STAT1010: EXERCISE SHEET 2

1. Continuation of exercise 3 on exercise sheet 1.

   a) Confirm the standard error, the t-statistic and the 95% confidence interval from Excel for the slope coefficient of the invention year by pen-and-paper calculations. *Hint:* $s_x^2 = 1833.\bar{1}$

   b) Find both a 95% confidence interval for the average lag to general use and a 95% prediction interval for the lag to general use of an invention made in year 2025. *Hint:* $\bar{x} = 1924.\bar{8}$

2. Continuation of exercise 2 on exercise sheet 1.

   a) Confirm the test statistic for Pearson's linear correlation coefficient by pen-and-paper calculations and cross-check its p-value from a table of critical values for the Student t-distribution.

   b) Find also the p-value for the two-sided test of $\rho = 0$ in the large sample approximation.

   c) Use the Real Statistics correlation tool to test $H_0: \rho = 0.5$ against $H_1: \rho \neq 0.5$

3. Regress the following time series of index values upon time (that is, the consecutive number of the observation) and perform a careful residual analysis:

	1	2	3	4	5	6	7	8	9	10	11	12
2006	103,8	104,1	104,0	104,3	104,7	104,7	105,2	105,0	105,4	105,8	105,5	105,1
2007	105,2	105,3	105,3	105,5	105,7	105,7	106,2	106,1	106,4	106,8	107,2	107,8
2008	108,1	108,9	109,2	109,8	110,8	111,4						

   a) Perform the regression first with excel's own data analysis tool. Ask for the residuals, the line fit plot and the residual plot.
   Is the linear apporach appropriate? Are the assumptions of homoscedasticity and independence of the residuals satisfied?

   b) Use the Real Statistics Descriptive Statistics & Normality tool to ask for a QQ-Plot, descriptive statistics, a box-plot and a Shapiro-Wilk test of the residuals. Are the residuals normally distributed?

   c) Perform a two-sided Durbin Watson test of the residuals ($\alpha = 5\%$) using the regression tool of the Real Statistics toolbox.

4. Below are stock price changes of the sectors trade, industry, and high-tech of shares traded at the Helsinki stock exchange on September 10th and 12th, 2001, some of which were exceptionally large. The table below displays how many shares in the respective sectors had higher/ lower returns than the median of all stock returns. Apply the median test in order to clarify, whether the impact of the September 11th terrorist attack was the same for all sectors. Do the calculation both in excel and by hand.

		Sector	
Return (%)	Trade	Industry	High-Tech
> median	13	6	14
≤ median	9	16	8