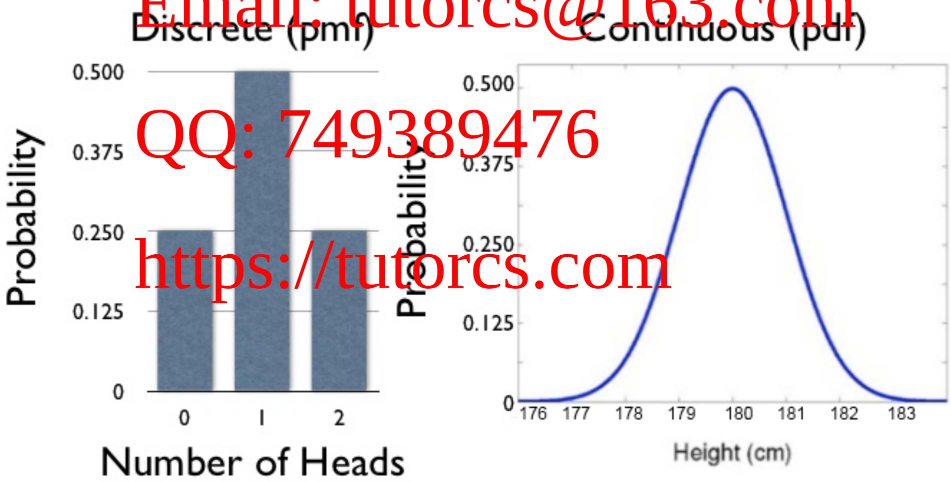
ECON3206/5206 Financial Econometrics

Tutorial 1

1. Let P_t be the [illegible] at the end of day t, adjusted for dividends. The daily return may b[illegible] the simple $R_t = (P_t - P_{t-1})/P_{t-1}$ or the log return $r_t = \ln(P_t/$[illegible] $\approx R_t$ when $|(P_t - P_{t-1})/P_{t-1}|$ is small. Hint: use Taylor expa[illegible]

2. In the same setting as in Question 1, suppose $P_1 = \$30$ at the end of day 1, $r_2 = 5\%$ at the end of day 2, and $r_3 = -3\%$ at the end of day 3. What is the price at the end of day 3? What is the return from the end of day 1 to the end of day 3? More generally, based on the daily returns, how do you calculate the weekly return of the BHP stock? Assume that a week consists of 5 trading days.

3.



The above figure shows the probability mass function (pmf) on the left and the probability density function (pdf) on the right for discrete and continuous random variables, respectively.

The discrete random variable represents the number of times we observe heads when we toss a fair coin 2 times.

In the future I will use asterisk *[ ] and parenthesis for materials or questions which are not essential for performing well in the course, but which may be of interest.

*[Abraham de Moivre was a French mathematician who first noticed that as you increase the number of tosses, the distribution of the total number of heads (appropriately rescaled because the mean is increasing with the number of tosses) takes a speci[illegible] be approximated by a continuous bell shaped distribution ([illegible]*ate curve*). This is first special case of at the central limit theorem[illegible] *curve,* which is now known as Normal or Gaussian distribution [illegible]arl Gauss, a German mathematician, the greatest contributor t[illegible] science since antiquity.
For more insights on de Moivre reasoning you may read this http://www.mathpages.com/home/kmath642/kmath642.htm]

(a) What are all possible outcomes of the experiment: toss a fair coin 2 times and count heads?
(b) What is the probability to observe outcome 0?
(c) Compute the mean and the variance for the discrete random variable.

The continuous random variable corresponds to a height of a person in some population.

(d) What is the probability to observe outcome 180?
(e) Which proportion of the population is expected to have height below 180?
(f) In your own words, explain the notions of the probability density function and the cumulative probability distribution for a continuous random variable. What about their counterparts for a discrete random variable?
(g) In your own words, explain what the mean and the variance of a random variable measure.
(h) In your own words, explain the central limit theorem.

4. Use an example with two (random) variables to explain the notion of the conditional distribution of one variable given the other.

5. Suppose $\{X_1, X_2, \dots, X_n\}$ is a set of random variables that (i) are *uncorrelated* with one another; (ii) have common mean μ and variance σ^2. Let $\bar{X} = \frac{\sum_{t=1}^{n} X_t}{n}$ be the sample

mean. Find (a) $E(\bar{X})$, (b) $\mathrm{Var}(\bar{X})$, (c) $E(f(\bar{X}))$, where $f(x)$ is a function. Hint: think carefully about (c), you may need to impose additional restriction on $f(x)$.

(d) Can you ... ing that the random variables are *uncorrelated*?

(e) What hap... n gets larger ($n \to \infty$)? What happens to $\bar{X}$?

ECON5206: ... e to the law of large numbers?

(f) **ECON52** ... **theorem in the context of** $\bar{X}$

6. Recently Chinese stock market received a lot of attention. We are going to use a recent data set on the SHANGHAI SE A SHARE - PRICE INDEX and S&P/ASX200 - PRICE INDEX. The data was downloaded from Data-steam, but you may get these data also from finance.yahoo.com. The data is in the file ASX200-SE-indexes.xlsx on Moodle. Using excel try to:

   (a) Plot the indices;

   (b) Generate the log return series of the indices and plot the log return series;

   (c) Compute the mean, variance, skewness and kurtosis of the log return series;

   (d) Compute the statistics Z_{sk}, Z_{kt} and JB;

   (e) Compute the correlations of log return series

   (f) Summarise the features of the log return series and compare with the lecture examples .

[1] You may ask why Excel. This is coming from a recent interaction from an employer who claimed that Economics graduate do not know how to use Excel and that is the only software they use. Sounds fishy, but let's do this one in Excel.