Financial Forecasting

M.Sc. in Finance – 2018/19 – 1st Semester

List of Exercises

(based on the Lecture Notes of Prof. António Costa (ISEG) and Prof. Nuno Sobreira (ISEG))

Week 1:

Exercises 5, 6a) (chapter 3 Textbook)

Week 2:

Exercises 7 a) b), 8a) and 9 (chapter 3 Textbook)

1. Consider the following stochastic processes where $\varepsilon_t \sim WN(0, \sigma_\varepsilon^2)$, $\beta_1, \beta_2 \neq 0$:
   i. $X_t = \alpha + \varepsilon_t$
   ii. $X_t = \beta_0 + \beta_1 t + \beta_2 t^2 + \varepsilon_t$
   iii. $X_t = \alpha + X_{t-1} + \varepsilon_t$ with X_0 fixed

a. Identify the processes that are stationary.

b. For the stationary processes verify that $\rho_k = Corr(X_t, X_{t-k}) \to 0$ with $k \to \infty$

c. For the nonstationary processes, propose a transformation that makes the process stationary.

Week 3:

2. Consider you are using exponential smoothing (EWMA), with parameter $\alpha = 0.05$, to forecast the variance of the returns of a financial series. If at time *t–1 the estimate is* 0.00015 and the observed return at time *t* is – 0,018, what is the forecast for next period? Consider that the variance of returns can be well approximated by the squared return.

3. The following table presents the seasonal estimates of a quarterly series.

Sample: 1995Q1 2009Q4	
Included observations: 59	
Ratio to Moving Average	
Original Series: CEL	
Adjusted Series: CELSA	
Scaling Factors:	
1	1.054249
2	0.948587
3	0.970647
4	1.030192

Given the following data would you say that for the period 2008Q2–2009Q1 the trend of the series is positive or negative?

2008Q2	12036.73
2008Q3	12246.77
2008Q4	13141.28
2009Q1	13043.56

4. We want to forecast the quarterly sales of passenger cars. The last estimate for the seasonal factors are: $s_{Q1} = 0.99$, $s_{Q2} = 1.14$, $s_{Q3} = 0.91$, $s_{Q4} = 0.96$.

To estimate the smoothed series level, exponential smoothing is being used with $\alpha = 0.40$. The last estimate was 37 520 after 2011Q2 and in 2011Q3, 31 625 cars were sold.

Identify the type of seasonal factors implied by the model and use the previous information to forecast the sales for the next 5 quarters. (2011Q4, 2012Q1, … 2012Q4).

5. Consider the following tables that contain information about the adjustment of two forecast models (M1 e M2) applied to the series CCIMD (CCIMD = quarterly cement sales, seasonally adjusted , ton.) and LCCIMD (LCCIMD=log(CCIMD)). The final table presents the estimates for the seasonal factors of CCIM.
   a. Using **M1** obtain forecasts of CCIM for the four quarters of 2012.
   b. Interpret the value of "Trend" in **M2**. Using M2 obtain forecasts of CCIM for the four quarters of 2012.
   c. Considering that the next observation of LCCIMD is 6,90, update the value of "trend" and comment the results comparing the previous value of "trend".

M1			M2		
Sample: 1995Q1 2011Q4			Sample: 1995Q1 2011Q4		
observations included: 68			observations Included: 68		
Method: Holt-Winters No Seasonal			Method: Holt-Winters No Seasonal		
Original Series: CCIMD			Original Series: LCCIMD		
Forecast Series: CCIMDSM			Forecast Series: LCCIMDSM		
Parameters:	Alpha	0.8000	Parameters:	Alpha	0.7900
	Beta	0.0800		Beta	0.1000
Sum of Squared Residuals		819574.3	Sum of Squared Residuals		0.175734
Root Mean Squared Error		109.7842	Root Mean Squared Error		0.050836
End of Period Levels:	Mean	1105	End of Period Levels:	Mean	7.00
	Trend	-45.5		Trend	-0.035

Sample: 1995Q1 2011Q4	
Included observations: 68	
Ratio to Moving Average	
Original Series: CCIM	
Scaling Factors:	
Q1	0.97
Q2	1.04
Q3	1.04
Q4	0.95