Unit 5. Common Stock: Valuation and Aggregate Measures of Stock Markets

Readings Chapters 9 and 10

Chapter 9. The Valuation of Common Stock

1. The investor's expected return
2. Valuation as the Present Value (PV) of dividends and the growth of dividends
3. The investor's required return and stock valuation
4. Alternative valuation techniques: Multiplier models
5. Valuation and the efficient market hypothesis

Valuation

- What is the value of a stock (or any asset)?
  - The value of a stock lies in its ability to generate future income, either dividend yield or capital gain, or both.
  - The process of figuring out the value of a stock (or any asset) is called "valuation".
- There are several valuation methods, each with its advantages and disadvantages
  - Valuation using Dividend Growth Model
  - Alternative valuation methods:
    - Valuation using P/E ratio
    - Valuation using Cash flow

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1.The Expected Return (Copied from Unit02, slide 36)

$$E(r)=\frac{E(D)}{P}+E(g)$$

- E(r)= the expected return
- E(D)= the expected dividend or interest income
- P= the price of the asset
- E(g)=the expected growth in the value of the asset

Example: An investor buys a stock for $20/share and expects to earn a dividend of $1/share for the year. He also expects to sell the stock for $25/share after one year. What is his expected return?

$$E(r)=\frac{E(D)}{P}+E(g)=\frac{\$1}{\$20}+\frac{\$25-\$20}{\$20}=0.05+0.2=0.25=25\%$$

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2. Valuation as The Present Value of Dividends and the Growth of Dividends

- For an investment to be attractive, the expected return must equal to or exceed the investor's required return.
  - Required return is the return an individual investor demands to justify the purchase of the stock.
  - This return included the risk-free rate (rf), plus a premium for bearing the risk associated with investments in common stock (rm and beta).
- The valuation of a stock involves bringing all future cash inflows back to the present (using Present Value Factor) at the appropriate discount rate.
  - Different investors may have different discount rates. For the individual investor, the discount rate is the required return.
- Decision:
  - If the valuation exceeds the price of a stock, the stock is undervalued. Buy the stock.
  - If the valuation is less than the price, the stock is overvalued. Short the stock.

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2.1. Dividend Growth Valuation Model – Dividend Grows at Rate g

Notations:
V=Valuation
D_0=Initial dividend (first year)
k=Discount rate=Required return
g=Dividends annual growth rate

- If the dividend grows at the rate of g annually, valuation is

$$V=D_0\frac{(1+g)}{(k-g)}$$

Note the dividend valuation model with no growth is just a special case of the dividend growth valuation model with g=0)

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2.2. Examples

1. Given the following data, what is the value of the stock?
   - Required return (discount rate) k=12%
   - Present dividend D_0=$1
   - Dividend growth rate g=6%
- Answer: This is a valuation case using dividend growth valuation model.

$$V = \frac{D_0(1+g)}{(k-g)} = \frac{\$1*(1+6\%)}{(12\%-6\%)} = \$17.67$$

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2. Now suppose this stock is traded in the market for $18 a share. Should this investor (with a 12% required return) buy this stock?
- Answer: No. Because the stock's value is only $17.67, less than the market price of $18. Thus this stock is overvalued.

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3. Given the following data, what is the value of the stock?
   - Required return k=12%
   - Present dividend D_0=$1
   - Dividend growth rate g=0% (no growth)
- Answer: This is a valuation case when there is no dividend growth.

$$V = \frac{D_0(1+g)}{(k-g)} = \frac{D_0}{k} = \frac{\$1}{12\%} = \$8.33$$

If the market price of this stock is over $8.33, don't buy. If it's under $8.33, buy.

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2.3. How to Valuate More Complicated Dividend Patterns?

- If the dividend patterns are more complicated, such as a combination of super growth for several years and slow growth later on, one can still use the dividend growth model. The only difference is that the equation setup is a bit more complicated.

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2.4. Some Generalizations from the Dividend Growth Model

- The larger the initial dividend, the higher the valuation.
- The higher the dividend growth rate, the higher the valuation.
- The lower the required return (discount rate), the higher the valuation.

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3. Required Return and Stock Valuation

- Note that in the previous examples a required return was just given to you. But how is the required return determined?
- Review the Capital Assets Pricing Model (CAPM) and the Security Market Line of Unit02.

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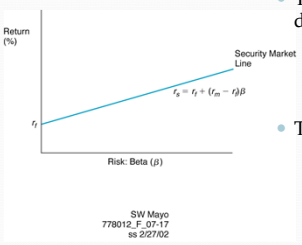
Unit02: Beta Coefficients and The Security Market Line



- The return on a stock depends on
  - The risk free rate (r_f)
  - The return on the market (r_M)
  - The stock's beta (β)
- The return on a stock is
  - $r_s = r_f + (r_M - r_f)\beta$
  - E.g. If r_M=6%, rf=3%, stock ABC β is 1.2 then return on stock ABC is
  - r_s= 3% + (6% - 3%)x1.2 =6.6%

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3.1. Required Return

- r_s is the required return.
- In the context of stock valuation, this r_s is typically denoted as k
- K=r_s= r_f + (r_M - r_f)β, where
  - r_f = the risk free rate (i.e.Treasure Bill rate)
  - r_M = the return on the market
  - β = the stock's beta

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3.2. An Example of Computing Required Return

- The annual risk-free rate of return is 4%. The overall market rate of return is 12%. ABC stock has a Beta of 1.4. What is the required return for ABC stock, adjusting for its risk?
- Answer: The required return k is:

$$k = r_f + (r_M - r_f)\beta = 4\% + (12\% - 4\%) * 1.4 = 15.2\%$$

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3.3. An Example of Valuation Incorporating Risk-Adjusted Required Return

- Firm XYZ's current dividend is \$2.00 (D_0), which is expected to grow annually at 5% (g). The risk free rate is 3.5% (r_f), and the market return is expected to be at 10% (r_M). If the Firm XYZ stock has a Beta of 1.2, what should be the value of XYZ's stock?
- Answer:
  - Step 1. Compute required return
    - k=3.5%+(10%-3.5%)*1.2=3.5%+7.8%=11.3%
  - Step 2. Compute valuation V using Dividend Growth Model:

$$V = \frac{D_0(1+g)}{(k-g)} = \frac{\$2.00 * (1+5\%)}{(11.3\% - 5\%)} = \$33.33$$

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3.4. Beta and Valuation

- If Beta is larger, the risk is higher. Thus the required return is higher to compensate for that risk. Assume dividend and dividend growth rate are the same, the stock with a higher beta has a lower value.

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3.5. Advantages and Shortcomings of the Dividend Growth Model

- Advantages
  - Theoretically sound
  - Practically doable with assumptions – can provide useful information beyond hunchs and intuitions.
- Shortcomings
  - If a stock does not pay a dividend right now, as in this case of many growth stocks, valuation can be difficult.
  - Beta can be different for the same stock, depending on data used to compute Beta.
  - The risk-free rate is not an easy determination. Long-term Treasury Bill (TB) rate can be different from short-term TB rate
  - Similar problems exist on rate of return of the market and dividend growth rate. Basically many assumptions need to be made in order for the Dividend Growth Model to work well.

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4. Alternative Valuation Techniques: Multiplier Models

- There are some alternative valuation techniques analysts use to identify stocks for purchase. These techniques include
  - P/E ratio – Price Earning ratio
  - Cash flow
  - P/S ratio – Price Sales ratio
  - PEG ratio – P/E divided by the growth rate of Earnings
  - Adjusted PEG
  - Price/Book ratio
  - Return on equity to Price/Book ratio
  - Profit margin to Price/Book ratio

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4.1. Valuation Using P/E Ratio

- P/E ratio is the price to earning ratio of a stock.
  - E.g., If the current stock price is $50, and earnings per year on the stock is $20, then the P/E=50/20=2.5
- Stock valuation using P/E:
  - P=(m)(EPS)
    - m is the "appropriate P/E ratio".
    - EPS is earnings per share = E is P/E ratio.
  - E.g., If the financial analysts believe the appropriate P/E ratio (m) for a particular stock should be, say 5, and the earning per share (EPS) for this stock is $3.5, then the value of this stock is P=m*EPS=5*$3.5=$17.5

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Weakness in the Use of P/E Ratio

- Question of the appropriate multiplier
  - What is an appropriate P/E (m)?
  - Today most stocks trade between 15-25 P/E range. In the Dot-com bubble the average P/E had risen to 32. The collapse in earnings caused P/E to rise to 46.5 in 2001.
  - A possible solution is to use current industrial average P/E ratio as the appropriate P/E (m).
- Differences in estimated earnings
  - A particular year's earnings may contain special items that do not occur every year.
  - Adjustments should be made for such events.
  - Historical earnings may not predict future earnings.

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4.2. Valuation Using Cash Flow

- Cash flow is the balance of the amounts of cash being received and paid by a business.
- The valuation process of using cash flow is essentially the same as is used with P/E ratio, except cash flow is substituted for earnings.
- Again, the determination of future cash flow and the determination of appropriate multiplier are at the discretion of the analyst.

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4.3. Price to Book Ratio (P/B) and Price to Sales Ratio (P/S)

- P/B ratio is the ratio of stock price to the per-share book value (B).
  - Book value is an accounting term denoting the company's total assets less its total liabilities.
  - Per share book value is "Book value"/ "Number of outstanding shares"
- P/S ratio is the ratio of stock price to per share sales.
- Conceptually using P/B ratio or P/S ratio for valuation of stocks is the same as using P/E ratio.
- Same weaknesses apply

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4.4. The PEG Ratio

- Standardizes the P/E ratio for growth

$$PEG = \frac{P/E}{\text{Earnings growth rate}}$$

- Low PEG ratios (below 1.0) suggest undervaluation.
- E.g., If a stock's P/E is 15, and the per-share earning growth rate is 10%, PEG=15/10=1.5

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Adjusted PEG Ratio

- Adjusted PEG ratio takes both dividends and growth into consideration.

$$PEG_{Adj.} = \frac{P/E}{\text{Growth rate} + \text{Dividend yield}}$$

- E.g., If in the previous example dividend yield is 2% on top of the 10% earning growth rate, then the adjusted PEG=15/(10+2)=1.25
- Low values of adjusted PEG is better than high values.

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4.5. Additional Ratios

$$\frac{\text{Return on equity}}{\text{Price/Book}}$$

- Return on equity is earnings divided by a firm's equity and is a measure of performance.
- The higher the better.

$$\frac{\text{Profit margin}}{\text{Price/Sales}}$$

-Profit margin is the ratio of earnings to sales.
-The higher the better.

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An Example

- One can get stock technical information online. Yahoo Finance is a good place to go. Here is the information on Wal-Mart I found on Yahoo Finance. http://finance.yahoo.com/q/ks?s=WMT. The site updates numbers frequently so what you see may be different from what I cite below.
  - P/E ratio – there are two P/E ratios (Trailing P/E is 18.80 and Forward P/E is 16.73).
  - P/S ratio – P/S is 0.61
  - PEG ratio – PEG ratio (5 year expected) is 1.53.
  - P/B ratio - P/B is 3.65
  - Return on equity to Price/Book ratio.
    - Return on equity is 20.75%
    - Return on equity to P/B=20.75%/3.65=5.68%
  - Profit margin to Price/Book ratio
    - Profit margin is 3.38%
    - Profit margin to P/B = 3.38%/3.65=0.93%

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5. Valuation and the Efficient Market Hypothesis (EMH)

- Stock valuation and selection is not a mechanical process.
- These ratios can provide information, but they are by no means definitive.
- Depending on the data and method, analytical techniques may be manipulated to achieve pretty much any preconceived results.
- The result is that few investors and securities analysts consistently outperform the market on a risk-adjusted basis – consistent with the Efficient Market Hypothesis (EMH)

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Chapter 10. Investment Returns and Aggregate Measures of Stock Markets

1. Measures of stock performance: Averages and Indexes
2. The Dow
3. Other indexes of aggregate stock prices
4. Rates of return on investments in common stocks
5. Reducing the impact of price fluctuations: Averaging

1. Measures of Stock Performance: Averages and Indexes

- Many averages and indexes have been developed to track security price movements, such as the Dow Jones averages and the S&P 500.
- The composition for these indexes differ.
  - Dow Jones Industrial Average includes 30 companies.
  - S&P 500 includes 500 companies
- The methods of calculation also differ:
  - Price-weighted average
  - Value-weighted average
  - Equal-weighted average
  - Geometric weighted average

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1.1. A Price-weighted Average

- Price of stock A $10
- Price of stock B $20
- Price-weighted average is ($10 + $20)/2 = $15
- The Dow-Jones Industrial Average uses this method.

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1.2. A Value-weighted Average

- Weights the prices by the number of shares outstanding
- Continue with the previous example:
  - Price of stock A = $10
  - Price of stock B = $20
- Additional information is needed for value-weighted average:
  - Number of shares outstanding of stocks A: 1,000,000
  - Number of shares outstanding of stocks B: 10,000,000
- Total value of each stock needs to be calculated
  - Total value of stock A = $10*1,000,000=$10,000,000
  - Total value of stock B = $20*10,000,000=$200,000,000
- Weighted Average Price is total value divided by total shares
  - Weighted average price=$210,000,000/(1,000,000 +10,000,000) = $19.09
- The S&P 500 stock index uses the value-weighted average method.

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1.3. An Equal-weighted Average

- This approach assumes equal dollar amount invested in each stock.
- Continue with previous example
  - Price of stock A is $10
  - Price of stock B is $20.
- Assume one invests $100 in each stock
  - Share of A purchased = 100/10=10
  - Share of B purchased = 100/20=5
- Average price of a share: $200/(10+5)=$200/15 = $13.33
- Note with this approach it does not matter whether you assume $100 invested in each stock or $1 million invested in each stock. The answer is the same.

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1.4. A Geometric Average

- Instead of dividing, take the 1/n root. Example:
  - Price of stock A = $10
  - Price of stock B = $20
  - n=2 (two stocks)
- Geometric average price of a share: (10)(20)^(1/2) = $14.14
- The Value-Line stock index uses the geometric average method.

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1.5. Comparison of Prices over time: Graphical illustrations

- Often historical trend of stock prices are illustrated using graphs.
- While the horizontal axis is always "Time (year, month, or day)", the vertical axis can have different scales so interpretation needs to be carefully done.
  - Absolute price scale: Equal dollar amount change as the vertical axis.
  - Relative price scale: Equal percentage change as the vertical axis.

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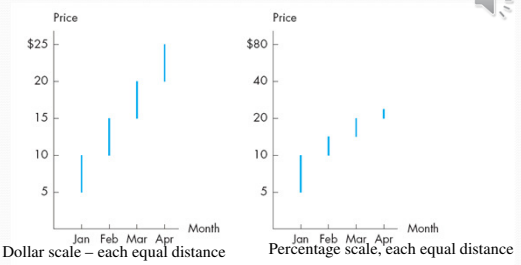
Use of Different Scales to Illustrate Stock Price Movements



Dollar scale – each equal distance on the vertical axis is a $5 increase

Percentage scale, each equal distance on the vertical axis is a 100% increase.

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Graphical Illustrations: Linear Scale vs. Log Scale

- For Composite Indexes, often there are two ways: Linear scale and Log scale
  - Presentation of data on a log scale can be helpful when the data cover a large range of values – the logarithm reduces this to a more manageable range.
  - Next slide shows two Dow Jones Composite Index graphs: Linear scale and Log scale.

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Use of Linear vs. Log Scale: Dow Jones Industrial Average from 1928 to 2011

The above graph is in linear scale. Because there are lots of data points, the trend in the early years is difficult to see.

The above graph is in log scale. The trend in the early years is much easier to see. However one needs to be careful when interpreting this graph.

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Common Stock Market Indexes

- There are many stock market indexes, domestic and international.
- Yahoo Finance has a great list:
  - Major world indices: http://finance.yahoo.com/intlindices?e=americas
  - Major U.S. indices: http://finance.yahoo.com/indices?e=dow_jones

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2. Dow Jones Industrial Average

- Perhaps the most well-known index is the Dow Jones Industrial Average.
- Created by Charles Dow in 1896. Of the original 12, only GE is currently still part of the index.
- In 1916, number of stock in the index increased to 20. It increased to 30 in 1928.
- Currently comprised of 30 largest and most widely held public companies in the U.S.
- Price-weighted and scaled average.
  - Scaled average means the divisor changes so that substitutions of one firm for another has no impact on the average.
- For a good description of the history and some interesting anecdotes see http://en.wikipedia.org/wiki/Dow_Jones_Industrial_Average

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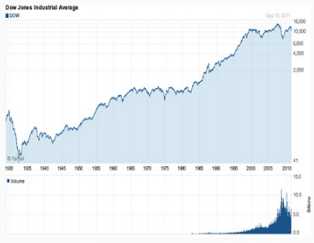
Annual Price of the Dow Jones Industrial Average 1928 to 2011: Log Scale



- When first published it stood at 40.94.
- The largest one day % gain was 15.34% on 3/15/1933.
- The largest one day % drop since 1914 was 22.61% on "Black Monday" – 10/19/1987.

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3. Additional Aggregate Measures of the Stock Market Include:

- Standard & Poor's 500 stock index:
  - Contains the stocks of 500 large-cap corporations.
  - http://en.wikipedia.org/wiki/S&P_500
- NYSE composite index
  - http://en.wikipedia.org/wiki/NYSE_Composite
- Value Line Stock average
  - http://en.wikipedia.org/wiki/Value_Line_Composite_Index
- Nasdaq composite index
  - http://en.wikipedia.org/wiki/NASDAQ
- Dow Jones Wilshire 5000 index
  - http://en.wikipedia.org/wiki/Wilshire_5000
- Russell 1000, Russell 2000, Russell 3000
  - http://en.wikipedia.org/wiki/Russell_Indexes
- S&P 400 MidCap
  - http://en.wikipedia.org/wiki/S&P_400
- S&P 600 SmallCap
  - http://en.wikipedia.org/wiki/S%26P_600
- S&P 1500
  - http://en.wikipedia.org/wiki/S&P_1500

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3.1. Specialized Indexes

EXHIBIT 10.1 Selected Specialized Indexes and Ticker Symbols

Index	Ticker Symbol
American Markets	
AMEX Internet	^IIX
AMEX Networking	^NWX
Pacific Exchange Technology	^PSE
Philadelphia Semiconductor	^SOXX
PHLX TheStreet.Com Internet	^DOT
Nasdaq Industrials	^IXID
Nasdaq Banks	^IXBX
Nasdaq Biotech	^NBI
Nasdaq Computer	^IXK
Nasdaq Insurance	^IXIS
Nasdaq Telecommunications	^IXUT
Nasdaq Transportation	^IXTR
Foreign Markets	
World Leaders	^NIN
Nikkei 225 (Tokyo)	^N225
FTSE-100 (London)	^FTSE
Hang Seng Index (Hong Kong)	^HIS
Shanghai Composite (China)	^SSEC
Seoul Composite (Korea)	^KSII

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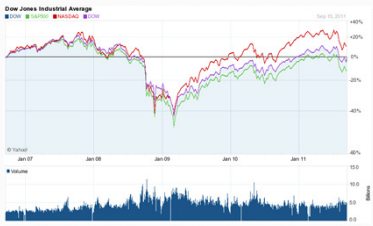
3.2. Aggregate Measures of the Stock Market Prices and Correlations



- The graph shows 5-year trend in Dow Jones Industrial Average (^DJI), S&P (^GSPC), and NASDAC (^IXIC).
- One can see that the correlations among aggregate measures of the American stock markets is high.

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3.3. Bond Averages

- In addition to stock indexes, there are aggregate measures of the bond market.
- Bond averages are expressed in yield instead of prices.
- Yield can be expressed in both dollars and percentage changes.
- Bond Indexes: Can be categorized based on their broad characteristics, such as whether they are government bonds, corporate bonds, high-yield bonds, mortgage-backed securities, etc. They can also be classified based on their credit rating or maturity.
  - An example: Dow Jones Corporate Bond Index
    - http://www.djindexes.com/mdsidx/?event=showCorpBond

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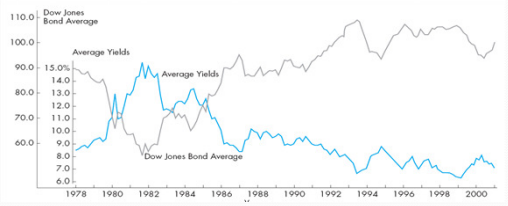
Dow Jones Bond Average and Yields on Mergent's (Moody's) Aaa-Rated Bonds, 1978–2000



Inverse relationship between bond price and yield. During the period covered in this graph, bond prices (Dow Jones Bond Average, blue line) was going down while yield (gray line) was going up.

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3.4. The Volatility Index (VIX) – the "fear" index

- The VIX is a measure of investors' expectations about near-term market volatility.
- The calculation of the VIX is based on the S&P 500 index options and is expressed in percentages (options are explained in later units).
  - Low values suggest low volatility (e.g. VIX=10)
  - High values suggest high volatility (e.g. VIX=50)

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Historical Data on VIX (Linear Scale)

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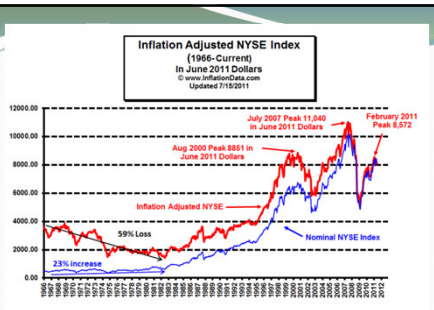
3.5. Securities Prices and Inflation – Changes in Real Terms (Instead of Nominal)

- Sometimes one might be interested in measuring securities price performance in comparison to a general price index, such as the Consumer Price Index (CPI).
- When adjusted for CPI, stock performance is much more modest.



This is a graph showing nominal NYSE index (blue line) and inflation-adjusted NYSE index (red line). The key point is to look at the slope of these lines: the real price increases are a lot less than the nominal price increases due to inflation.

4. Rates of Return on Investments

- Just as there are many ways to compute an average, there are several ways to compute a return.
  - Holding period return
  - Dollar-weighted return (also called: internal rate of return, true annualized rate of return)
  - Time-weighted return (also called: average percentage return)

4.1.Holding Period Return (HPR)

- The percentage earned on an investment during a period of time

$$HPR = \frac{P_1 + D}{P_0} - 1$$

- P_0 is purchase price, P_1 is sell price, D is dividend.
- Example: You bought a stock for $20. After a year the price rose to $25 but fell back to $22 at the end of the second year. The total dividend payment for the two years was $2. What was the holding period return?
- Answer:
  - In this case the holding period is two years. For holding period return only the beginning and ending prices matter, the middle price ($25 in this case) does not matter.
  - Holding period return=($22+$2)/$20-1=20%
- Major weakness of HPR
  - Does not consider the length of time

4.2. Dollar-Weighted Rate of Return (Also called "True Annualized Return" or " Internal Rate of Return")

- This measure takes compounding into consideration.
- It is the discount rate that equates the cost of an investment with the present value of cash flows generated by the investment.
- See equation below. Solve for r.
- Computation can be very tedious. But if the dividend amount is the same every year, one can simplify the dividend part of the equation using Present Value Factor Sum (PVFS, see Week 1 notes or FCS3450 notes)

$$P_0 = \frac{D_1}{(1+r)} + \ldots + \frac{D_n}{(1+r)^n} + \frac{P_1}{(1+r)^n}$$

Weaknesses of the internal rate of return:
- Assumes cash flows are reinvested at that internal rate of return.

- Consider the previous example again. You bought a stock for $20. After a year the price rose to $25 but fell back to $22 at the end of the second year. Dividends were $1 per year. What was the true annualized return?
- Answer:

$$20 = \frac{1}{(1+r)} + \frac{1}{(1+r)^2} + \frac{22}{(1+r)^2},$$

Solving for r using Excel by trying different numbers for r, r=9.76%

4.3. Time-Weighted Rate of Return – Simple Average and Geometric Average

- The time-weighted rate of return is to compute return for every year, and then take the average.
  - Simple average is also called 'average percentage return".
  - Geometric average is the true compound rate.
- Consider the previous example again. You bought a stock for $20. After a year the price rose to $25 but fell back to $22 at the end of the second year. Dividends were $1 per year. What was the average percentage return? What was the geometric time-weighted rate of return?
- Answer:
  - Year 1 return=(25+1)/20-1=30%
  - Year 2 return=(22+1)/25-1= -8%
  - Simple average (Average percentage return)=(30%-8%)/2=11%
  - Geometric average =[(1+30%)(1-8%)]^(1/2) -1 = 9.36%

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4.4. A Simplified Case: Return without Dividends

- If there is no dividend distribution the computation of return is greatly simplified. Here is an example:
- You bought a stock for $20. After a year the price rose to $25 but fell back to $22 at the end of the second year. There was no dividend distribution. What was the (1) holding period return? (2) dollar-weighted average return (true annualized return), and (3) time-weighted average return (average percentage return) and geometric time-weighted return?
- Answer:
  - 1. Holding period return:
    - (22/20)-1=20%
  - 2. True annualized return:
    - 20=22/[(1+r)^2], r=4.88%
  - 3. Average percentage return:
    - Year 1 return=25/20-1=25%
    - Year 2 return=22/25-1= -12.5%
    - Average percentage return=(25%-12.5%)/2=6.25%
    - Geometric time-weighted return=[(1+25%)(1-12.5%)]^(1/2)-1=4.58%

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4.5. Which Rate of Return Measure is the Best?

- The dollar-weighted measure of rate of return makes the most sense in theoretical consistency.
- However the time-weighted rate of return can be useful to evaluate the performance of a portfolio over time.

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5. Studies of Investment Returns

- Studies indicate stocks earn about 9% annually on average.
- The Ibbotson results (the industry benchmark) 1926-2007 data for common stocks:
  - Mean: 10.4%
  - Standard Deviation: 20.2%, meaning that 68% of the times the return fell between -10.2% to 30.6%
- Pay attention to the issues of reinvestment assumption and time diversification when interpreting study results.

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6. Reducing the Impact of Price Fluctuation: Averaging Strategies

- Averaging is one strategy designed to reduce the impact of security price fluctuations.
- Two averaging methods:
  - Dollar cost averaging through periodic purchase
  - Averaging down - buy additional shares after prices fall
- These strategies may reduce the average cost of the stock.

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