FINANCIAL MARKETS cont’d

The Stock Market, the Theory of Rational Expectations, and the Efficient Market Hypothesis
Stocks or Company Shares

• Common stock is the principal way that corporations or companies raise equity capital.

• Holders of common stock own an interest in the corporation consistent with the percentage of outstanding shares owned.

• This ownership interest gives stockholders—those who hold stock in a corporation—a bundle of rights.

• The most important are the right to vote and to be the residual claimant of all funds flowing into the firm (known as cash flows), meaning that the stockholder receives whatever remains after all other claims against the firm’s assets have been satisfied.
Stocks

• Stockholders are paid dividends from the net earnings of the corporation.

• Dividends are payments made periodically, usually every quarter, to stockholders (in Ghana annually).

• The board of directors of the firm sets the level of the dividend, usually upon the recommendation of management.

• In addition, the stockholder has the right to sell the stock.
Common Stock - Rights

• Share of firm’s ownership:
  • Ownership interest- a bundle of rights - right to vote - right to sell stocks

• A residual claimant
  • Paid after all other creditors
  • “last in line”

• Limited liability
  • Shareholders cannot be liable beyond stock investment
Stock Market: 1950 - 2010

- Recall that stocks are a share of ownership in a corporation or firm.
- Question: What do we hope to gain by holding stocks?
Figure 5: Performance of GSE All-share index
Issues

• Stocks and How are stocks priced
• How to incorporate peoples expectations about the market
• Market Efficiency and Efficient Market Hypothesis
• rational expectations theory and adaptive expectation
• Explain the implications of the rational expectations theory
• efficient market hypothesis
• State and explain the three types of efficient market hypothesis
Measuring the Stock Market

• Stock market indexes—A stock index or stock market index is a measurement of the value of a section of the stock market. It is computed from the prices of selected stocks (typically a weighted average). It is a tool used by investors and financial managers to describe the market, and to compare the return on specific investments.

• Market capitalization is commonly utilized for benchmarking stock markets across countries or across time. As a measure of the value of all stocks listed on an exchange, it intends to summarize the development of a stock market
The Value of a security or Asset in Finance

• One basic principle of finance is that the value of any investment is found by computing the value today of all cash flows the investment will generate over its life.

• For example, a commercial building will sell for a price that reflects the net cash flows (rents – expenses) it is projected to have over its useful life.

• Similarly, we value common stock as the value in today’s dollars (or cedis) of all future cash flows.

• The cash flows a stockholder might earn from stock are dividends, the sales price of the stock, or both.
Stock Valuation

• Recall:
  • We value an asset based on the present value of the expected future cash flows
  • For stocks there are dividend payments which affect the resale price
STOCK VALUATION

• If stock is bought and held for one period to get a dividend, then sold.
• We call this valuation - the one-period valuation model
One-period valuation model

- The cash flows consist of one dividend payment plus a final sales price. When these cash flows are discounted back to the present, the following equation computes the current price of the stock:

\[
P_0 = \frac{D_{1}}{(1 + k_e)} + \frac{P_1}{(1 + k_e)}
\]

- where \( P_0 \) = the current price of the stock. The zero subscript refers to time period zero, or the present. 
  \( D_{1} \) = the dividend paid at the end of year 1. 
  \( k_e \) = the required return on investments in equity. 
  \( P_1 \) = the assumed sales price of the stock.
The Generalized Dividend Valuation Model

• Using the same concept, the one-period dividend valuation model can be extended to any number of periods: The value of stock is the present value of all future cash flows.

• The only cash flows that an investor will receive are dividends and a final sales price when the stock is ultimately sold in period \( n \).

• The generalized multi-period formula for stock valuation can be written as:
Generalized Dividend Valuation Model

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

- Since we do not know in advance what the future price in period will be, we replace it with what we expect it to be, \( P^e \):

\[ P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P^e_n}{(1+k_e)^n} \]

(2)

\[ = \sum_{t=1}^{n} \frac{D_t}{(1+k_e)^t} + \frac{P^e_n}{(1+k_e)^n} \]
Generalized Dividend Valuation Model

Equation 2 is made up of two parts:

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”:

$$\frac{\rho^e_n}{(1 + k_e)^n}$$
General Dividend Valuation Model

• The generalized dividend valuation model requires that we compute the present value of an infinite stream of dividends, a process that could be difficult, to say the least.

• Simplified models have been developed to make the calculations easier. One such model is the Gordon growth model, which assumes constant dividend growth.
General Dividend Valuation Model

• This reasoning implies that the current value of a share of stock can be calculated as simply the present value of the future dividend stream.

• This says that the price of stock is determined only by the present value of dividends and that nothing else matters.

• As n tends to infinity $n \to \infty$ the last term $P_n e/(1+k_e) \to 0$
Generalized Dividend Model (cont.)

- If we let period “n” be very large, then equation (2) boils down to:

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

(3)

- In other words: the price of the stock should be the present discounted value of the stream of dividends it pays out.

- Note:
  - The price of the stock is accurately reflected in terms of its fundamentals.
  - The presence of a bubble distorts the relationship above
The generalized dividend model is rewritten in Equation 3 without the final sales price: as the fundamental only \(-P_0 = \text{the current price of the stock}\)

\[
P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1 + k_e)^t}
\]
Consider the tech stocks in the late 1990’s and the “dot-com” phenomena. They offered no dividends.

Can the generalized dividend model of equation (2) reflect the price of those stocks?

\[ P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{(1+k_e)^n} \]  (2)
The Gordon Growth Model

• Many firms strive to increase their dividends at a constant rate each year. Equation 4 rewrites Equation 3 to reflect this constant growth in dividends:

\[ D_0 (1 + g)^n = P_0 \]

• Where
• \( D_0 \) = the most recent dividend paid
• \( g \) = the expected constant growth rate in dividends
• \( k_e \) = the required return on an investment in equity
• \( P_0 \) = the current price of the stock
Gordon Growth Model

• Assuming dividend growth is constant, Equation 3 can be written as

$$P_0 = \frac{D_0 \times (1+g)^1}{(1+k_e)^1} + \frac{D_0 \times (1+g)^2}{(1+k_e)^2} + \ldots + \frac{D_0 \times (1+g)^\infty}{(1+k_e)^\infty}$$  \hspace{1cm} (4)

• Assuming the growth rate is less than the required return on equity, Equation 4 can be written as

$$P_0 = \frac{D_0 \times (1+g)}{(k_e - g)} = \frac{D_1}{(k_e - g)}$$  \hspace{1cm} (5)
How the Market Sets Prices

• The price is set by the buyer willing to pay the highest price

• The market price will be set by the buyer who can take best advantage of the asset

• Superior information about an asset can increase its value by reducing its perceived risk
EXPECTATIONS

• The analysis of stock price evaluation we have outlined in the previous section depends on people’s expectations—especially of cash flows.
• Indeed, it is difficult to think of any sector in the economy in which expectations are not crucial; this is why it is important to examine how expectations are formed.
• We do so by outlining the theory of rational expectations
Expectations…

• Key Question: How are Expectations Formed?

• Types of Expectations
  ➢ Adaptive Expectations
  ➢ Rational Expectations
  ➢ Other types of expectations…

• Here we focus on Rational Expectations
• Adaptive expectations is an economic theory which gives importance to past events in predicting future outcomes.

• A common example is for predicting inflation. Adaptive expectations states that if inflation increased in the past year, people will expect a higher rate of inflation in the next year.
• DEFINITION of 'Adaptive Expectations Hypothesis'
• A hypothesis stating that individuals make investment decisions based on the direction of recent historical data, such as past inflation rates, and adjust the data (based on their expectations) to predict future rates.

• For example, if inflation over the last 10 years has been running in the 2-3% range, investors would use an inflation expectation of that range when making investment decisions. Consequently, if a temporary extreme fluctuation in inflation occurred recently, such as a cost-push inflation phenomenon, investors will overestimate the movement of inflation rates in the future.
Adaptive Expectations

• Expectations are formed from past experience only.

• Changes in expectations will occur slowly over time as data changes.

• However, people use more than just past data to form their expectations and sometimes change their expectations quickly.
What is the 'Rational Expectations Theory'?

• The rational expectations theory is an economic idea that the people make choices based on their rational outlook, available information and past experiences.

• The theory suggests that the current expectations in the economy are equivalent to what people think the future state of the economy will become.

• This contrasts with the idea that government policy influences people's decisions.

• Rational expectations (RE) was propounded Lucas

• Read more: Rational Expectations Theory Definition | Investopedia
  http://www.investopedia.com
Rational Expectations

- Is economic-behavior according to which: (1) On average, people can quite correctly predict future conditions and take actions accordingly, even if they do not fully understand the cause-and-effect (causal) relationships underlying the events and their own thinking. Thus, while they do not have perfect foresights, they construct their expectations in a rational manner that, more often than not, turn out to be correct. Any error that creeps in is usually due to random (non-systemic) and unforeseeable causes.

- (2) In efficient markets with perfect or near perfect information (such as in modern open-market economies) people will anticipate government's actions to stimulate or restrain the economy, and will adjust their response accordingly.

- Read more: http://www.businessdictionary.com/definition/theory-of-rational-expectations-TRE.html
• For example, if the government attempts to increase the money supply, people will raise their prices and wage demands to compensate for the inflationary impact of the increase. Similarly, during periods of accelerating inflation, they will anticipate stricter credit controls accompanied by high interest rates. Therefore they will attempt to borrow up to their credit capability, thus largely nullifying the controls. This theory was proposed not as a plausible explanation of human behavior, but to serve as a model against which extreme forms of behavior could be compared.

• Read more: http://www.businessdictionary.com/definition/theory-of-rational-expectations-TRE.html
Rational Expectations

• The rational expectations theory is often used to explain expected rates of inflation. For example, if inflation rates within an economy were higher than expected in the past, people take that into account along with other indicators to assume that inflation may further increase in the future.

• The rational expectations theory also explains how producers and suppliers use past events to predict future business operations. If a company believes that the price for its product will be higher in the future, for example, it will stop or slow production until the price rises. Since the company weakens supply while demand stays the same, the price will increase.
• The producer believes that the price will rise in the future and makes a rational decision to slow production, and this decision partially affects what happens in the future. By relying on the rational expectations theory, companies can inadvertently effect future inflation in an economy.

• An Example of Rational Expectations Theory
Rational expectations theory, while valid, can sometimes have adverse effects on the global economy. For example, Former Bank of England governor Mervyn King has pointed out that central banks can easily become a prisoner of the economy's rational expectations theory. (The End of Alchemy: Money, Banking and the Future of the Global Economy, by Mervyn King, 2016)

Since the theory stipulates that people in an economy make assumptions based largely on past experiences, specific monetary policies enacted by central banks can actually cause disequilibrium in an economy. When the Federal Reserve decided on a quantitative easing program to help the economy through the 2008 financial crisis, it set unattainable expectations for the country, as outlined by the theory. The quantitative easing program reduced interest rates for more than seven years, and people began to believe that interest rates would remain low.

In 2015, when Janet Yellen announced that the Federal Reserve would increase interest rates starting in 2016, the markets reacted negatively. This rational expectations theory subsequently trapped the Federal Reserve into making decisions that would take expectations of the economy into account, and Yellen soon backed off her initial decision to increase rates as many as four times in the coming years.
Theory of Rational Expectations

- **Rational Expectations** (Muth): People use available information efficiently, including how the economy works.

- In practice this boils down to assuming agents use the same model of the economy as the researcher ("model-consistent" expectations).

- People can make mistakes, but they do not make **systematic** forecasting errors.
Theory of Rational Expectations

Definition:

Rational expectation (RE) = Expectation that is optimal forecast (best prediction of future) using all available information:

\[ X^e = X^{of} = E_t[X | \Omega_t] \]
Rational Expectations (cont…)

• Two reasons Expectations may not be rational
  ➢ Not best prediction
  ➢ Not using available information

• Rational expectation, although optimal prediction, may not be accurate

• Rational expectations makes sense because is costly not to have optimal forecast
Implications of Rational Expectations

Implications:

1. If there is a change in the way a variable moves, then the way expectations are formed also changes.

2. Forecast errors on average = 0 and are not predictable.
Some definitions

• The price-earnings ratio (PE Ratio) is the ratio for valuing a company that measures its current share price relative to its per-share earnings.

• The price-earnings ratio can be calculated as: \( \frac{\text{Market Value per Share}}{\text{Earnings per Share}} \).

• What is an efficient market?

• Efficient market is one where the market price is an unbiased estimate of the true value of the investment.
MARKET EFFICIENCY IN FINANCIAL MARKETS

• Implicit in this definition of an efficient market are several key concepts -

• (a) Market efficiency does not require that the market price be equal to true value at every point in time. All it requires is that errors in the market price be unbiased, i.e., that prices can be greater than or less than true value, as long as these deviations are random.

• (b) The fact that the deviations from true value are random implies, in a rough sense, that there is an equal chance that stocks are under or over valued at any point in time, and that these deviations are uncorrelated with any observable variable. For instance, in an efficient market, stocks with lower PE ratios should be no more or less likely to undervalued than stocks with high PE ratios.

• (c) If the deviations of market price from true value are random, it follows that no group of investors should be able to consistently find under or overvalued stocks using any investment strategy.
Market Efficiency for Investor Groups

• Definitions of market efficiency have to be specific not only about the market that is being considered but also the investor group that is covered.

• It is extremely unlikely that all markets are efficient to all investors, but it is entirely possible that a particular market (for instance, the New York Stock Exchange) is efficient with respect to the average investor.

• It is also possible that some markets are efficient while others are not, and that a market is efficient with respect to some investors and not to others. This is a direct consequence of differential tax rates and transactions costs, which confer advantages on some investors relative to others.
Market Efficiency for Investor Groups

• Definitions of market efficiency are also linked up with assumptions about what information is available to investors and reflected in the price. For instance, a strict definition of market efficiency that assumes that all information, public as well as private, is reflected in market prices would imply that even investors with precise inside information will be unable to beat the market.
EFFICIENCY OF FINANCIAL MARKETS - the concept of financial efficiency is closely related to the rational expectations hypothesis

• A financial market is efficient when security prices fully reflect all available information. An efficient financial market is in equilibrium when the demand for and supply of Securities is equal.

• Characteristics of an efficient financial market are :-

1. Information is available to all buyers and sellers of financial securities
2. Transactions must be executed without significant price changes
3. Security prices are independent of individual buyers and sellers
4. There are no transaction costs. In other words there are no brokerage fees, transfer charges or taxes etc when securities are bought and sold
5. Prices of securities are promptly adjusted to equalise their yields. i.e. risk adjusted expected returns on all investments are equalised
6. The efficient-market resources are used in a non-wasteful manner
7. The resources are allocated to the socially most productive uses
• Market efficiency refers to the degree to which stock prices and other securities prices reflect all available, relevant information.

• The efficient market hypothesis (EMH) is an investment theory that states it is impossible to "beat the market" because stock market efficiency causes existing share prices to always incorporate and reflect all relevant information.

• Notice that the level/degree/form of efficiency in a market depends on two dimensions:
  
  1. The type of information incorporated into price (which information is "available"?).
  
  2. The speed with which new information is incorporated into price ( how fast information is "reflected"?).

• Efficient Capital Market. Efficient capital market is a market where the share prices reflect new information accurately and in real time. Capital market efficiency is judged by its success in incorporating and inducting information, generally about the basic value of securities, into the price of securities.

Definitions from Investopedia
The efficiency of a financial market can be judged from the following:-

1. Proper Valuation – This requires that the market price of a financial security must equal its intrinsic value, which is the present value of its future stream of cash flows from investment made in it. $\text{PV}/(1+r)^t$

2. Operationally Efficient – This means a) minimisation of administrative and transaction costs  b) providing maximum convenience to lenders and borrowers while transmitting resources, c) providing a fair return to financial intermediaries for these services

3. Allocationally Efficient – For this a0 It should channel its financial resources into such investment projects and uses where, the marginal efficiency of capital after adjusting for risk differences is the highest

4. Insurance against Risk- A market to be efficient must hedge and reduce risks such as possible future contingencies.

5. Information Arbitrage – If a person gains much on the basis of commonly available information the financial market is not efficient. It is only under perfect competition that a market is efficient.
Classification or Types of Efficient Markets - 3 types

• Weak Form of Efficient Market - In this market, the best forecasting of a bond price of the next period is the price of the current period. Any past information on bond price cannot improve its forecasting. It is very difficult to forecast returns to bonds on the basis of past data on bond prices.

• Semi-strong Form of Efficient Market – the current of bonds does better forecasting of future prices. However any available information of will not be helpful in forecasting of future prices or returns to bonds or assets. Such information consists of past prices of assets, rates of interest, profit, etc. But a broker of any stock may earn profit in future by selling or purchasing bonds on the basis of internal information of the company.

• Strong Form of Efficient market – In this, any available current information cannot improve forecasting of future values of the asset by using the recently known values of that asset price. Any available information may not be helpful in forecasting stock price movements. In reality, the strong form of efficient market is not possible because nobody can forecast future stock prices according to internal information.
Types of Market Efficiency

- Define: Market Efficiency – how quickly do markets reflect new information?

- 3 Types of Market Efficiency:
  - Weak form efficient
  - Semi-strong form efficient
  - Strong form efficient

Note: These do not refer to the degree to which markets are efficient. They refer to the type of efficiency that exists in markets.
Market Efficiency

Strong Form Efficiency

Semi-Strong Form Efficiency

Weak Form Efficiency

Stock prices reflect ALL information including insider information (as well as public info).

Stock prices reflect all publicly available information.

Stock prices reflect information contained in past history of stock price.

Note: These lecture notes are incomplete without having attended lectures.
Implications of market efficiency

• An immediate and direct implication of an efficient market is that no group of investors should be able to consistently beat the market using a common investment strategy.

• An efficient market would also carry very negative implications for many (at least three) investment strategies and actions that are taken for granted:
  • (a) In an efficient market, equity research and valuation would be a costly task that provided no benefits. The odds of finding an undervalued stock should be random (50/50). At best, the benefits from information collection and equity research would cover the costs of doing the research.
Implications of Market Efficiency

• (b) In an efficient market, a strategy of randomly diversifying across stocks or indexing to the market, carrying little or no information cost and minimal execution costs, would be superior to any other strategy, that created larger information and execution costs. There would be no value added by portfolio managers and investment strategists.

• (c) In an efficient market, a strategy of minimizing trading, i.e., creating a portfolio and not trading unless cash was needed, would be superior to a strategy that required frequent trading.
What market efficiency does not imply:

• An efficient market does not imply that -
• (a) stock prices cannot deviate from true value; in fact, there can be large deviations from true value. The only requirement is that the deviations be random.
• (b) no investor will 'beat' the market in any time period. To the contrary, approximately half of all investors, prior to transactions costs, should beat the market in any period.
What market efficiency does not imply:

• (c) No group of investors will beat the market in the long term. Given the number of investors in financial markets, the laws of probability would suggest that a fairly large number are going to beat the market consistently over long periods, not because of their investment strategies but because they are lucky.

• It would not, however, be consistent if a disproportionately large number of these investors used the same investment strategy.

• In an efficient market, the expected returns from any investment will be consistent with the risk of that investment over the long term, though there may be deviations from these expected returns in the short term.
Necessary conditions for market efficiency

Markets do not become efficient automatically. It is the actions of investors, sensing bargains and putting into effect schemes to beat the market, that make markets efficient.

The necessary conditions for a market inefficiency to be eliminated are as follows:

1. The market inefficiency should provide the basis for a scheme to beat the market and earn excess returns. For this to hold true:
   a. The asset (or assets) which is the source of the inefficiency has to be traded.
   b. The transactions costs of executing the scheme have to be smaller than the expected profits from the scheme.

2. There should be profit maximizing investors who:
   a. Recognize the 'potential for excess return'
   b. Can replicate the beat the market scheme that earns the excess return
   c. Have the resources to trade on the stock until the inefficiency disappears
• Efficient Markets and Profit-seeking investors: The Internal Contradiction

• There is an internal contradiction in claiming that there is no possibility of beating the market in an efficient market and then requiring profit-maximizing investors to constantly seek out ways of beating the market and thus making it efficient.

• If markets were, in fact, efficient, investors would stop looking for inefficiencies, which would lead to markets becoming inefficient again.

• It makes sense to think about an efficient market as a self-correcting mechanism, where inefficiencies appear at regular intervals but disappear almost instantaneously as investors find them and trade on them.
• Propositions about market efficiency
• Proposition 1: The probability of finding inefficiencies in an asset market decreases as the ease of trading on the asset increases. To the extent that investors have difficulty trading on a stock, either because open markets do not exist or there are significant barriers to trading, inefficiencies in pricing can continue for long periods.
  • Example:
  • Stocks versus real estate
  • NYSE vs NASDAQ (a Secondary market)
Proposition 2

• The probability of finding an inefficiency in an asset market increases as the transactions and information cost of exploiting the inefficiency increases.

• The cost of collecting information and trading varies widely across markets and even across investments in the same markets. As these costs increase, it pays less and less to try to exploit these inefficiencies.
Proposition 2 - example

• Initial Public Offerings: IPOs supposedly make excess returns, on average.

• Investing in 'loser' stocks, i.e., stocks that have done very badly in some prior time period should yield excess returns. Transactions costs are likely to be much higher for these stocks since-

  • (a) They then have to be low priced stocks, leading to higher brokerage commissions and expenses
  • (b) The bid-ask becomes a much higher fraction of the total price paid.
  • (c) Trading is often thin on these stocks, and small trades can cause prices to move.

• [The ask price is what sellers are willing to take for it. If you are selling a stock, you are going to get the bid price, if you are buying a stock you are going to get the ask price. The difference (or "spread") goes to the broker/specialist that handles the transaction.]
Corollary 1: Investors who can establish a cost advantage (either in information collection or transactions costs) will be more able to exploit small inefficiencies than other investors who do not possess this advantage.

Example: Block trades effect on stock prices & specialists on the Floor of the Exchange

Establishing a cost advantage, especially in relation to information, may be able to generate excess returns on the basis of these advantages.

Thus a John Templeton, who started investing in Japanese and other Asian markets well before other portfolio managers, might have been able to exploit the informational advantages he had over his peers to make excess returns on his portfolio.
Proposition 3:

• The speed with which an inefficiency is resolved will be directly related to how easily the scheme to exploit the inefficiency can be replicated by other investors.

• The ease with which a scheme can be replicated itself is inversely related to the time, resources and information needed to execute it.

• Since very few investors single-handedly possess the resources to eliminate an inefficiency through trading, it is much more likely that an inefficiency will disappear quickly if the scheme used to exploit the inefficiency is transparent and can be copied by other investors.
Types of Market Efficiency

Define: Market Efficiency – how quickly do markets reflect new information?

3 Types of Market Efficiency:
- Weak form efficient
- Semi-strong form efficient
- Strong form efficient

Note: These do not refer to the degree to which markets are efficient. They refer to the type of efficiency that exists in markets.
Market Efficiency

• Recall: We are asking how quickly do markets respond to new information?

• Response to new information can cause:-
  - A delayed reaction
  - An efficient market reaction
  - An overreaction and correction
Efficient Markets: 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

Note: These lecture notes are incomplete without lecture attended lecture
Efficient Markets (cont’d)

At the beginning of the period, we know $P_t$ and $C$.

$P_{t+1}$ is unknown and we must form an expectation of it.

The expected return then is

$$R^e = \frac{P^e_{t+1} - P_t + C}{P_t}$$

Expectations of future prices are equal to optimal forecasts using all currently available information so

$$P^e_{t+1} = P^o_{t+1} \Rightarrow R^e = R^o$$

Supply and Demand analysis states $R^e$ will equal the equilibrium return $R^*$, so $R^o = R^*$
Efficient Markets

• Current 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.

• In an efficient market, a security’s price fully reflects all available information.
Rationale

\[ R^{of} > R^* \Rightarrow P_t \uparrow \Rightarrow R^{of} \downarrow \]
\[ R^{of} < R^* \Rightarrow P_t \downarrow \Rightarrow R^{of} \uparrow \]

until

\[ R^{of} = R^* \]

Note:
1. All unexploited profit opportunities eliminated
2. Efficient Market holds even if are uninformed, irrational participants in market
Evidence on Efficient Markets Hypothesis

Favorable Evidence

1. Investment analysts and mutual funds don’t beat the market
2. Stock prices reflect publicly available information: anticipated announcements don’t affect stock price
3. Stock prices and exchange rates close to random walk
   If predictions of $\Delta P$ big, $R_{of} > R^* \Rightarrow$ predictions of $\Delta P$ small
4. Technical analysis does not outperform market
Evidence on Efficient Markets Hypothesis

Unfavorable Evidence

1. Small-firm effect: small firms have abnormally high returns
2. January effect: high returns in January
3. Market overreaction
4. Excessive volatility
5. Mean reversion
6. New information is not always immediately incorporated into stock prices
Implications for Investing

1. Published reports of financial analysts not very valuable

2. Should be skeptical of hot tips

3. Stock prices may fall on good news

4. Prescription for investor
   - Shouldn’t try to outguess market
   - Therefore, buy and hold
   - Diversify with no-load mutual fund
Evidence on Rational Expectations in Other Markets

1. Bond markets appear efficient

2. Evidence with survey data is mixed
   - Skepticism about quality of data

3. Following implication is supported: if there is a change in the way a variable moves, then the way expectations are formed also changes
• $D_0 =$ dividend today
• $g =$ annual dividend growth rate
• $P_n =$ future resale price in year $n$
• $P =$ price today
• $i =$ discount rate
value of a stock today

\[ P = \frac{D_0(1+g)}{1+i} + \frac{D_0(1+g)^2}{(1+i)^2} + \ldots + \frac{D_0(1+g)^n}{(1+i)^n} + \frac{P_n}{(1+i)^n} \]
• but we do not know the future P....
• assume stock is held indefinitely, just paying dividends....
Dividend-discount model

\[ P = \frac{D_0}{i - g} \]
• interest rate = risk free rate + risk premium
  • \( i = rf + rp \)
• 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 / (0.03 + 0.05 - 0.02)
• P = $2 / 0.06 = $33.33
• what if risk premium rises to 7%?
  • $P = \frac{2}{.03+.07-.02} = \frac{2}{.08} = $12.50$

• what if risk premium falls to 3%?
  • $P = \frac{2}{.03+.03-.02} = \frac{2}{.04} = $50$

• Dividend discount model shows us why stock prices are volatile
Theory of Efficient Markets

• efficient market hypothesis (EMH)
• asset prices (stock prices) reflect all available information
  • markets adjust immediately to new information
  • prices incorporate expectations about future
example

• XYZ stock, $25
  • value of $25 based on
    --past prices, profits, trading, litigation
    --forecasts about future profits, litigation,
    market share
    --relevant economic conditions
• not ALL buyers and sellers must act rationally for markets to be efficient
  • just most of them
implications

• IF stock market is efficient,
  • THEN stock prices already reflect all relevant, available information
  • SO, using the same info to predict future prices will not work
• if future stock prices were predictable...
  • Expect price to rise tomorrow,
  • Then you buy it today,
  • Price rises TODAY
• Stock price today reflects our expectations about future price movements
  • Stock prices are close to a “random walk”
Are markets efficient?

• a lot of research on efficiency of U.S. stock market

• to “test” efficiency, must understand implications of efficiency
• it should be almost impossible to
  “beat the market”
(to earn above-average stock market returns over time)
Is this true?
  -- most evidence says yes
  -- some evidence suggests that some price inefficiencies do exist
Evidence for efficiency

• do professionally managed mutual funds beat the market?
  • no, on average
• S&P 500 outperformed 72% of all actively managed large-cap funds in the past 5 years
• funds that do well in one year do not do well in subsequent year
• 1973-98, Wilshire 5000 outperformed 67% of equity funds
• so if professionals have difficulty earning superior returns
  • then prices likely reflect public information
Technical analysis

• Chartists

• using past price patterns to predict future price patterns
  • no evidence this technique beats the market
Fundamental Analysis

• Use available data to determine proper value of stock
  • Which may or may not match price
• Again, we see no evidence that this earns above-average return in the long run
WSJ Dartboard contest

• 1988-2001
• Over 6-month period
  • 4 professionals pick 1 stock each
  • 4 dartboard stocks
  • Price appreciation of each portfolio
• Dartboard won about 40% of the time
  • Even the deck stacked in favor of professionals
Evidence against efficient markets

- certain return patterns out there
  - “anomalies”
  - should not exist if markets are fully efficient
• small-firm effect
  • risk-adjusted returns of smaller firms higher over time
    • Risk measure?
    • Survivorship bias
  • effect has become smaller over time
• January effect
  • stocks post larger returns in January
  • (December sell-offs for taxes)
  • should disappear as tax-exempt pension funds attempt to profit,
  • but still exists (but smaller)
• P/E effect
  • Stocks with low P/E do better over time
  • Not consistent over time

• Price-to-book value
  • Value investing (Buffet)
  • Not consistent, survivorship
• “Dogs of the Dow”
  • Portfolio of 10 DJIA stocks with highest dividend yield (D/P)
  • Once strategy became widespread, it no longer worked.
• other effects
  • day-of-the-week
  • weather

• most anomalies are too small to allow a profit after trading costs
• stock price over-reaction
  • prices fall/rise too much with bad/good news
  • A “contrarian” strategy might produce superior returns

• excess volatility
  • stock prices fluctuate more than their fundamentals
• Bubbles
  • Large gaps between actual asset price and fundamental value
  • Internet stock bubble of late 1990s
  • Housing bubble?

• Eventually the bubble bursts!
weight of evidence

• so efficiency is not perfect,
• but earning above-average returns is very difficult
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
• Questions: Explain the working of the financial market. What do you understand by the efficiency of financial market?

• Explain the functions of a financial market,

• Discuss the role of financial markets in the economic development of a country such as Ghana

• Explain the concept of efficiency of financial markets. What are the various levels of an efficient market?

• Explain the criteria for judging the efficiency of a financial market

• Define Money Market and explain its functions

• Distinguish between Money and Capital Markets and show how they are interrelated

• Explain the function of financial intermediaries. Discuss their role in a developing country such as Ghana
• Explain: Equity or common company Stock; mortgage; corporate bond; government treasury bill; government treasury note; government bond; euro bond; Repurchase Agreements (repos); Commercial Paper; Certificates of Deposit; Derivative; Banker’s Acceptances

• Read Mishkin on Models of Asset Pricing (Appendix 1 to Chapter 5 in 7th edition)
• What are NBFIs? How do they differ from banks?
• Explain the functions of NBFIs.
• What are: Mutual Funds; Finance Companies; Savings and Loans Companies; Credit Unions; Insurance Companies.
• State the functions of: Bank of Ghana; National Insurance Commission; and Securities and Exchange Commission.