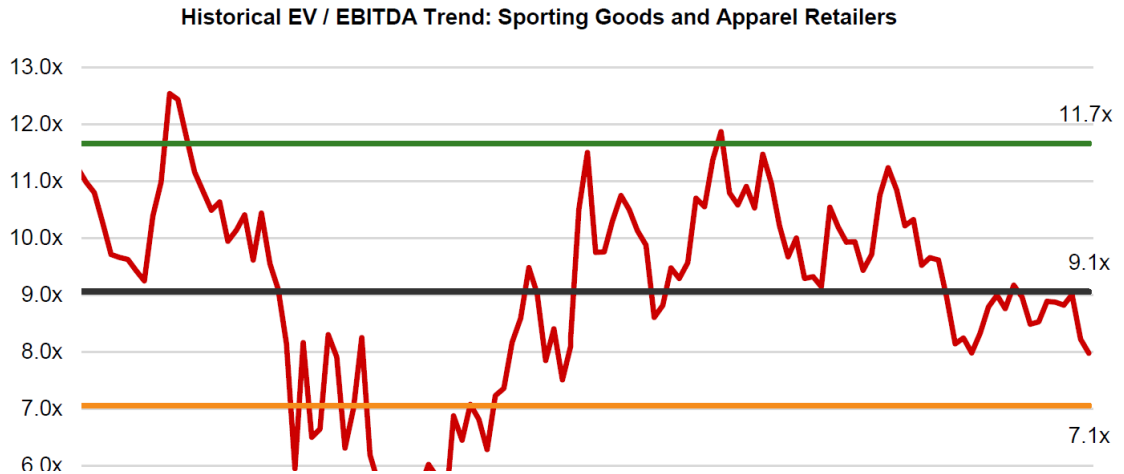
A Glimpse at an Analysts' Report

- https://www.cfainstitute.org/en/societies/challenge/past-champions

Financial Model – Base Case
Canadian Tire Retail
INCOME STATEMENT
Revenue from Stores Opened 2014 and Prior
Revenue from New Stores ('15E - '20E)
Revenue
Cost of Goods Sold
Gross Margin
Selling, General, and Administrative (excl. D&A)
Depreciation and Amortization
EBIT
Taxes
Unlevered Net Income
EBITDA
FREE CASH FLOW SCHEDULE
Unlevered Net Income
Add: Depreciation and Amortization
Less: Capital Expenditures
Less: Change in Net Working Capital
Unlevered Free Cash Flow
Terminal Growth Rate
Terminal Value
WACC (Diversified Retail)
Present Value Factor (Mid-Year Convention)
PV of Unlevered Free Cash Flow
Implied Enterprise Value

Appendix A3: FGL Terminal Multiple Assumptions

The terminal multiple for FGL was determined through a 10-year trading multiples analysis of comparable companies in the sporting goods retailing subsector. The global median (second quartile) of the 10-year trading multiples analysis was used as the terminal multiple. The chosen competitor set included: Foot Locker, Inc., Cabela's Incorporated, Dick's Sporting Goods Inc., Sportman's Warehouse Holdings, Inc., and Hibbett Sports, Inc.



- Source: written report of the 2016 champion

Analysts Often Disagree with Each Other!

- Analysts' price targets of Tesla Inc.

Date	Brokerage	Action	Rating	Price Target
2/11/2019	**Canaccord Genuity**	Upgrade	Hold → Buy	$330.00 → $450.00
2/6/2019	**Royal Bank of Canada**	Reiterated Rating	Sell	$245.00
2/5/2019	**Morgan Stanley**	Reiterated Rating	Equal → Equal Weight	$291.00 → $283.00
2/4/2019	**DZ Bank**	Reiterated Rating	Sell	
1/31/2019	**CIBC**	Reiterated Rating	Outperform → Outperform	$418.00 → $437.00
1/31/2019	**JPMorgan Chase & Co.**	Reiterated Rating	Underweight → Underweight	$220.00 → $230.00
1/31/2019	**JMP Securities**	Reiterated Rating	Mkt Outperform → Outperform	$408.00 → $406.00
1/31/2019	**Jefferies Financial Group**	Set Price Target	Buy	$450.00

Why are We Learning This?

- The purpose of the lecture is not
  - To teach you how to make accurate forecasts so you can get rich
- But rather, the purpose is to get you familiar with the techniques so you are able to
  - Understand the assumptions and flaws of the pricing models
  - Be able to draw insights from the models even though they are flawed
  - Understand the news/reports
  - Take more advanced finance courses
  - Think critically

Summary

- Three commonly used methods to price stocks
  - Dividend discount model
  - Method of comparable pricing
  - Discounted free cash flow model
- No single method is perfect.
  - We typically use a combination of different methods in reality.
  - Analysts disagree with each other all the time.

Next Lecture—Risk and Return

- Motivation
- Definition and Measurement of Risk and Return
- Empirical Facts on Historical Returns