

## Lecture 3

(1)

### Investment Theory & strategies

#### • Today's questions

##### • Investment strategies:

- what is meant by passive & active investment strategies?
- what is fundamental & technical analysis?

##### • Efficient markets:

- what is meant by the concept of efficient & capital markets?
- How can market efficiency be tested?
  - what do the tests say?
- what are the implications for investment strategies?

##### • Asset pricing theories:

- The CAPM - a review.

#### • Investment strategies

Passive Vs active portfolio management

##### • Active

$$\text{Total Actual Return} = [\text{Risk Free Rate} + \text{Risk Premium}] + [\text{"Alpha"}]$$

$$E(\tilde{r}_i) = r_f + \beta_i(E(r_m) - r_f)$$

- Jensen's Alpha:

- This can be an application of the CAPM.

For example,

- If the Beta of firm I is 0.8,

- risk free rate is 2% and

- market return is 7%

- then return of firm I is predicted to be 6% according to CAPM

$$E(\tilde{r}_i) =$$

• If however manager finds the actual return to be say, 7%.

- then the stock has a positive alpha.

- If on the other hand actual return is 5%,
  - then the stock has a negative alpha.

## Passive Vs active portfolio management

- Passive portfolio management:
  - Long-term buy-and-hold strategy
  - Usually tracks an index over time
  - Designed to match market performance
  - Manager is judged on how well they track the target index
- Active portfolio management
  - Attempts to outperform a passive benchmark portfolio on a risk-adjusted basis.

## Types of active management: Fundamental analysis

- Fundamental analysis:
  - Main premise: Intrinsic value of securities depends on real variables.
    - Examples of relevant real variables:
      - companies' cash flows and earnings forecasts,
      - interest rates,
      - risk measures
  - If market price does not fully reflect these variables,
    - profits can be made by selling overvalued, and
    - buying undervalued securities.
  - Purpose is to find value stocks:
    - e.g. stocks that are underpriced given their fundamentals.

## • Technical analysis:

- Main premise: past asset price (return) movements
  - can be used to predict future prices (returns)
- Method: examine historical price movements for
  - trends & develop trading rules based on those

## Does active management work?

- The success of various trading strategies depends on how prices are actually set.
- We need to test some theories of how markets reflect information.
- Next: the efficient markets hypothesis (EMH)**

## Efficient Markets

### • Efficient capital markets

- In an efficient capital market,
  - security prices adjust rapidly to the arrival of new information,
  - therefore, the current prices of securities reflect all information about the security.
- Whether markets
  - are efficient has been extensively researched and remains controversial.

### • Why should capital markets be efficient?

- The premises of an efficient market:
  - A large number of competing profit-maximizing participants analyze and value securities,
  - each independently of the others
  - New information regarding securities comes to the market in a random fashion
  - Profit-maximizing investors adjust security prices rapidly to reflect the effect of new information
- Conclusion:
  - the expected returns implicit in the current price of a security should reflect its risk.

## Efficient market hypothesis (EMH)

- Three forms of EMH:

- Weak-Form EMH

- prices reflect all security-market information.

- Semistrong-form EMH

- prices reflect all public information

- Strong-form EMH

- prices reflect all public and private information

- This division is due to Eugene Fama (1970)

### Weak-form EMH

- Current prices reflect all security-market information, including

- the historical sequence of prices,

- rates of return,

- trading volume data, and

- other market-generated information.

- This implies that past rates of return and other market data

- should have no relationship with future rates of return

- This invalidates technical analysis!

- but not fundamental analysis

### Semi-strong-form EMH

- Current security prices reflect all public information including

- market and non-market information.

- This implies that decisions made on new information after it is public

- should not lead to above-average risk-adjusted profits from those transactions.

- This still leaves place for fundamental analysis,

- as long as it uses information that is not "old news"

- (not commonly known)

## Strong-form EMH

- Stock prices fully reflect all information
  - from public and private sources
- This implies that no group of investors should be able to
  - consistently derive above-average risk-adjusted rates of return
- This assumes perfect markets in which all information is
  - cost-free and
  - available to everyone at the same time.
- There is no benefit from
  - for any active management strategy
  - (either technical or fundamental).

## A revised definition Latham (1985), Rubinstein (1975)

- The market is efficient with respect to an information
  - even if the event does not cause any portfolio rebalancing.
  - Happens when investors disagree on the interpretation of the event.
- The price change is zero
  - And no transactions take place.

## Rational Expectations

- What information do investors act upon?
- There are 4 different hypotheses:
  1. Naive hypothesis:
    - Asset prices are completely arbitrary & unrelated to the future stream of cash flows.
  2. Speculative Equilibrium hypothesis:
    - Investors make their decisions based on a market consensus.
    - Their decisions anticipate what other market participants will do.
      - Icyness' 'beauty contest'

### 3. Intrinsic Value hypothesis:

- Asset prices are related to their future payouts.
- Each investor's estimate of the payoffs of an asset will determine its price, and
- speculation about future resale value are not important.

### 4. Rational Expectations hypothesis (REH):

- prices are formed by discounting future payouts +  
the resale value.
- A RE market is an efficient market.

## Tests of the EMH (Efficient market hypothesis)

### 1. Fair game

- On average, across a large sample, the expected return on an asset equals its actual return.  
i.e., expectations are not biased.

### 2. Martingale

- Is a fair game, but additionally, period  $t+1$  price is expected to be the same as period  $t$  price.

### 3. Submartingale

- Is a fair game, but period  $t+1$  price is greater than  $t$  price.

### 4. Random walk

- There is no difference between the distribution of returns conditional on a given information structure and
- the unconditional distribution of returns

## Tests & results of weak-form EMH

- Statistical tests of independence between rates of return
  - Autocorrelation tests have mixed results
  - Runs tests indicate randomness in prices
- Comparison of trading rules to a buy-and-hold policy
  - is difficult because trading rules can be complex and
  - there are too many to test them all
- Results generally support the weak-form EMH,
  - but results are not unanimous
- A run is defined as
  - a series of increasing values or a series of decreasing values.
  - The number of increasing, or decreasing, value is the length of the run.
- In a random dataset,
  - the probability that the  $(m+1)^{th}$  value
  - is larger or smaller than the  $n^{th}$  value.
  - follows a binomial distribution, which forms the basis of the runs test.
- Typical Analysis & Test statistics:
  - The first step in the runs test is to count the number of runs in the data sequence.
  - There are several ways to define runs in the literature,
    - However, in all cases the formulation must produce a dichotomous sequence of values.

For example: a series of stock prices might produce the following sequence of increase (+) or decrease (-)

  - + - - + - + + + - + + - - - - + +
  - The number of runs for this series is 9.
  - There are 11 increases & 9 decreases in the sequence.
  - We can code increase in value from the last observed value as positive
  - and decrease below the last observed as negative.

- A run is defined as a series of consecutive
  - positive values
  - or negative values

The runs test is defined as:

$H_0$ : the sequence was produced in a random manner

$H_a$ : the sequence was not produced in a random manner

The test statistic is  $Z = \frac{R - \bar{R}}{S_R}$

Where;  $R$  - is the observed number of runs;  
 $\bar{R}$  - is the expected number of runs, and  
 $S_R$  - is the standard deviation of the number of runs

The values of  $\bar{R}$  and  $S_R$  are computed as follows:

$$\bar{R} = \frac{2n_1 n_2}{n_1 + n_2} + 1 \quad \text{and} \quad S_R^2 = \frac{2n_1 n_2 (2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2 (n_1 + n_2 - 1)}$$

with  $n_1$  &  $n_2$  denoting the number of positive & negative in the series.

If  $|Z| > Z_{1-\frac{\alpha}{2}}$

- The runs test rejects the null hypothesis

### Tests of the semi-strong form of market efficiency

- Two sets of studies:

#### 1. Studies to predict future rates of return

- using available public information beyond capital market prices

- either time series analysis of returns or

- the cross section distribution of returns for individual stocks

#### 2. Event studies that examine how fast stock prices adjust to specific significant economic events.

Ex of events: earnings announcements, stock splits, mergers, management changes.

## Abnormal returns

- Tests are carried out on 'abnormal returns' of which there are two types:

1. For the market rate of return:

$$AR_{it} = R_{it} - R_{mt}$$

2. For risk

$$AR_{it} = R_{it} - E[R_{it}]$$

Where;

- $AR_{it}$  abnormal rate of return on security  $i$  during period  $t$
- $R_{it}$  rate of return on security  $i$  during period  $t$
- $R_{mt}$  rate of return on a market index during period  $t$
- $E[R_{it}]$  risk-adjusted expected rate of return on security  $i$  during period  $t$

(e.g., under CAPM:  $E[R_{it}] = R_f + \beta_{it}(R_{mt} - R_f)$ )

## Results of semi-strong-form EMH tests

- Evidence on semi-strong-form EMH is mixed
  - strong support for semi-strong-form EMH from numerous event studies
- Evidence against semi-strong-form EMH
  - from studies predicting rates of return for a cross-section of stocks:
    - Significant predictors of returns:
      - dividend yields, - calendar patterns, and
      - risk premiums, - earnings surprises

## Tests of strong-form EMH

- Strong-form EMH contends that stock prices
  - fully reflect all information, both public & private
- This implies that no group of investors has access to
  - private information that will allow them to
  - consistently earn above-average profits

- Test analyze the performance of 3 groups of investors:
  - Corporate insiders
  - Security analysts
  - Professional money managers

### Test results for strong-form EMH

- Results on strong-form EMH are mixed.
- Tests for corporate insiders & stock exchange
  - specialists do not support the hypothesis
  - Both groups seem to have monopolistic access
  - to important information and
  - use this to derive abnormally high returns
- Tests results for analysts have changed over time.
  - Currently tend to support strong-form EMH
- Performance of professional money managers seems to provide support for strong-form EMH
  - But: averages may be very misleading here.
  - The real question is: do there exist any managers who consistently outperform the market?

### Summary of EMH results

- Overall results indicate
  - the capital markets are efficient as related to numerous sets of information.
- However,
  - there are substantial instances where the market fails to rapidly adjust to public information.

## EMH: Implications for technical analysis

- Assumptions of technical analysis directly oppose the notion of efficient markets
- Technicians' defense:
  - new information is not immediately available to everyone,
  - but takes time to be disseminated
  - thus, trends in price movements can predict what is still to happen.
- EMH response:
  - price adjustment may not be perfect (could over- or under-adjust),
  - but the deviation is random & unpredictable
- As technical analysis contradicts the weak-form EMH,
  - which is generally found to hold, it has limited promise.

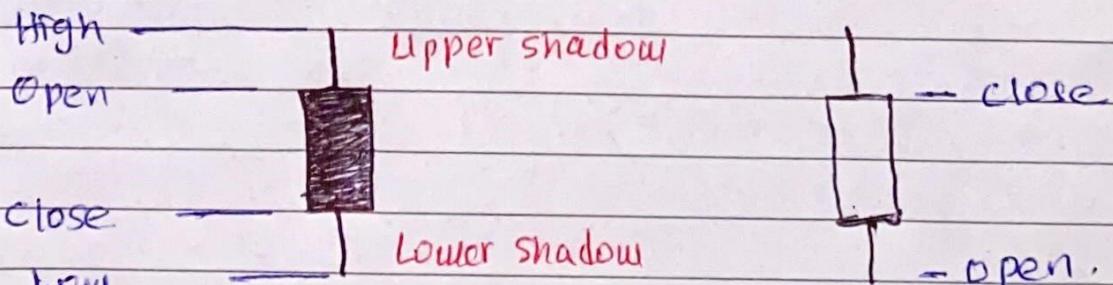
## Technical Analysis

- Some people discount chartism as not better than reading tea leaves.
- Chartists advocate that:
  - It is a short cut form of fundamental analysis
  - Once all the fundamental information have been incorporated in prices,
  - the effects of those (external) factors quickly show up in price movements

For example:- rising prices indicate a **BULLISH** market.

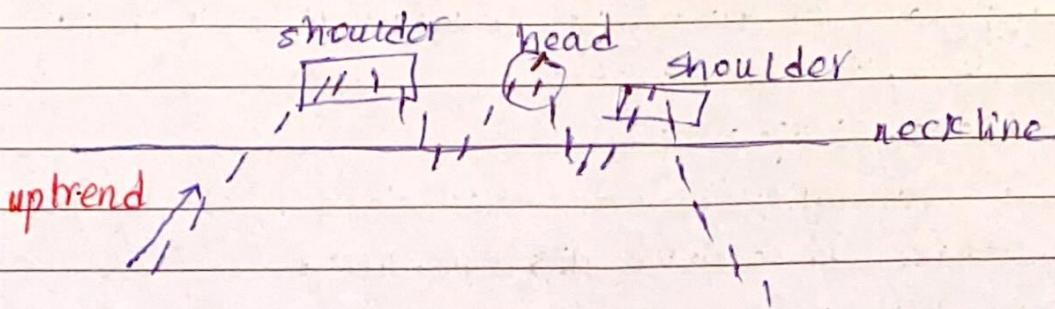
- Falling prices indicate a **BEARISH** market.

• An Example: the candlestick chart



e.g. when the bar is high and white relative to preceding periods, the market is bullish.

## Example: Head and shoulders Pattern



- In a Head and shoulders pattern, the stock price typically:
  1. Rises to a peak & subsequently declines.
  2. Then, the price rises above the formed peak & gain declines.
  3. And finally, rises again, <sup>but</sup> not to the second peak, ~~reaches new high~~ and declines once more.

The 1<sup>st</sup> & 3<sup>rd</sup> peaks are shoulders. The 2<sup>nd</sup> peak forms the head.

## Does Chartism make money?

- In "A Random Walk Down Wall Street" (1973), Burton Malkiel says that
  - a blindfolded chimpanzee throwing darts at the Wall Street Journal could select a portfolio
  - that would do as well as the experts..
- However, chartism
  - is still a very popular method/art among many market participants
  - it is particularly favoured by Forex traders
- Debate is still open as to whether prices are predictable, and whether Chartist can detect any patterns.

## EMH: Implications for fundamental analysis

- Under semi-strong EMH, fundamental analysis
  - can work if the underlying real variables that the analyst estimates are not perfectly observed by all market participants
  - A superior analyst can obtain positive abnormal profits if
    - He or she estimates the underlying variables correctly
    - The estimate is different from the market average estimate.
  - Gauging the relevant variables involves
    - aggregate market analysis,
    - Industry analysis, and
    - company analysis
  - Merely using historical data to estimate future values
    - Is not sufficient
    - Prices adjust quickly.

## How to evaluate analysts or investors

- Examine the performance of numerous securities
  - that this analyst recommends over time in relation to
  - a set of randomly selected stocks in the same risk class
- Selected stocks should
  - consistently outperform the randomly selected stocks

## Efficient markets & portfolio management

- Portfolio managers with superior analysts
  - concentrate efforts on mid-cap stocks
  - that do not receive the attention given by institutional portfolio managers to the top-tier stocks.
  - the market for these neglected stocks may be less efficient than the market for large well-known stocks.
- Portfolio managers without superior analysts
  - Determine & quantify your client's risk preferences
  - Construct diversified portfolio
  - Maintain the desired risk level by rebalancing the portfolio whenever necessary
  - Minimize total transaction costs.

## • The Rational & Use of Index Funds & Exchange-Traded Funds.

- Efficient capital markets & a lack of superior analysts
- imply that many portfolios should be managed passively
- (so their performance matches the aggregate market, minimizes the costs of research & trading).
- Institutions created market (index) funds
  - which duplicate the composition & performance of a selected index series,

## • Insights from Behavioral Finance

### • Growth stock

- usually does not pay dividends, as these are reinvested.
- There are stocks of companies that are
  - expected to experience high and sustainable growth in earnings

Caution: Overconfidence could lead analyst to overvalue future growth rates.

## • Contrary Investing:

- buy stocks for which price is falling and
- sell stocks for which the price is rising
- (contrarian investment strategy)
- That is, do not follow 'herd mentality'

## Behavioural Finance

### • Explaining Biases

#### • Prospect Theory

- Contends that utility depends on deviations from moving reference point rather than absolute wealth.

#### • Overconfidence (confirmation bias)

- Look for information that supports their prior opinions & decision.

#### • Noise Traders

- Influenced strongly by sentiment, they tend to move together,
- which increases the prices & the volatility of stocks

#### • Escalation Bias

- Put more money into a bad investment.

## • Fusion Investing

- The integration of two elements of investment valuation

1. fundamental value &
2. investor sentiment

#### • During some periods,

- investor sentiment is rather muted &
- noise traders are inactive,
- so that fundamental valuation dominates market returns.

#### • In other periods,

- when investor sentiment is strong,
- noise traders are very active & market returns are more heavily impacted by investor sentiments.

## Lecture 3

### Investment theory and strategies

#### page 46 Capital Asset Pricing Model (CAPM)

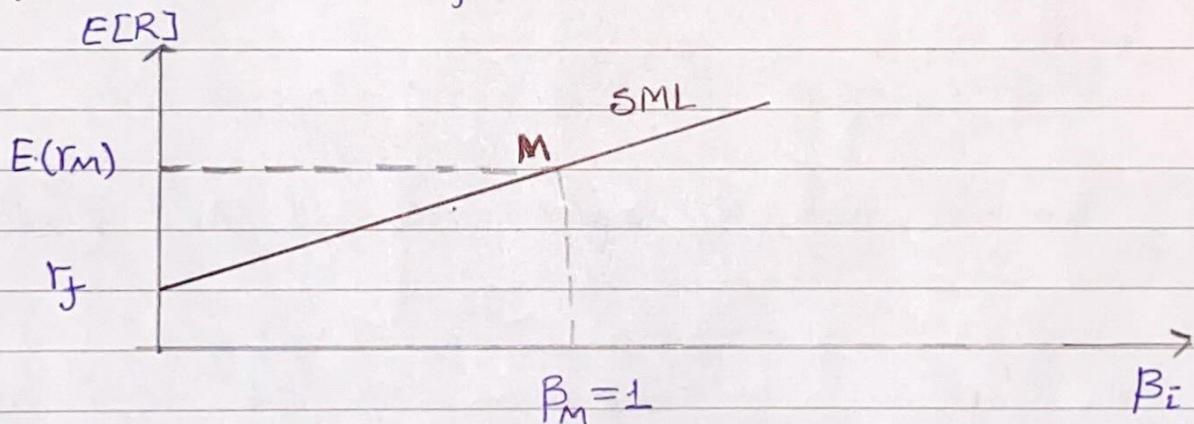
- is the equilibrium model that underlies all modern financial theory
- derived using principles of diversification with simplified assumptions

- For a (risky) asset  $i$ ,
- returns can be expressed as:

$$E(\tilde{r}_i) = r_f + \beta_i(E(\tilde{r}_m) - r_f)$$

where

- $M$  is the market portfolio
- $f$  is a risk-free asset
- $\beta$  is a measure of asset  $i$ 's risk



- the required return on any asset  $i$ ,
- is equal to the risk-free rate of return plus a risk premium

- The risk premium in this context
  - is the price of risk multiplied by the quantity of risk
- $\text{risk premium} = \text{price of risk} \times \text{quantity of risk}$
- The risk price of risk
  - is the excess return on the market portfolio.

• The quantity of risk

- Is the beta of the asset:

$$\beta_i = \frac{\text{Cov}(r_i, r_m)}{\text{Var}(r_m)}$$

- The beta of portfolio M is 1, and that for the risk-free asset is 0.

Example: Suppose two stocks: XYZ with  $E[r] = 12\%$ ,  $\beta = 1$  and ABC  $E[r] = 13\%$  &  $\beta = 1.5$ .

For M,  $E[r] = 11\%$  and  $r_f = 5\%$ .

which stock is a better buy according to the CAPM?

Solution

• For ABC:

$$E(r_i) = r_f + \beta_i(E(r_m) - r_f)$$

$$E(r) = 0.05 + 1.5 \times (0.11 - 0.05) = 0.14$$

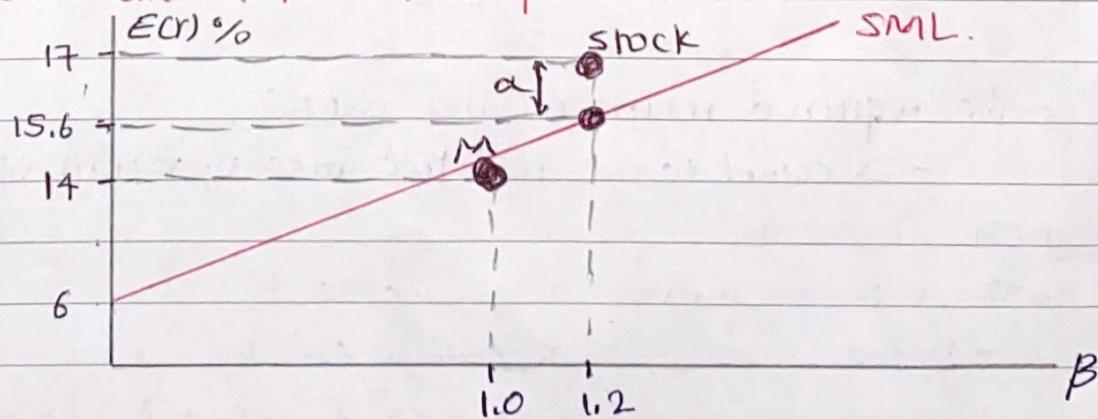
• For XYZ:

$$E(r) = 0.05 + 1 \times (0.11 - 0.05) = 0.11$$

Therefore, given the respective  $\beta$ 's, ABC is underperforming and XYZ is over-performing.

so, go long XYZ and short ABC

The SML and a Positive-Alpha Stock



## Alpha of stocks

- the alpha of the stock
  - difference between expected returns and returns predicted by CAPM

→ For ABC,

$$\alpha = 0.13 - 0.14 = -0.01$$

→ For XYZ,

$$\alpha = 0.12 - 0.11 = 0.01$$