

## Tutorial 1 Time Series Analysis

### Stochastic Time Series: ARMA modeling

1. Upload the data files “gsci” and “jpm”.
2. Generate the logs of the and check for normality (descriptive statistics, histogram, Jarque-Bera-test), estimate the autocorrelation coefficients and run a Ljung Box test statistics. Generate the log differences and estimate the autocorrelation coefficients. At which level are the series integrated according to graphical inspection?
3. Apply a formal test for stationarity on the time series. Use the sequential procedure of the Augmented Dickey Fuller test. Do you need to include a trend component? Do the ADF-test for all three possible models(none, trend, intercept) and compare their Akaike Information Criterion values. For the one with the smallest AIC, check whether the test statistic is exceeding the critical values. At which level are the series integrated according to ADF?
4. Fit an appropriate ARMA model for the “gsci”-returns- use the acf and pacf to specify the ma and ar parts. According to the Info criteria which ARIMA model would you specify to fit the data?
5. Fit also an appropriate ARMA model for the “jpm”-returns. Choose between AR(1), MA(1) and ARMA(1,1).
6. Check for white noise in the residuals.
7. Use the model to forecast future values of the series. What does Theil’s Inequality Coefficient tell about the accuracy of the forecast.