

Homework 9 – Due Tuesday, May 12
(Turn in at KMC 8–63 or via email to pperry@stern.nyu.edu before 6:00PM)
STAT-GB.2302, STAT-UB.0018: Forecasting Time Series Data

In these problems, we will consider the spread (long term minus short term interest rates) between 20 year UK gilts and 91 day UK Treasury Bills for the period 1952, First Quarter, to 1988, Fourth Quarter ($n = 148$). The interest rates for the gilts and the treasury bills are in the long and short columns from `gilt.csv`. You will need to take the difference of these two variables to find the spread.

Problem 1

Plot the UK interest rate spread. Does the series appear to be stationary? Based on the ACF and the PACF of the raw data, explain why an AR(1) model might be reasonable.

Problem 2

Estimate an AR(1) model by a least squares regression of (x_2, \dots, x_n) on (x_1, \dots, x_{n-1}) , together with a constant term. Using the standard error from the regression output, and assuming that $\hat{\rho}$ is normally distributed, calculate the p -value for the hypothesis test of $H_0 : \rho = 1$ versus $H_1 : \rho < 1$ (one-sided alternative), where ρ is the true AR(1) parameter. Does this p -value provide strong evidence against the random walk hypothesis? Is $\hat{\rho}$ significantly less than 1 at level .01?

Problem 3

Based on the ACF, PACF, sample mean and sample standard deviation of the differenced data, argue that a random walk without drift might also provide a reasonable model for the UK interest rate spread.

Problem 4

Perform the Dickey-Fuller test (τ_μ) of driftless random walk versus stationary AR(1). Compute the approximate p -value for the AR(1) hypothesis, based on the Dickey-Fuller table. Is $\hat{\rho}$ significantly less than 1 at level .01? Accordingly, based on a hypothesis test at level .01, decide whether the UK interest rate spreads are driftless random walk or stationary AR(1). This conclusion is different from the one you arrived at in Problem 1 (if you have not made a mistake). What is the reason for the difference? Which conclusion is more justifiable, on statistical grounds? If you used a significance level of .05, what would you conclude from the Dickey-Fuller test?