Washington University — Fall 2008
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Economics 487

Midterm #1 Practice Questions

You are allowed to bring one single-sided sheet of notes to the exam. You can also use a calculator. Please bring a dark pen.

1. Suppose that X and Y are two random variables and that $Y = X^2$. Let X have values –3, –1, 1, 3 with equal probabilities. Show that the correlation coefficient between X and Y is zero. Does this mean that X and Y are independent random variables? Explain.

2. Suppose P_t is the price of a stock that pays no dividends. How would you calculate the simple gross return for the stock using P_t and P_{t-1}? How would you calculate the continuously compounded return for the stock using P_t and P_{t-1}? How would you calculate the continuously compounded return for the stock using the simple gross return? Which return, the simple net return or the continuously compounded return, will be larger and why (intuition)?

3. Suppose P_t is the price of a stock and the stock pays a dividend D_t between *t-1* and *t*. How would you calculate the simple gross return for the stock using P_t, P_{t-1}, and D_t? How would you calculate the continuously compounded return for the stock?

4. How would you calculate the annualized simple return if the monthly simple net return for a stock is $R_t = 0.05$? How would you calculate the annualized continuously compounded return if the monthly continuously compounded return is $r_t = 0.05$?

5. Consider a discrete random variable X that mimics the behaviour of the annual return on Microsoft.

State of Economy	S_X = Sample Space	$p(x) = \Pr(X = x)$
Recession	-0.3	0.2
Normal	0.1	0.6
Boom	0.5	0.2

What is the formula used to calculate the expected value of a discrete random variable? What is the expected value of X? What is the formula used to calculate the variance of a discrete random variable? What is the variance of X?

6. Suppose the historical sequence of annual returns (x_t's) for Microsoft is 0.1, -0.3, 0.1, 0.5, 0.5, -0.3, 0.1, 0.5, -0.3. What is the formula used to calculate the *sample* mean of a set of realizations of a random variable? What is the *sample* mean of the return on Microsoft? What is the formula used to calculate the *sample* variance of a set of realizations of a random variable? What is the *sample* variance of the return on Microsoft?

7. In words, what are *skewness* and *kurtosis*? Why is *skewness* relevant to the usual measure of risk in finance? (Hint: see Random Walk Down Wall Street, Pt. 3.)

8. What three assumptions underlie the CER model? Why is CER model applied to continuously compounded returns rather than simple returns? What is the main assumption underlying the use of *sample* statistics to estimate the CER model?

9. In the CER model $\varepsilon_{it} \sim i.i.d.N(0,\sigma_i^2)$ represents the impact of news about firm *i* at time *t* on the realized return r_{it}. Why is it reasonable to assume that $E[\varepsilon_{it}] = 0$?

10. Which is a random variable: an estimator or an estimate? How does *bias* relate to these concepts?

11. Draw the portfolio frontier for 2 risky assets whose returns are negatively correlated. Label the points on the frontier corresponding to the assets. Briefly describe how you would compute this frontier using Excel.

12. What is the Sharpe ratio in economic terms? Why is it important in portfolio theory?

13. Given assets A and B, with $\mu_A = 0.175$, $\mu_B = 0.055$, $\sigma_A^2 = 0.067$, $\sigma_B^2 = 0.013$, and $\sigma_{AB} = -0.004875$, go through the optimization steps to calculate the weights for the minimum variance portfolio. Then, calculate the mean and variance for the minimum variance portfolio. That is, calculate x_A, x_B, μ_P, and σ_P^2 using the analytical formulas you solved for.

14. Discuss Malkiel's critique of technical analysis and fundamental analysis and how it relates to the weak, semi-strong, and strong versions of the random walk hypothesis. In particular, give examples of investment strategies based on these two approaches, discuss why Malkiel believes any successful technical rule is doomed to ultimate failure, and discuss why he believes fundamental analysis is affected by the randomness of events. What does Malkiel propose as an alternative investment strategy?