ECON30024
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Tutorial 2 (for Week 3)

1. Review Week 3 quiz questions.

2. Consider a 'random walk' model of asset prices. Let $p_t \equiv \log(P_t)$ denote the logarithm of asset prices, and assume p_t satisfies

$$p_{t+1} = p_t + \varepsilon_{t+1} \tag{1}$$

where $\{\varepsilon_t\}$ is a sequence of i.i.d. Normal random variables with zero mean and standard deviation σ. We would like to forecast p_{t+1} based on information available at date t. The following questions ask you to find some information about p_{t+1}.[1]

   (a) Let $p_0 = 1$ and $\sigma = 0.1$, simulate p_1, p_2, ..., p_{500} using equation (1), and plot the simulated asset prices $\{P_t\}$.[2]

   (b) Express p_{t+1} in terms of p_0 and ε_1, ..., ε_{t+1}, where p_0 is the initial observation.

   (c) Find $E(p_{t+1}|p_t)$, i.e., the expectation of p_{t+1} conditional on p_t.[3] Is $\{p_t\}$ a martingale?

   (d) Find $var(p_{t+1}|p_t)$, which indicates the forecasting error when we forecast p_{t+1} conditional on p_t); and $var(p_{t+1})$, which indicates the forecasting error when we forecast p_{t+1} at date 0 when no information has been revealed yet.

   (e) Find $cov(p_{t+1}, p_t|p_t)$, the covariance of p_{t+1} and p_t conditional on p_t.

3. Briefly explain the difficulties inherent in empirically testing the EMH.[4]

4. Discussion questions:

   (a) If asset markets are efficient, can arbitrage opportunities exist?

   (b) Do asset market anomalies indicate asset market inefficiency?

[1] The purpose of this question is to deepen your understanding of a random walk process so that you understand why asset prices are not predictable when they follow a random walk. It also practices some formulas in math review 1.

[2] The figure on page 7 of Topic 2 slides plots one simulated path of asset prices.

[3] 'Conditional on' p_t means p_t is known to us, i.e., p_t is no longer a random variable and we can treat it as a number.

[4] In the final exam, there will be short essay questions. This question and question 3 of additional exercise questions on Topic 2 give you two examples of such questions.