Notes on Market Efficiency

1 Time Patterns in Security Returns

1.1 Intraday and and Day-of-the-Week Patterns

Returns on Mondays appear to be much lower than on other days of the week on the New York Stock Exchange, and returns on Fridays seem higher.

- Gibbons and Hess (1981): Monday's return was -35.5% on an annualized basis from 1962-1978. Large positive returns on Wednesdays and Fridays.
- Harris (1986): Large negative Monday returns from Dec. 1981-Jan 1983, but return for other days roughly the same. Most of the negative Monday occured from Friday close to 45 minutes after Monday open.

1.2 Monthly Patterns

Returns seem much better in January than any other month of the year, particularly for small firms.

- Fama (1991):

	1941-1981		1982-1990	
Portfolio	Jan	Feb.-Dec.	Jan.	Feb.-Dec
S&P 500	1.34	0.92	3.20	1.23
CRSP Small	8.06	0.88	5.32	0.17

- Gultekin and Gultekin (1983): January effect in 16 non-US markets stronger than in the US.

- Kato and Shallheim (1985): January effect for the Tokyo stock exchange not related to firm size.
- Tax-selling hypothesis
- January effects has been observed even where capital gains are not taxed.
- Hard to reconcile with efficient markets.

2 Predicting Return from Past Returns

2.1 Correlation Tests

$$r_t = a + br_{t-1-T} + e_t$$

- Weak relationship between returns over time.
- When using returns in excess of a benchmark, like the CAPM, no correlation at all.

2.2 Run Tests

Sign of price changes.

$$+ + + - -0 + - + ++$$

6 runs in this example: A run of 3 +'s, a run of 2 −'s, a run without change, a run of one +, a run of one − and a run of 3 +'s. More runs means less correlation.
Fama (1965): Expected 760 runs for one-day intervals and found 735.

2.3 Filter Rules

Buy the stock if its price increases by $X\%$ and sell it if it decreases by $Y\%$.
Fama and Blume (1966): Filter of 0.5% was profitable assuming very low trading costs.

2.4 Relative Strength

$$\frac{P_{it}}{\overline{P}_{it}}$$

$P_{it} \equiv$ price of security i at time t.
$\overline{P}_{it} \equiv$ average price n weeks prior to t (27 weeks, for example).
Buy if the stock is in the top $X\%$ of all stocks in terms of relative strengths;
sell if stock's relative strength is below that of $K\%$ of all securities.
Jensen and Bennington (1970): Tested different such trading rules but couldn't do better than the market as a whole.

2.5 Long-Run Correlation

Small negative correlation for three-year and five-year periods.

- Changing expected returns
- Mean reverting expected returns

3 Returns and Firm Characteristics

- **The size effect**.
  Banz (1981): Size has the same statistical significance as β.
  Subsequent studies: Much of the size effect occurs in January.
  May be due to the fact that the CAPM underestimates small firms' β's, thus calculating expected return that are too low.
  Size effect disappears with multifactor models.
- **Market-to-Book Ratios**.
  Fama and French (1988): Low market-to-book ratios is an indicator of return in excess of CAPM predictions.
- **Earnings/Price Ratios**.
  The P/E effect disappears when size and market-to-book ratio are accounted for.

4 Announcements and Returns

How fast is information incorporated into asset prices ?
Semi-strong form efficiency
Earnings greater than expected, seasonal offerings, stock splits.

Event Studies

- Collect a sample of firms that had a surprise announcement (the event).
- Determine the precise day of the announcement and designate this day as zero.
- Define the period to be studied. For example, 60 days around the event, i.e. day $-30, -29, \ldots, -1, 0, 1, \ldots, 29, 30$.
- For each firm in the sample, compute the return on each day being studied.
- Compute the "abnormal" return for each firm-day.

$$e_{i,t} \;=\; r_{i,t} \;-\; E[r_{i,t}],$$

  where $E[r_{i,t}] = \alpha_{i,t} + \beta_i E[r_{M,t}]$, for example.

- Compute for each day the average abnormal return for all firms in the sample.
- "Cumulative" abnormal returns are often used, the sum of abnormal returns since the beginning of the period.

4.1 Some Findings

Look at the figures in appendix.

5 Strong Form Efficiency

- Event studies using corporate insiders' reported trades.
- Information content of analysts' forecasts.
- Mutual funds' performance.

6 Market Rationality

- **Volatility Tests:** Are share prices more volatile than the fundamental variables that affect them (e.g. dividends)?
- **Winners-Losers:** DeBondt and Thaler (1985) demonstrate signs of investors' overreaction. As a result, winners become losers and losers become winners.
- **Market Crash of October 1987:** Impossible to find the news items that could have led to this major revision of expectations.

6.1 Behavioral Interpretations

- Forecasting errors
- Overconfidence
- Regret avoidance
- Framing and mental accounting