Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
EC 513	Chaos and Finance	1	3	0	0	3	6

Prerequisites	
Admission Requirements	

Language of Instruction	Turkish
Course Type	Elective
Course Level	Masters Degree
Objective	The course aims to develop students' conceptual understanding of time series, chaos, risk and uncertainty, behavioural economics, and financial markets, and to examine the relationships among these concepts through modelling methods. It focuses on modelling and testing stochastic processes in economic and financial markets and relating these processes to economic agents' decision-making within the framework of behavioural economics. Linear stochastic processes are analysed using Stata 10.0, while chaotic processes are examined using R. The course also covers estimation and forecasting methods. The course schedule is available at the following link: Course Schedule.
Content	Analysis and critical assessment of the Efficient Market Hypothesis. Risk, uncertainty, and time. Information, Bayesian decision-making, and rationality. Applications of behavioural economics. The concept of equilibrium. Time series analysis: Linear modelling of stochastic processes, with applications using Stata 10.0. Nonlinear modelling, with applications using R. Chaotic processes. Application of time series methods to financial variables in markets with high and low trading volumes, including equity, foreign exchange, and bond markets.

References	In addition to the studies of 4 scientists who received the award in the fields of Nobel Economics and Physics, the following sources will be followed. Johansen, S. (1991) Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models. Econometrica, 59, p 1151-1181 Johansen, S ., Juselius, K. (1991) Testing structural hypotheses in a multivariate cointegration analysis of the PPP and the UIP for UK. Journal of Econometrics, 53, p 211-244 Kahneman, D., Slovic, P., Tversky, A. (1982). Judgment Under Uncertainty: Heuristics and Biases . New York: Cambridge University Press. Kantz, H. (1994) A robust method to estimate the maximal Lyapunov exponent of a time series, Physics Letters A 185, 77-87. Kantz, H., Schreiber T.(1997) Nonlinear time series analysis. Cambridge, UK: Cambridge University Press. Karanfil, F., Ozkaya, A. (2007). Estimation of real GDP and unrecorded economy in Turkey based on environmental data. Energy Policy 35 (10), 4902-4908. Grassberger, P., Procaccia, I. (1983a). Characterization of strange attractors. Phy. Rev. Let., 50: 346-349 Grassberger, P., Procaccia, I. (1983b.) Estimation of the Kolmogorov entropy from a chaotic signal. Phys Rev [A] 29:2591-3. Rosenstein, M.T., Collins, J.J., De Luca, C.J. (1993) A practical method for calculating largest Lyapunov exponents from small data sets, Physica D 65, 117-34. Sachs, J.D. (1984) Theoretical issues in international borrowing. Princeton Studies in International Finance, vol. 54. Department of Economics, Princeton University, Princeton. Said, S.E., Dickey, D.A. (1984) Testing for unit roots in autoregressive moving average models of unknown order. Biometrica, 71, p 599-608 Takens, F. (1981) Detecting strange attractors in turbulence. In: Dynamical systems and turbulence. Berlin: Springer; p. 366. Wolf, A., Swift, J.B., Swinney, H.L., Vastano, J.A. (1985) Determining Lyapunov Exponents from a time series, Physica D 16, 285-317. World Bank (2000, September). Turkey—Country economic memorandum— Structural reforms for sustainable Growth (Vols. I and II) (Report No.20657TU), Washington, DC. Johansen, S. (1991) Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models. Econometrica, 59, p 1151-1181 Johansen, S ., Juselius, K. (1991) Testing structural hypotheses in a multivariate cointegration analysis of the PPP and the UIP for UK. Journal of Econometrics, 53, p 211-244

Theory Topics

Week	Weekly Contents
1	Criticism of dynamical economic models in terms of system theory
2	Efficient market hypothesis and numerical criticism
3	Introduction to time series analysis and modeling and linear time series
4	Non-linear time series
5	A methodological approach to chaos theory
6	Takens theorem and Recurrence graphs
7	Phase space restructuring and analysis of European countries public debt interest rates,

Week	Weekly Contents
8	Sensitive dependence of debt interest rates on preliminary policies and Lyapunov coefficient,
9	BISE - 100 and FTSE-100 indexes maximum Lyapunov coefficient calculation,
10	Chaotic behavior of certain world stock markets
11	Agent behaviors that can cause chaos in trade and markets
12	Agent behaviors that can cause chaos in trade and markets
13	Financial crises and chaos