The Stock Market, the Theory of Rational Expectations, and the Efficient Markets Hypothesis

Extra Material-(Narrated Power Point

http://highered.mcgraw-hill.com/sites/0072946733/student_view0/chapter7/narrated_powerpoint_presentation.html

http://www.karlwhelan.com/Teaching/International%20Monetary/part12.pdf

Article on stock valuation

http://www.gurufocus.com/stock-market-valuations.php

On analysis of stock market

http://education.wallstreetsurvivor.com/Stock-Market-Forecast-2010-Q1

Ch 7: Stock Markets and Efficient Market Hypothesis. (*)
Topics:
1. The price of common stock;
2. The Generalized Dividend Model and the Gordon Growth Model;
3. The theory of Rational Expectations and its applications in financial markets (Efficient Market Hypothesis);
4. Empirical evidence on the Efficient Market Hypothesis.

Learning Objective.
To understand how stocks are valued and to examine the Efficient Market Hypothesis.

Equities/Stocks, like bonds as financial, are one of the key assets in the personal wealth portfolio of individuals, as well as one of the several ways of obtaining external finance for productive organizations. This chapter discusses the fundamental theories that help us in computing the price of the stock, and in explaining what forces cause prices to vary over time, including the important role of expectations in influencing the expected returns on equities.

The Markets for Stocks. (*)

In Canada, stocks are traded in two types of markets: organized stock exchanges(like Toronto Stock exchange) and over-the-counter(OTC) markets.

Stock Exchanges are organized markets where trading takes place in a central facility, either electronically through a broker or by open bidding. The Toronto Stock Exchange (TSE) is the largest stock exchange in Canada. Equities are traded in Toronto while derivative products are traded in the Montreal stock exchange.

Aggregate Stock Indexes
The aggregate movement of individual stocks is measured by stock indexes. The most famous stock index is the Dow Jones Industrial Average, which currently contains thirty large firms. The S&P (Standard and Poor's) 500 Stock Index contains five hundred stocks and is a value-weighted price index. It is considered the benchmark index for large stocks traded and contains about 80 percent of the value of all U.S. stocks. The Nasdaq index is also value-weighted and is heavily influenced by the large technology stocks that trade on the NASDAQ market.

Toronto Stock Exchange 300 (TSE300), which was an index of 300 stocks traded at the Toronto Stock Exchange. Recently, TSE300 has been replaced by the S&P (Standard and Poor's)/TSX composite index.

Common Stock

- Common stock is the principal way that corporations raise equity capital.
- Stockholders have the right to vote and be the residual claimants of all funds flowing to the firm.
- Dividends are payments made periodically, usually every quarter, to stockholders.

Several Kinds of “Value”

- There are several types of value, of which we are concerned with four:
  - Book Value – The carrying value on the balance sheet of the firm’s equity (Total Assets less Total Liabilities)
  - Tangible Book Value – Book value minus intangible assets (goodwill, patents, etc)
  - Market Value - The price of an asset as determined in a competitive marketplace
  - Intrinsic Value - The present value of the expected future cash flows discounted at the decision maker’s required rate of return

9.1 Reading Stock Listings

- The following newspaper stock listing is usually printed as a horizontal string of information
- The listing is for IBM, which is traded on the New York Stock Exchange

Reading Stock Listings

Yr Hi	Yr Lo	Stock	Sym
123 1/8	93 1/8	IBM	IBM
Div	**Yld %**	**PE**	**Vol 100**
4.84	4.2	16	14591
Day Hi	**Day Lo**	**Close**	**Net Chg**
115	113	114 3/4	+1 3/8

Reading Stock Listings

- Hi = 123 1/8: The highest price the stock has traded at over the last 52 weeks
- Lo = 93 1/8: The lowest price the stock has traded at over the last 52 weeks
- Stock = IBM: The stock's name
- Sym = IBM: The stock's symbol

Reading Stock Listings

- Div = 4.84: The last quarterly dividend multiplied by 4
- Yld % = 4.2: Dividend yield; (Annualized dividend ÷ stock price)
- PE = 16: Price-to-earnings; (Latest price ÷ last 4 actual dividends)
- Vol 100s = 14591*100; Volume of exchange traded shares

Reading Stock Listings

- Hi = 115: Highest share price of the day
- Lo = 113: Lowest share price of the day
- Close = 114 3/4: Days closing share price
- Chg = 1 3/8: Change in closing price from previous trading day

The price of common stock. (*)

Common stocks have two sources of future returns: future cash flows of dividends(which are periodic-like quarterly- payments) and the sale price of the stock when it is sold (yielding capital gain). Common stocks, compared to bond and other assets, carry greater risk of fluctuations in returns, and, therefore, must potentially pay a greater rate of return to induce investors to buy the stocks. This is referred to as the **required rate of return** (discussed below).

The equity valuation model, discussed below, relates the present stock price to the present value of its future cash flows(dividends and capital gains) in the same way that a bond is priced in terms of its future cash flows(coupon payments).

Equation Total Return

$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}}$$

Rate of Total Return

$$= \text{Dividend Yield} + \text{Capital Gain Yield}$$

$$= \frac{\text{Dividend}}{\text{Original Price}} \times 100\% + \left(\text{Selling Price} - \text{Purchase Price}\right) \times 100\%$$

One-Period Valuation Model

$$P_0 = \frac{Div_1}{(1+k_e)} + \frac{P_1}{(1+k_e)}$$

P_0 = the current price of the stock

Div_1 = the dividend paid at the end of year 1

k_e = the required return on investment in equity

P_1 = the sale price of the stock at the end of the first period

Generalized Dividend Valuation Model

The value of stock today is the present value of all future cash flows

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{(1+k_e)^n}$$

If P_n is far in the future, it will not affect P_0

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t}$$

The price of the stock is determined only by the present value of the future dividend stream

Gordon Growth Model

$$P_0 = \frac{D_0(1+g)}{(k_e - g)} = \frac{D_1}{(k_e - g)}$$

D_0 = the most recent dividend paid

g = the expected constant growth rate in dividends

k_e = the required return on an investment in equity

Dividends are assumed to continue growing at a constant rate forever

The growth rate is assumed to be less than the required return on equity

According to the above model, current stock prices depend on three factors: (a)current dividends, (b) expected growth rate of dividends, and (iii) the required return on equity, which in turn is the sum of two components: available alternative risk free return, and the riskiness of the stock.

This approach is also termed as the fundamentalist approach, which argues that fundamentals, such as the flow of anticipated dividends of a company, determine the price of its stocks.

Example 9.1 Stock Prices and Returns

Problem

Suppose you expect Longs Drug Stores to pay dividends of $0.56 per share in the coming year and trade for $45.50 per share at the end of the year. If investments with equivalent risk to Longs' stock have an expected return of 6.80%, what is the most you would pay today for Longs' stock? What dividend yield and capital gain rate would you expect at this price?

Example 9.1 Stock Prices and Returns

Solution

Using Eq. 9.1, we have

$$P_0 = \frac{Div_1 + P_1}{1 + r_E} = \frac{0.56 + 45.50}{1.0680} = \$43.13$$

At this price, Longs' dividend yield is $Div_1 / P_0 = 0.56 / 43.13 = 1.30\%$. The expected capital gain is $\$45.50 - \$43.13 = \$2.37$ per share, for a capital gain rate of $2.37 / 43.13 = 5.50\%$. Therefore, at this price Long's expected total return is $1.30\% + 5.50\% = 6.80\%$, which is equal to its equity cost of capital.

Example Valuing a Firm with Constant Dividend Growth

Problem

Consolidated Edison, Inc. (Con Edison), is a regulated utility company servicing the New York City area. Suppose Con Edison plans to pay $2.30 per share in dividends in the coming year. If its equity cost of capital is 7% and dividends are expected to grow by 2% per year in the future, estimate the value of Con Edison's stock.

Example 9.2 Valuing a Firm with Constant Dividend Growth

Solution

If dividends are expected to grow perpetually at a rate of 2% per year, we can use Eq. 9.6 to calculate the price of a share of Con Edison stock:

$$P_0 = \frac{Div}{r_E - g} = \frac{\$2.30}{0.07 - 0.02} = \$46.00$$

Factors Affecting Stock Prices

- Business cycles
- Interest rate changes
- Investor sentiment about
  - Economy,
  - Earnings
  - And markets

- interest rate = risk free rate + risk premium, k_e = rf + rp
- then

$$P = \frac{D_0}{rf + rp - g}$$

$$P = \frac{D_0}{rf + rp - g}$$

- higher risk free rate, lower stock price
- higher risk premium, lower stock price
- higher dividends, higher stock price
- higher dividend growth, higher stock price

example

- D = $2, g = 2%, rf = 3%, rp = 5%
- P= $2/(.03+.05-.02)
- P = $2/.06 = $33.33

- what if risk premium rises to 7%?
  - P = $2/(.03+.07-.02) = $2/.08 = $12.50
- what if risk premium falls to 3%?
  - P = $2/(.03+.03-.02) = $2/.04 = $50
- Dividend discount model shows us why stock prices are volatile

Gordon Model- Applications.

The effect of monetary policy.

The Gordon's growth model can explain the effect of monetary policy on the stock's price(intrinsic value). It may be noted that monetary Policy affects the stock prices in two ways: (i) through changes in the required return rate, K_{Req}, (through changing r_f , return on risk free securities) and (ii)through influencing g. First, when bond returns decline(that is lower interest rates), investors in the stock market investors are willing to accept lower equity returns, which means higher P0. Second, when interest rates are reduced, economy expands(through increase in aggregate demand), profitability and dividends increase, resulting in higher, stock prices, P_0.

Economic conditions, uncertainties and Financial markets crisis.

When the economy enters a recessionary phase, stock prices start falling, predicated on the fear that the companies' profits would be adversely affected during economic slowdown. The falling stock prices, during recessionary conditions(as evidenced in 2009 stock markets crash) and associated economic uncertainties, can be explained by rising K_{Req} (through larger risk premium component, r_p, required to induce investors to invest in securities). Thus, in a bear market, the K_{Req} will be higher than in a bull market.

The growth prospects of the economy in general and of companies in particular(reflected in g) would have effect on the stock price movements.

Price-Earnings Ratio: The price/earnings ratio, which equals to the company's net income divided by its earnings per share, is a widely popular ratio reported for stocks. Earnings per share (EPS) is calculated to be equal to the company's net income minus the dividends paid to preferred stockholders and divided by the number of common shares outstanding.

A higher P/E ratio, usually, reflects a higher expectation of future company's growth potential, while a relatively low P/E ratio reflects that there is less potential for rapid growth of the company.

The factors that contribute to an increase in P/E ratio of a company may include, higher earnings growth rate of the company and higher than expected dividend amount announced by the company etc.

Price Earnings Valuation Method (Cont'd)

- The PE ratio can be used to estimate the value of a firm's stock.
- The product of the PE ratio times the expected earnings is the firm's stock price.
- (P/E) x E = P

Stock Analysis

- Fundamental analysis
  - Quantitative analysis
    - Based on financial statements
  - Qualitative analysis
    - More subjective
    - Examines management skill
- Technical analysis
  - Examines past performance
    - Of firm and market

How the Market sets Stock Prices.
(a)Theory of Rational Expectations in Financial Markets (Efficient Market Hypothesis).

(b) Behavioural Finance

(a)The theory of Rational Expectations and its applications in financial markets (Efficient Market Hypothesis).
Forecasting future stock prices

As the value of a share of stock is dependent on the expected future income from that stock, it is essential to understand how people form expectations in the market.

One well known mechanism, explaining how do people form expectations about future behavior of economic variables, like stock prices is known as the Rational Expectations model.

Rational Expectations

Rational expectations theory views expectations as being identical to the best guess of the future (**the optimal forecast**) that uses all available

$$X^e = X^{of}$$

If we applying the Rational expectations Hypothesis in calculating a Stock's Intrinsic Value , it can be shown that stock prices should equal a discounted present-value sum of expected future dividends, is usually known as the dividend-discount model.

That is, the prices in a financial market will be set so that the optimal forecast of a security's return using all available information equals the security's equilibrium return. The theory of Rational expectations, thus, assumes that outcomes that are being forecasted do not differ systematically from the market equilibrium results .

Random Walk

The theory of rational expectations says that the actual price will only deviate from the expectation if there is an 'information shock' caused by information unforeseeable at the time expectations were formed. Thus, changes in stock prices follow a random walk.

The term random walk describes a movement of a variable whose future value can not be predicted on the basis of the today`s values.

The Efficient Market

The **efficient-market hypothesis** (**EMH**) asserts that financial markets are "informationally efficient", or that prices on traded assets (*e.g.,* stocks, bonds, or property) already reflect all available information.

This framework seeks to explain the random walk hypothesis by positing that only new information will move stock prices significantly, and since new information is presently unknown and occurs at random, future movements in stock prices are also unknown and, thus, move randomly.

Therefore, according to theory, it is impossible to consistently outperform the market by using any information that the market already has.

In **strong-form efficiency**, share prices reflect all information, public and private, and no one can earn excess returns.

The efficient-market hypothesis requires that agents have rational expectations; that on average the population is correct (even if no one person is) and whenever new relevant information appears, the agents update their expectations appropriately.

Implications of the Theory of Rational Expectations

Even though a rational expectation equals the optimal forecast using all available information, a prediction based on it may not always be perfectly accurate

- It takes too much effort to make the expectation the best guess possible.
- Best guess will not be accurate because predictor is unaware of some relevant information.

Implications

- If there is a change in the way a variable moves, the way in which expectations of the variable are formed will change as well.
- The forecast errors of expectations will, on average, be zero and cannot be predicted ahead of time.

Efficient Markets: An Application of Rational Expectations

Recall

The rate of return from holding a security equals the sum of the capital gain on the security, plus any cash payments divided by the initial purchase price of the security.

$$R = \frac{P_{t+1} - P_t + C}{P_t}$$

$R =$ the rate of return on the security

P_{t+1} = price of the security at time $t + 1$, the end of the holding period

P_t = price of the security at time t, the beginning of the holding period

C = cash payment (coupon or dividend) made during the holding period

Implications of the EMH for the stock market: Investing in the Stock Market:

- Recommendations from investment advisors cannot help us outperform the market.
- A hot tip is probably information already contained in the price of the stock.
- Stock prices respond to announcements only when the information is new and unexpected.
- A “buy and hold” strategy is the most sensible strategy for the small investor.

Evidence Against Market Efficiency

- Small-firm effect
- January Effect
- Market Overreaction
- Excessive Volatility
- Mean Reversion
- New information is not always immediately incorporated into stock prices
- Chaos and fractals

(b)Behavioural Finance.

- The lack of short selling (causing over-priced stocks) may be explained by loss aversion.
- The large trading volume may be explained by investor overconfidence.
- Stock market bubbles may be explained by overconfidence and social contagion.

(b) Behavioural Finance.

Behavioral economists attribute the imperfections in financial markets to a combination of cognitive biases such as overconfidence, overreaction, representative bias, information bias, and various other predictable human errors in reasoning and information processing. Empirical evidence has been mixed, but has generally not supported strong forms of the efficient-market hypothesis.

Speculative economic bubbles are an obvious anomaly, in that the market often appears to be driven by buyers operating on irrational exuberance, who take little notice of underlying value. These bubbles are typically followed by an overreaction of frantic selling, allowing shrewd investors to buy stocks at bargain prices.

- Bubbles
  - Large gaps between actual asset price and fundamental value
  - Internet stock bubble of late 1990s
  - Housing bubble?
- Eventually the bubble bursts!

In the Generalized Dividend Valuation Model equation:

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n^e}{(1+k_e)^n}$$
$$= \sum_{t=1}^{n} \frac{D_t}{(1+k_e)^t} + \frac{P_n^e}{(1+k_e)^n}$$

i. "Fundamentals":

$$\sum_{t=1}^{n} \frac{D_t}{(1+k_e)^t} = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n}$$

ii. "Bubble":

$$\frac{P_n^e}{(1+k_e)^n}$$

Implications of efficiency evidence

- very difficult for average person to beat the market
  - trying to do so generates trading costs
- the alternative
  - buy-and-hold diversified portfolio
  - indexing

conclusion

- stock market price behavior combines
  - fundamentals
  - investor psychology
- markets are not perfectly efficient
  - field of behavioral economics, finance

- On rational Expectations
- http://www.tcd.ie/Economics/staff/whelanka/topic4.pdf
- Stocks Valuation
- http://www.gurufocus.com/stock-market-valuations.php
- Stock Dividend Model
- http://thismatter.com/money/stocks/valuation/dividend-discount-model.htm