ECON3206/5206 Financial Econometrics

Tutorial 2

1. With a suitable transformation, which of the following models can be classified as linear regression and estimated by OLS? Comment.

(1) $y_t = e^{\alpha} x_t^{\beta} e^{u_t}$,

(2) $y_t = \alpha + \beta\gamma x_t + u_t$,

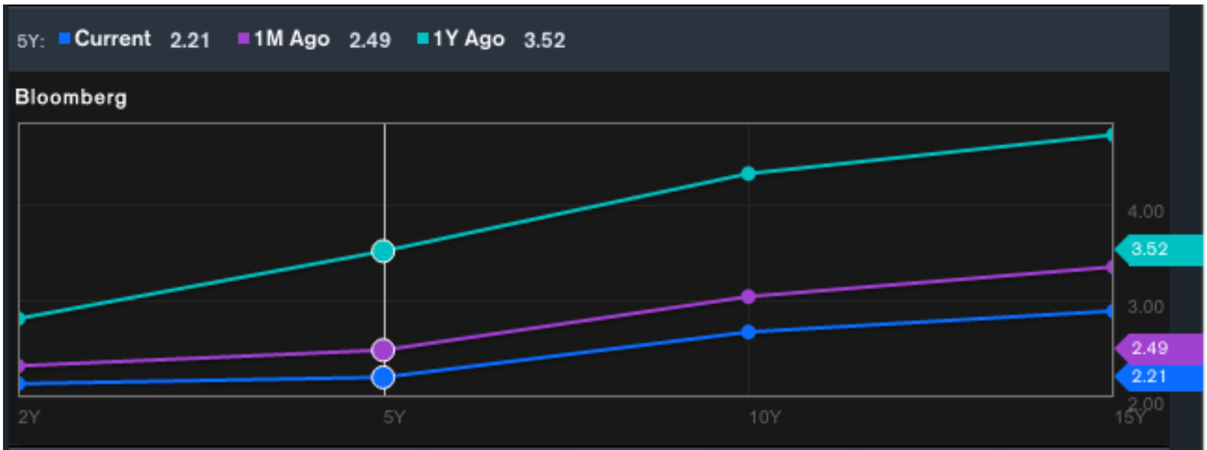
(3) $y_t = \alpha + \beta x_t z_t + u_t$,

where e^x is the exponential function; α, β and γ are parameters to be estimated; y_t is a dependent variable; x_t and z_t are explanatory variables; u_t is the error term with $E(u_t | x_t, z_t) = 0$.

2. Derive the OLS estimator for the coefficient α for the following simple model: $Y_t = \alpha + u_t$. You may use matrix notation, if you want.

3. Suppose that a population equation is given by $\mathbf{Y} = \mathbf{X\beta} + \mathbf{Z\gamma} + \mathbf{u}$. Instead you estimated the following linear regression model $\mathbf{Y} = \mathbf{Xb} + \mathbf{e}$. Assume $E[\mathbf{u} \mid \mathbf{X}, \mathbf{Z}] = 0$. It is well known that the estimator of $\boldsymbol{\beta}$ typically will suffer from the omitted variables bias. Derive the bias and state the condition(s) under which the estimator will be still unbiased.

4. The chart below describes the evolution of the yield curve for the Australian government bonds at different maturities. Interpret the annualized yield? What it the relation between the yields and the bond prices? Which tendency do you observe about the yield curve? What does it signal about the expectations of the market participants about the future yields? (Use the law of one price to support your discussion). How these expectations relate to the inflation expectations and the level of economic activity?



Name	Yield	1 Day	1 Month	1 Year	Time
Australia Bond 2 Year Yield	2.14%	-4	-17	-66	01/07/2015
Australia Bond 5 Year Yield	2.21%	-4	-27	-130	01/07/2015
Australia Bond 10 Year Yield	2.68%	-3	-36	-164	01/07/2015
Australia Bond 15 Year Yield	2.90%	-3	-45	-182	01/07/2015

Change shown in basis points

Source: Bloomberg

Python exercises

1. (Commodity Prices) The Excel data file `commod.XLS` contains daily data from the 1st of May 1989 to the 26th of February 1993 (a total of 1000 observations) on the following commodity prices: copper, gold, lead and silver.

   (a) For the commodity price (denoted P) of Copper,
   - generate the returns: $r_t = 100[\ln(P_t) - \ln(P_{t-1})]$,
   - generate squared (and absolute) returns,
   - Time series plot the returns, the squared (and absolute) returns.

   (b) For the returns, squared returns and absolute returns, compute
   i. Summary or descriptive statistics: mean, variance, skewness and kurtosis.
   ii. The empirical distribution a histogram.
   iii. The Jarque-Bera test of normality.

   (c) Are the returns, squared returns, and absolute returns normally distributed? Characterise their empirical distributions.

   (d) For the three series (returns, absolute returns and squared returns, compute
   i. The first twelve autocorrelation coefficients of returns.
   ii. Are the returns, squared returns and absolute returns autocorrelated?

iii. Given the results, would you support the claim that the Copper market is efficient?

(e) Repeat (a) – (d) for Gold price series (and the other two commodities if you wish).

2. Under the Fisher hypothesis, nominal interest rates fully reflect the long-run movements in inflation. Let R_t be the nominal interest rate and π_t be the inflation rate. The Fisher hypothesis (due to Irving Fisher of the University of Chicago) is given by $R_t = \beta_0 + \beta_1\pi_t + u_t$

   where u_t is a disturbance term. If the Fisher hypothesis is correct $\beta_1 = 1$. Using the data in the excel file `fisher.XLS`, which contains 108 quarterly Australian data for the period 1969:3 to 1996:2 on R (90 day bank accepted bill rate) and P (the Australian CPI), test the Fisher hypothesis by doing the following.

   (a) Construct the inflation rate as $\pi_t = 400(\log P_{t+1} - \log P_t)$. We multiply by 400 to express the change in price as an annual percentage change. In EViews, generate the series as $INF = 400 * (\log(P(1)) - \log(P))$ Graph both the interest rate and inflation.

   (b) Estimate the model and interpret the parameter estimates.

   (c) Test $\beta_1 = 1$ and interpret the result. In particular, interpret the estimate of β_0 when $\beta_1 = 1$.

   (d) Compute the autocorrelations and partial autocorrelations for R_t and π_t. Interpret your results