

# Chapter 9

## Efficient Market Hypothesis

### Road Map

**Part A** Introduction to Finance.

**Part B** Valuation of assets, given discount rates.

**Part C** Determination of risk-adjusted discount rates.

- Introduction to risk and return.
- Portfolio theory.
- CAPM and APT.
- Efficient Market Hypothesis.

**Part D** Introduction to derivatives.

### Main Issues

- Efficient Market Hypothesis (EMH)
- Empirical evidence on EMH
- Implications of EMH
- Questions and practical issues about EMH

# 1 Efficient Market Hypothesis (EMH)

Definition: A financial market is (informationally) efficient when market prices reflect all available information about value.

A precise definition needs to answer two questions:

1. What is “all available information”?
2. What does it mean to “reflect all available information”?

Answer:

1. All available information includes:
  - Past prices – Weak form.
  - Public information (prices, news, ...) – Semi-Strong Form.
  - All information including inside information – Strong Form.
2. “Prices reflect all available information” means that financial transactions at market prices, using the available information, are zero NPV activities.

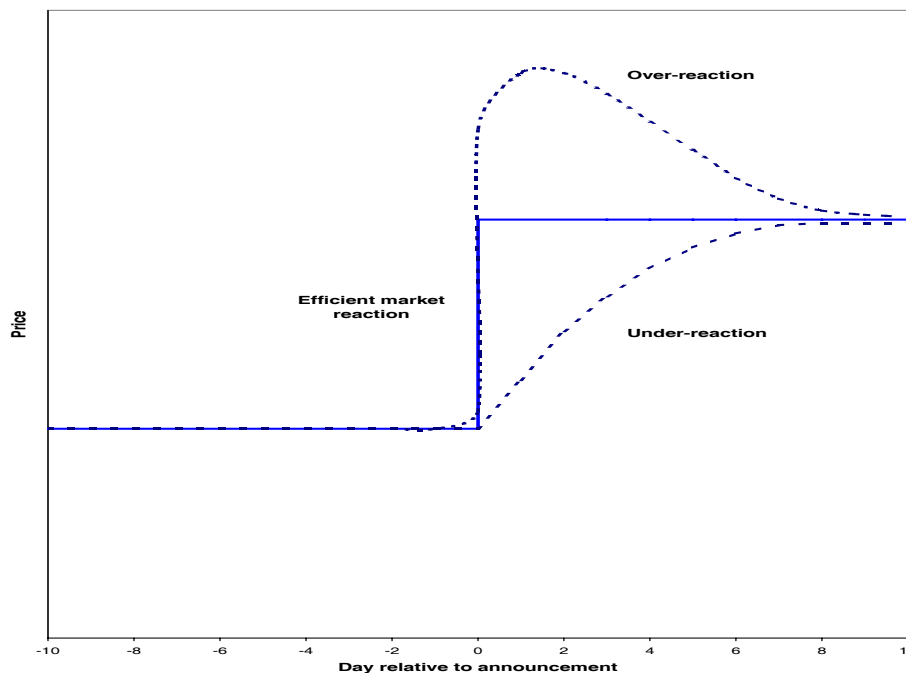
Question: Why should prices reflect available information?

Answer: If not, there would be positive NPV trades.

**Example.** Suppose that Merck announces a new allergy drug that could completely prevent hay-fever. How should the share price of Merck react to this news?

Consider three hypothetical paths for price adjustments:

1. Increase immediately to a new equilibrium level
2. Increase gradually to the new equilibrium level
3. First over-shoot and then settle back to new equilibrium level.



What do you think?

## 2 Empirical Tests of EMH

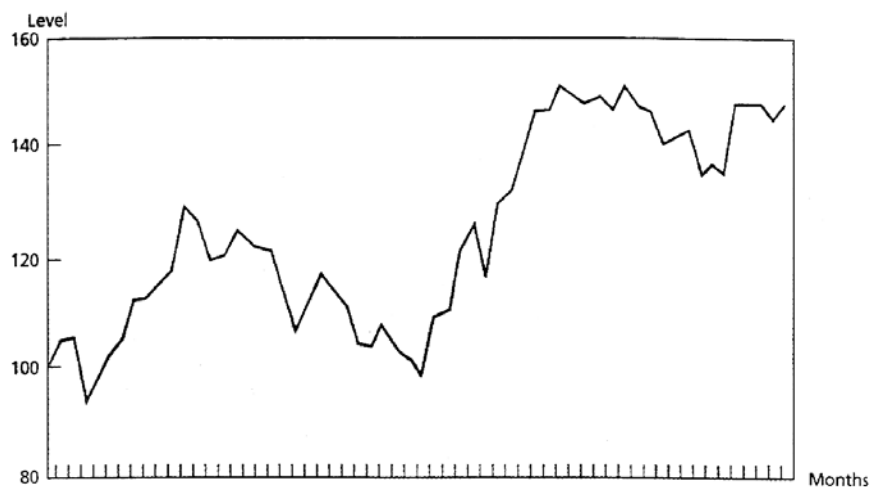
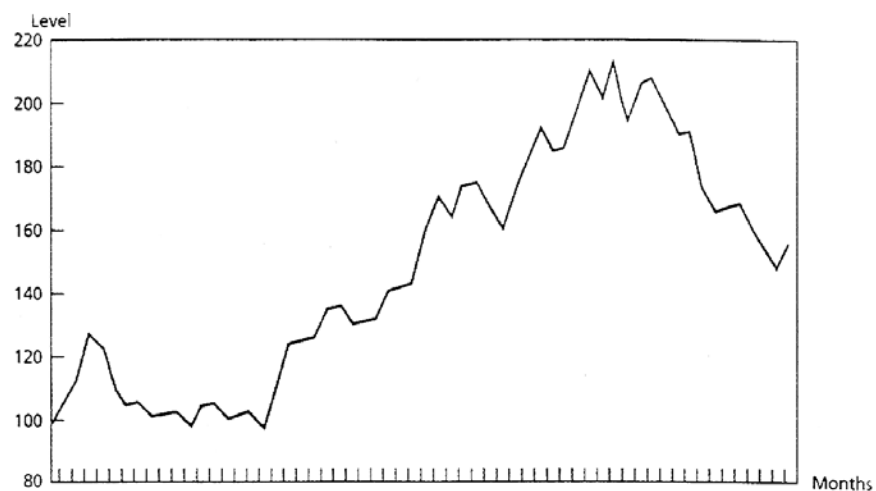
### 2.1 Supportive Evidence

1. Weak form of EMH is supported by the data.

► Technical trading rules are not consistently profitable.

S&P 500 Index (1980-1984) versus Coin-tossing

Source: R. Brealey and S. Myers, *Principles of Corporate Finance*.



- Serial correlation in daily stock returns is close to zero.

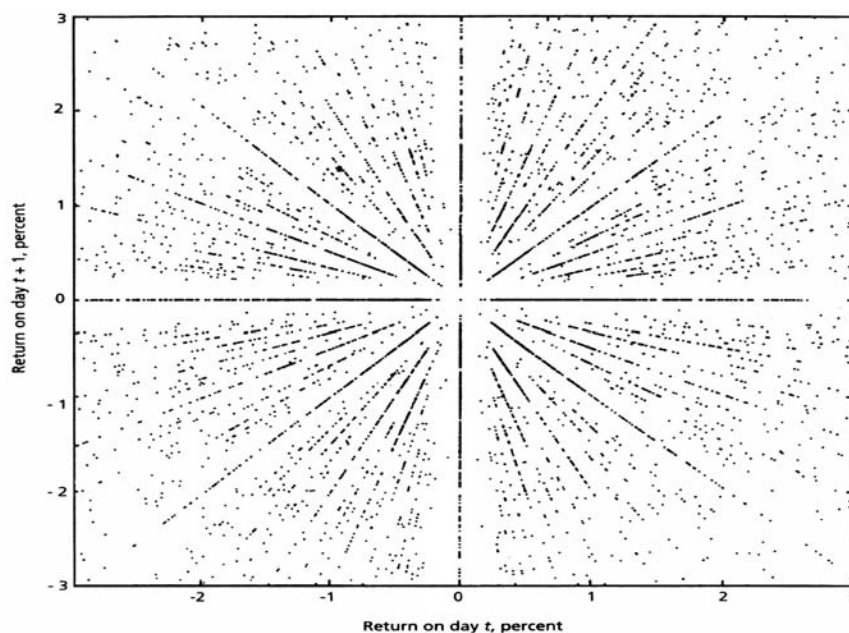
### Serial Correlation of Daily Returns on Nine Stock Markets

Source: B. Solnik, "A Note on the Validity of the Random Walk for European Stock Prices." *Journal of Finance* (December 1973).

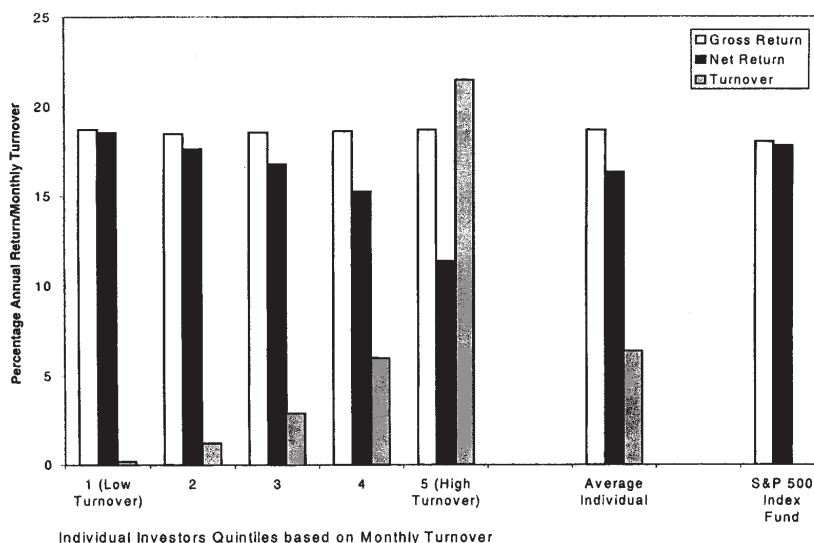
USA	0.03	UK	0.08
France	-0.01	Italy	-0.02
Germany	0.08	Holland	0.03
Belgium	-0.02	Switzerland	0.01
Sweden	0.06		

### Returns on Two Successive Days for Weyerhaeuser (1963-1993)

Source: T. Crack and O. Ledoit, "Robust Structure without Predictability: The 'Compass Rose' Pattern of the Stock Market." *Journal of Finance* (1996).



### Example. Trading can be hazardous to your wealth



**Figure 1. Monthly turnover and annual performance of individual investors.** The white bar (black bar) represents the gross (net) annualized geometric mean return for February 1991 through January 1997 for individual investor quintiles based on monthly turnover, the average individual investor, and the S&P 500. The net return on the S&P 500 Index Fund is that earned by the Vanguard Index 500. The gray bar represents the monthly turnover.

(From B. Barber and T. Odean, *Journal of Finance*, 2000, 773-806.)

### Example. Gender Issues in finance.

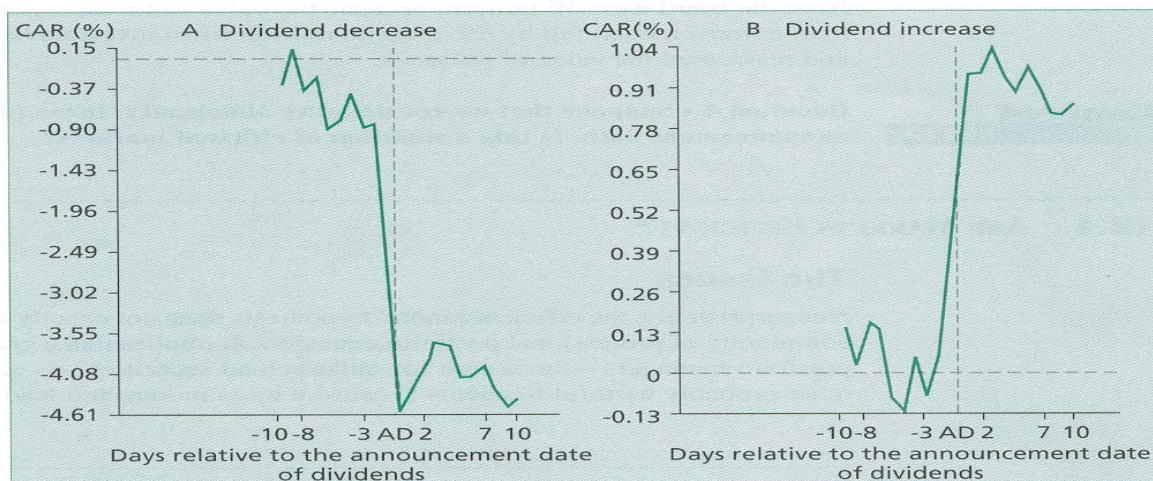
	<i>Single</i>		
	Men	Women	Difference
Average turnover	84.6%	50.6%	34.0%
Abnormal gross return	-0.89%	-0.35%	-0.54%
Abnormal net return	-2.90%	-1.45%	-1.45%
	<i>Married</i>		
	Men	Women	Difference
Average turnover	73.3%	52.9%	23.4%
Abnormal gross return	-0.82%	-0.60%	-0.22%
Abnormal net return	-2.57%	-1.85%	-0.72%

(From B. Barber and T. Odean, *Quarterly Journal of Economics*, 2001, 261-292.)

2. Semi-strong form of EMH is generally supported by the data.

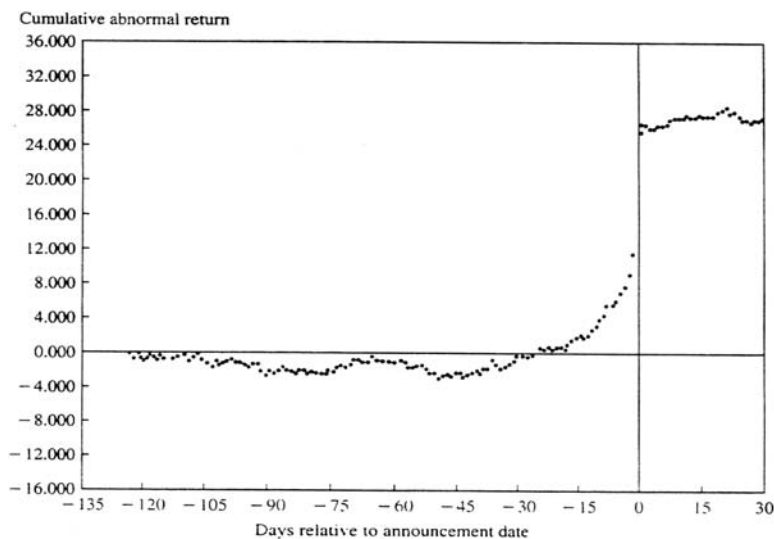
► Prices react to news quickly.

### Cumulative Abnormal Returns (CAR) before and after Dividend Announcements



### Cumulative Abnormal Returns (CAR) before and after Takeover Attempts: Target Companies

Source: A. Keown and J. Pinkerton, "Merger Announcements and Insider Trading Activity." *Journal of Finance* (1981).

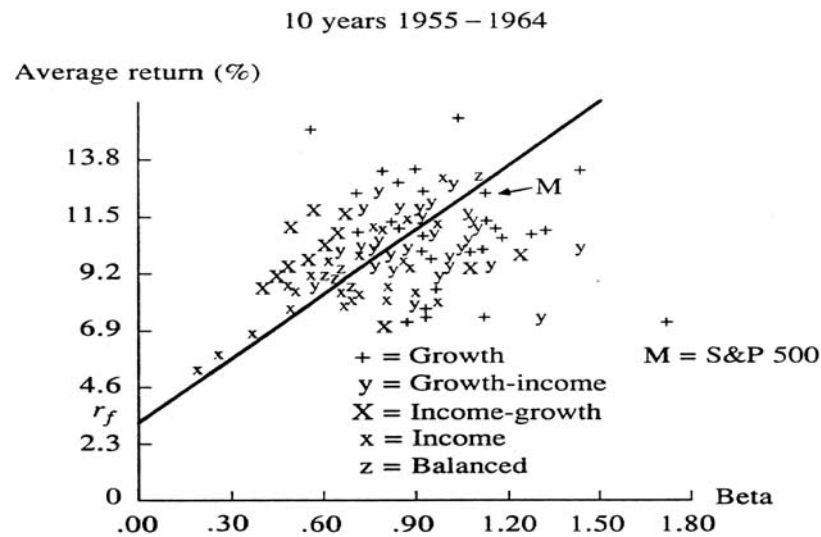


### 3. Strong-form of EMH has mixed evidence:

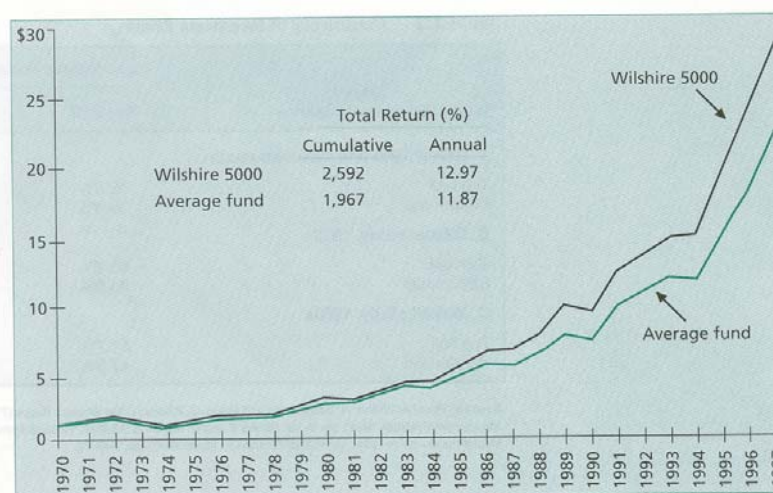
#### ► Money managers cannot consistently outperform.

##### Mutual Fund Performance (Gross of Expenses)

Source: M. Jensen, "Risks, the Pricing of Capital Assets, and the Evaluation of Investment Performance." *Journal of Business* (April 1969).



##### Performance of Average Equity Mutual Funds





► Inside-trading is not profitable — or is it?

Cumulative Abnormal Return (CAR) of Insider Trading

Source: L. Meulbroek, "An Empirical Analysis of Illegal Insider Trading." *Journal of Finance* (December 1992) .

Type of inside information	N	Insider holding period (# of trading days)	CAR over holding period (%)
Takeover related	145	12.5 (1.4)	29.9 (1.5)
Negative earnings	12	18.4 (7.6)	30.0 (4.7)
Positive earnings	3	21.3 (11.2)	3.3 (4.2)
Bankruptcy	10	26.4 (14.6)	73.9 (12.0)
Misc. good news	11	11.2 (7.7)	34.8 (6.9)
Misc. bad news	2	10.0 (7.0)	28.1 (2.5)
Total	183	13.7 (1.6)	32.2 (1.7)

Notes: The insider holding period begins with the first insider purchase or sale, and ends when the insider information becomes public. Standard errors are in parentheses.

## 2.2 Ambiguous Evidence

### 1. Stock Market Crash of 1987.

#### (a) Facts:

- No apparent exogenous news
- Enormous and dis-continuous price drop
- Worldwide
- No immediate bouncing back.

#### (b) Suspects:

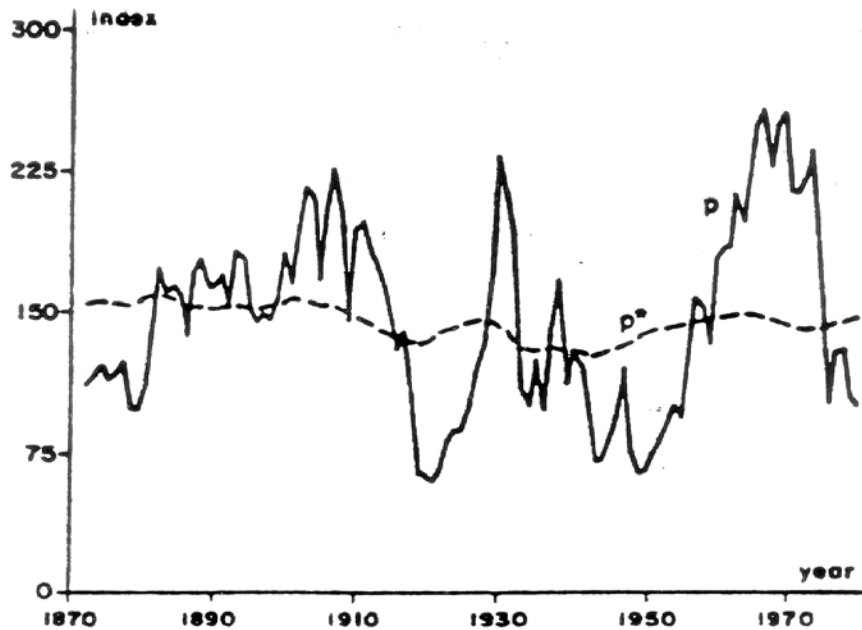
- Index arbitrageurs (actors or messengers?)
- Portfolio insurance
- Institutional selling.



## 2. Smooth dividends but volatile prices (Shiller).

Real S&P Index  $p$  versus Ex Post Rational Price  $p^*$  (1871-1979)

Source: R. Shiller, "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?" *American Economic Review* (Vol. 71, 1981).



### 3 Implications of EMH

1. Trust market prices.

- Buying and selling assets are zero NPV activities.
- Market prices give best estimate of value for projects.
- Firms receive “fair” value for securities they issue.

2. Read into prices.

- If market price reflects all available information, we can extract information from prices.

3. There are no financial illusions.

- Market price reflects value only from an asset’s payoff.
- It is not easy to trick the market.

4. Value comes from economic rents such as

- superior information
- superior technology
- access to cheap resources
- etc.

## 4 Questions about EMH

1. How does information get into prices?
2. If prices reflect all available information, who has the incentive to collect costly information?
3. How about anomalies?

### Practical Issues about EMH

1. Transactions costs
2. Regulatory restrictions
3. Taxes ...

# 5 Homework

## Readings:

- BKM Chapter 12.
- BMA Chapter 13.