FM 431: Econometrics of Financial Markets

Fall 2009

PROBLEM SHEET # 2

Problem 1: File `marriages.txt` contains a series of monthly marriages in Turkey.

a) Analyze this series using stl.

b) Based on your stl decomposition, produce a forecast for the monthly number of marriages in 2008.

Problem 2: The data files in folder `analyze_market_data` contain daily (adjusted, where necessary) closing quotations of F (Ford Motor Co.), IBM (International Business Machines Corp.), DAX, DJIA, SSEC, and WTI (West Texas Intermediate crude oil; spot price quotations.)[1]

a) For each asset, analyze the distribution of daily returns of the price series, using the R function `elem.an` (file elem.an_02.R) with respect to its mean, standard deviation, skewness, and kurtosis.

b) Find the days with the highest (second highest etc.) loss (gain). Do you know what happened on these days? Which events may have contributed to this high loss or gain? (Hint: Try looking up keyword "List of stock market crashes" in the Wikipedia.)

c) Split each series into two equal parts. Analyze the sub-periods separately. Are they similar with respect to the distribution of returns?

d) For each asset, plot a histogram of the return distribution and add the normal density to the plot, with mean and variance equal to the sample mean and sample variance. What is your conclusion?

e) Examine whether the three sigma-rules hold for the daily returns.

f) Do (a)–(e) also for weekly returns.

Problem 3: Define two processes $x = (x_t)_t$ and $y = (y_t)_t$ as follows:

$$\begin{aligned} x_t &= \epsilon_t + \beta\epsilon_{t-1}, \\ y_t &= \epsilon_t + \frac{1}{\beta}\epsilon_{t-1}, \end{aligned}$$

where (ϵ_t) is white noise with variance σ^2, and $0 < \beta < 1$.

a) Show that x and y have the same autocorrelation function.

b) What can you say about the invertibility of x and y?

[1] Source of data: WTI: http://www.eia.doe.gov, the website of the Energy Information Agency of the US Government; all others: http://finance.yahoo.com.