

Testing and difficulties

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We can note that whilst an apparent proof based upon historical data over one period of time might be valid for that particular period, it might not be valid for a subsequent time period, perhaps because the nature of the market or the available information has changed. We can also note that the parties involved in providing proof will have vested interests and may therefore be biased, publishing only those results that support their position.

Thus, although it may in principle be possible to exploit temporary mispricing, it may not be possible in practice after appropriate allowance has been made for both transaction costs and the costs of obtaining information. Whether or not such a finding contradicts the EMH depends upon exactly how we define the EMH.

The EMH is not contradicted by a strategy which produces higher profits than the market portfolio by taking higher risks. The market rewards investors for taking risks, so we expect, on average, a high-risk strategy to result in higher returns. What would contradict the EMH is an investment strategy that provided returns over and above those necessary to compensate an investor for the risk they faced. Unfortunately, there is no universally agreed definition of risk, and no perfectly accurate way of measuring it.

Informational efficiency The EMH (in its various forms) states that asset prices reflect information. However, it does not explicitly tell us how new information affects prices.

Many studies show that the market over-reacts to certain events and under-reacts to other events. The over/under-reaction is corrected over a long time period. If this is true then traders could take advantage of the slow correction of the market, and efficiency would not hold.

Over-reaction to events Some of the effects found by studies can be classified as over-reaction to events, for example:

1. **Past performance:** past winners tend to be future losers and vice versa. The market appears to over-react to past performance. Hence it might be possible to make excess profits by selling shares in firms that have performed well recently and buying those that have performed badly. This is sometimes referred to as a contra-cyclical investment policy.
2. **Certain accounting ratios appear to have predictive powers:** eg companies with high earnings to price, cashflow to price and book value to market value (generally poor past performers) tend to have high future returns. Again, this is an example of the market apparently over-reacting to past growth.
3. **Firms coming to the market:** evidence from a number of major financial markets including the UK and the US appears to support the idea that stocks coming to the market by Initial Public Offerings and Seasoned Equity Offerings have poor subsequent long-term performance.

Under-reaction to events There are also well-documented examples of under-reaction to events:

1. **Stock prices continuing to respond to earnings announcements up to a year after their announcement.** This is an example of under-reaction to information which is slowly corrected.
2. **Abnormal excess returns for both the parent and subsidiary firms following a de-merger.** This is another example of the market being slow to recognise the benefits of an event.

3. Abnormal negative returns following mergers (agreed takeovers leading to the poorest subsequent returns). The market appears to over-estimate the benefits from mergers and the stock price slowly reacts as the optimistic view is proved to be wrong.

Excessive volatility therefore arises when security prices are more volatile than the underlying fundamental variables that should be driving them. The claim of 'excessive volatility' was first formulated into a testable proposition by Shiller in 1981. He considered a discounted cashflow model of equities going back to 1870. By using the actual dividends that were paid and some terminal value for the stock, he was able to calculate the perfect foresight price, the 'correct' equity price, if market participants had been able to predict future dividends correctly. The difference between the perfect foresight price and the actual price arises from the forecast errors of future dividends. If market participants are rational, we would expect no systematic forecast errors. Also if markets are efficient, broad movements in the perfect foresight price should be correlated with moves in the actual price as both react to the same news.

Shiller found strong evidence that the observed level of volatility in the S&P 500 stock index contradicted the EMH as such volatility was not in line with the subsequent fluctuations in the dividends.

However, subsequent studies, using different formulations of the problem, found that the violation of the EMH only had borderline statistical significance. Numerous criticisms were subsequently made of Shiller's methodology. These criticisms covered:

- the choice of terminal value for the stock price
- the use of a constant discount rate
- bias in estimates of the variances due to autocorrelation
- possible non-stationarity of the series, ie the series may have stochastic trends which invalidate the measurements obtained for the variance of the stock price.