FORECASTING HOMEWORK 9

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. ($n = 148$). You need to create this data set by taking the difference between the contents of the files Long.M and Short.M which are stored in /class/churvich.

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.

2)

Estimate an $AR(1)$ model by a least-squares regression of $(x_2, \ldots, x_n)$ on $(x_1, \ldots, x_{n-1})$, 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 $H_1 : \rho < 1$, 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?

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.

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 rates 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?