

## Chapter 4: Market efficiency

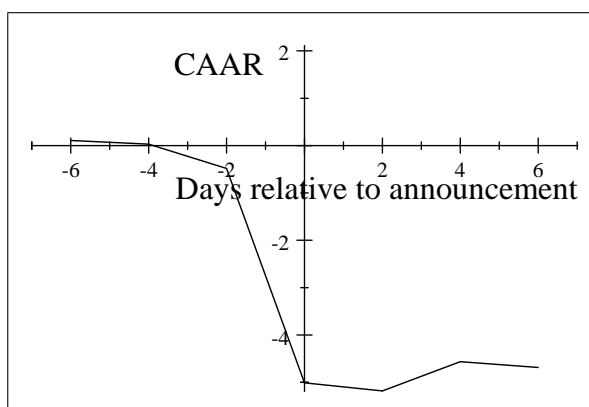
### Exercises - solutions

1. Goldman's decision is an effort to 'time' the market, which assumes the ability to predict when valuations will go up again. In efficient markets prices cannot be predicted, the possibility that valuations will go up again is already included in today's price.
2. That the NPV is zero. On efficient markets securities are priced such that they earn their expected return, which makes their NPV zero.
3. Investors will sell and short sell the stock when prices are predictably high and buy when they are low. This will drive the prices down at the top of the cycle and up at the bottom of the cycle, and they will keep on buying and selling until the cycle has disappeared.
4. No, even if many investors do not follow the information on a stock and even less trade, the price can still reflect available information. Market efficiency requires that trades take place and at prices that reflect all available information, the number of investors involved is irrelevant.
5. No, investors can disagree and prices will reflect some average of opinions. However, market efficiency requires that no (groups of) investors are consistently better at evaluating the impact on prices than others. Investors can earn excess returns, but not consistently.
6.
  - (a) The plots can visualize autocorrelation in the daily returns. Positive autocorrelation would give a clustering of the observations in the upper right and lower left quadrants of the graphs, showing that positive returns tend to be followed by positive ones and negative returns by negative ones. Negative autocorrelation would give a clustering of the observations in the lower right and upper left quadrants of the graphs, showing that positive returns tend to be followed by negative ones and negative returns by positive ones. The figure in the question shows neither pattern, the observations are scattered over all quadrants. Hence, the graphs show no autocorrelation in daily returns and do not reveal market inefficiency.
  - (b) The plots show that the single stock AF has a much larger volatility than the index: the index returns are much more clustered around the graph's origin (coordinates 0,0).
  - (c) The autocorrelation coefficients are all low, but the coefficient of Unilever is statistically significant. Significant autocorrelation rejects the hypothesis that the market is efficient. However, it is doubtful whether we can use such a low coefficient for a successful trading strategy. The square of the correlation coefficient measures the proportion of the variance of today's return that is explained by yesterday's return. For Unilever's coefficient this is less than 2%:  $-.138^2 = .019$ . Also, it is highly unlikely that Unilever will have the same autocorrelation in the next period.
  - (d) As under (c), the coefficients are low, but two of them are significantly different from zero (those for  $r_{t-2}$  and  $r_{t-3}$  of Royal Dutch Shell (RDSA)). These two contradict

the efficient market hypothesis but it is, again, doubtful whether this result persists in other periods and whether it is large enough to be exploitable. The proportion of variance in today's return that is explained by the regression (measured by the  $R^2$  statistic) is lower than 5%. Note that the significant autocorrelation in UNA does not appear in the regression.

7. No, over short time intervals (e.g. days) the expected return is so small that it can be ignored in autocorrelation calculations. 20% return per year over 250 trading days means less than 0.1% per day, very small compared to daily price changes. The fair game model does not require returns (price changes) to have zero expectation, but the *excess returns*, or deviations from the expected returns. Similarly, the EMH does not require stock prices to be martingales but the *properly discounted* stock prices. The stock prices themselves are expected to increase with required rate of return on the stock.
8. No, the EMH does not say that excess returns are impossible, it says that excess returns cannot be systematically earned by using the available information set. In view of the very large number of investors, it is to be expected that a few will be lucky a number of times in a row. Similarly, a few people will be very unlucky and lose large amounts on the stock market.
9. (a) No, it is to be expected that news reaches the stock market before it materializes in earnings (see question 13). It would contradict the EMH if it were the other way around (that earnings predict next quarter's stock returns).
- (b) No, you have tried 1000 different filter rules. Using a 5% confidence interval with a two-sided test you would expect to find  $\pm 25$  rules with a significantly positive return and the same number with a significantly negative return, based on pure chance. If you re-run the analysis on a different period you will probably find about the same number of significant results but in different stock-rule combinations.
- (c) Yes, the stocks of smaller, infrequently traded companies usually have higher transaction costs, e.g. a larger bid-ask spread.
- (d) Predictability contradicts the EMH but in this case it is obvious that the relation you found is spurious. Re-testing on a different dataset and/or period will almost certainly not reproduce similar results. However, the same conclusion would apply if your computer happened to find two variables that look plausible on first sight.
10. (a) That they do not exist.
- (b) No. There is no mention of risk, so the extra return relative to the index could be a premium for extra risk, relative to the index. Even if the 3% were truly excess returns, they could have been due to chance.
11. If the ranking is over a short period (0.5-1 year is typical), the benchmark index would be somewhere in the middle. Since excess returns are random, about equal proportions of the funds will over- and under-perform the index. As the period becomes longer, the index would move higher up on the ranking. Excess performance is not persistent so that good and bad years alternate. In the (very) long run few, if any, funds will outperform the index, so that the index will be (almost) on top.
12. Unknowledgeable investors are indeed protected in an efficient market, but only to a certain degree. Buying and selling at market prices will be fair, i.e. there is no mispricing that other, knowledgeable investors can profit from. But if you offer to sell below market prices (e.g. by making a typing error) other investors will quickly profit from your mistake. Efficient markets offer no protection against excessive trading and no reward for the unsystematic risk of poorly diversified portfolios.

13. No, the good news can have reached the market gradually in other forms, e.g. news that large contracts were concluded, personal was recruited, new plants were being build, etc. The reflection of this news in the stock price does not contradict the EMH.
14. No, the market can have expected a larger increase in earnings based on the news that became available earlier.
15. To calculate the abnormal return we first have to calculate the normal return with the market model. Estimation of the market model for DetNor over April-May gives:  $r_{DetNor} = 0.339 + 0.659 \times r_{OBX}$ . The return of the OBXindex on the announcement day is 1.46% so DetNor's normal return is  $0.339 + 0.659 \times 1.46 = 1.30$ . DetNor's observed return on the announcements day is 8.65%, so the abnormal return  $8.65 - 1.3 = 7.35\%$ .
16. (a) Dividend (omission) announcements are public information other than prices and volumes: Szewczyk et al. test semi-strong market efficiency. Their results do not contradict the Efficient Market Hypothesis (EMH): CAAR are stable before the event, there is a sharp decline on the event date and again hardly any change in CAR after event date. This is shown in the data but it becomes more clear if we plot CAAR over time. The figure shows an efficient marked response to new information. The usual statistical assumptions apply.



CAAR for firms announcing dividend omissions

- (b) No! In order to say something about strong form market efficiency it has to be tested. For example by taking a sample of insiders, analyse their investments, look at the excess returns, etc. It is not possible to draw conclusions about strong form efficiency from a test of semi-strong efficiency.