

## Extended Syllabus (2020 Spring Semester)

|              |   |                        |                              |
|--------------|---|------------------------|------------------------------|
| Course Title | ECONOMETRICS FOR FINANCIAL TIME SERIES<br>금융시장 계량분석 | Course Number          | ECO4032                      |
| Credit       | 3   | Enrollment Eligibility | Introduction to Econometrics |
| Class Time   | T 10:30-11:45, Th 10:30-11:45                       | Classroom              | To be announced              |

|                       |                          |   |
|-----------------------|--------------------------|---|
| Instructor's<br>Photo | Name: Choi, In           | Homepage: <a href="http://inchoi.sogang.ac.kr">http://inchoi.sogang.ac.kr</a> |
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### I . Course Overview

|  |            |                      |             |               |       |
|--|------------|----------------------|-------------|---------------|-------|
| 1. Description   |            |                      |             |               |       |
| <p>This course introduces basic concepts and techniques for financial time series analysis. This course introduces major econometric models used for financial time series and the inferential procedures for these models. The econometric models that will be discussed are linear regression, autoregressive moving average (ARMA), autoregressive conditional heteroskedasticity (ARCH) and vector autoregressive (VAR) models. Whether asset returns are predictable will also be discussed. Last, major asset pricing theories like capital asset pricing model and arbitrage pricing theory will be covered from an empirical viewpoint. This course requires students to perform data analysis by using real data and PC. How to use the required software will be discussed in class.</p> |            |                      |             |               |       |
| 2. Prerequisites   |            |                      |             |               |       |
| Knowledge in statistics and econometrics   |            |                      |             |               |       |
| 3. Course Format (%)   |            |                      |             |               |       |
| Lecture  | Discussion | Experiment/Practicum | Field study | Presentations | Other |
| 80%  | 5%         | 10%                  | 0%          | 5%            | 0%    |

| 4. Evaluation (%) |            |         |               |          |             |               |       |
|-------------------|------------|---------|---------------|----------|-------------|---------------|-------|
| Mid-term Exam     | Final exam | Quizzes | Presentations | Projects | Assignments | Participation | Other |
| 30%               | 50%        | 0%      | 0%            | 10%      | 10%         | 0%            | 0%    |

## II. Course Objectives

This course has the following objectives.

1. Understand basic time series models such as ARMA, ARCH, GARCH, VAR, etc.
2. Learn some research topics in financial time series analysis
3. Learn how to use Python
4. Learn how to write a research report using time series methodology

## III. Course Format

(\* In detail)

This course consists of lectures by the instructor, practices for Python and presentations of research reports by students at the end of the semester.

## IV. Course Requirements and Grading Criteria

Students are required to submit solutions for home assignments and research report. Final grades depend on home assignments, report, midterm examination and final examination.

#### V. Course Policies

#### VI. Materials and References

Text: Tsay, R.S. (2010) *Analysis of Financial Time Series*. 3rd edition. Wiley: New Jersey.

##### References:

##### *Time series analysis in general*

- Box, G.E.P., G.M. Jenkins, G.C. Reinsel and G. M. Ljung (2016) *Time Series Analysis: Forecasting and Control*, 5th edition, John-Wiley & Sons.
- Brockwell, P.J. and R.A. Davis (2002) *Introduction to Time Series and Forecasting*, 2<sup>nd</sup> edition, Springer-Verlag.
- Diebold, F.X. (1998) *Elements of Forecasting*, South-Western College Publishing. (Elementary introduction to forecasting. Readable for undergraduate students.)
- Harvey, A.C. (1993) *Time Series Models*, MIT Press, Cambridge, Massachusetts. (Introduces basic time series models. Not too technical.)
- Fuller, W. (1996) *Introduction to Statistical Time Series*, Wiley, New York. (Standard graduate-level text for time series analysis. Requires some knowledge on probability theory.)

##### *Financial time series*

- Campbell, J.Y., A.W. Lo and A.C. MacKinlay (1997) *The Econometrics of Financial*

*Markets*. Princeton University Press: New Jersey. (Graduate-level text in financial time series.)

- Cuthbertson, K. and D. Nitzsche (2004) *Quantitative Financial Economics*. Wiley: New Jersey. (Discusses major topics in finance from an empirical viewpoint.)
- Koop, G. (2006) *Analysis of Financial Data*. Wiley: Chichester. (Undergraduate text in financial econometrics.)

*Econometrics:*

- Stock, J. and M. Watson (2003) *Introduction to Econometrics*, Addison Wesley.
- Greene, W.H. (2003) *Econometric Analysis*, 5th Edition. Prentice Hall.

*Asset Pricing:*

- Campbell, J.Y. (2018) *Financial Decisions and Markets: A Course in Asset Pricing*. Princeton University Press.
- Cochrane, J. (2005) *Asset Pricing: Revised Edition*. Princeton University Press.

VII. Course Schedule

(\* Subject to change)

|           |                                  |  |
|-----------|----------------------------------|--|
| Week<br>1 | Learning Objectives              | Basic concepts in financial econometrics |
|           | Topics                           | Asset returns<br>Present value           |
|           | Class Work<br>(Methods)          | Lecture                                  |
|           | Materials<br>(Required Readings) | Tsay, Chapter 1                          |
|           | Assignments                      | To be distributed                        |
| Week<br>2 | Learning Objectives              | Basic concepts in financial econometrics |
|           | Topics                           | Distributional properties of returns     |
|           | Class Work<br>(Methods)          | Lecture                                  |
|           | Materials<br>(Required Readings) | Tsay, Chapter 1                          |

|           |                                  |   |
|-----------|----------------------------------|---|
|           | Assignments                      | To be distributed   |
| Week<br>3 | Learning Objectives              | Python  |
|           | Topics                           | Basic commands  |
|           | Class Work<br>(Methods)          | Lecture and practice  |
|           | Materials<br>(Required Readings) | To be distributed   |
|           | Assignments                      | To be distributed   |
|           |                                  |   |
| Week<br>4 | Learning Objectives              | Python  |
|           | Topics                           | Basic commands  |
|           | Class Work<br>(Methods)          | Lecture   |
|           | Materials<br>(Required Readings) | To be distributed   |
|           | Assignments                      | To be distributed   |
| Week<br>5 | Learning Objectives              | Autoregressive and moving average (ARMA) model  |
|           | Topics                           | Stationarity and autocorrelation function<br>White noise and linear processes<br>ARMA and ARIMA models<br>Forecasting using ARMA models |
|           | Class Work<br>(Methods)          | Lecture   |
|           | Materials<br>(Required Readings) | Tsay, Chapter 2   |
|           | Assignments                      | To be distributed   |
| Week<br>6 | Learning Objectives              | Autoregressive conditional heteroskedasticity (ARCH) model  |
|           | Topics                           | ARCH model and its variants<br>Stochastic volatility model  |

|           |                                  |  |
|-----------|----------------------------------|--|
|           | Class Work<br>(Methods)          | Lecture  |
|           | Materials<br>(Required Readings) | Tsay, Chapter 3  |
|           | Assignments                      | To be distributed  |
| Week<br>7 | Learning Objectives              | Autoregressive conditional heteroskedasticity (ARCH) model |
|           | Topics                           | Realized volatility<br>Volatility forecasting              |
|           | Class Work<br>(Methods)          | Lecture  |
|           | Materials<br>(Required Readings) | Tsay, Chapter 3  |
|           | Assignments                      | To be distributed  |
| Week<br>8 | Learning Objectives              | Midterm week   |
|           | Topics                           |  |
|           | Class Work<br>(Methods)          |  |
|           | Materials<br>(Required Readings) |  |
|           | Assignments                      |  |
| Week<br>9 | Learning Objectives              | Vector autoregressive model                                |
|           | Topics                           | Impulse-response analysis                                  |
|           | Class Work<br>(Methods)          | Lecture  |
|           | Materials<br>(Required Readings) | To be distributed  |
|           | Assignments                      | To be distributed  |

|            |                                  |  |
|------------|----------------------------------|--|
| Week<br>10 | Learning Objectives              | Vector autoregressive model  |
|            | Topics                           | Forecasting  |
|            | Class Work<br>(Methods)          | Lecture  |
|            | Materials<br>(Required Readings) | To be distributed  |
|            | Assignments                      | To be distributed  |
| Week<br>11 | Learning Objectives              | Asset return predictability  |
|            | Topics                           | Long-horizon stock return regressions                                |
|            | Class Work<br>(Methods)          | Lecture  |
|            | Materials<br>(Required Readings) | To be distributed  |
|            | Assignments                      | To be distributed  |
| Week<br>12 | Learning Objectives              | Asset return predictability  |
|            | Topics                           | Evidence of return predictability<br>Mean reversion of stock returns |
|            | Class Work<br>(Methods)          | Lecture  |
|            | Materials<br>(Required Readings) | To be distributed  |
|            | Assignments                      | To be distributed  |
| Week<br>13 | Learning Objectives              | Capital asset pricing model  |
|            | Topics                           | Minimum variance frontier<br>CAPM<br>Testing for CAPM                |

|            |                                  |  |
|------------|----------------------------------|--|
|            | Class Work<br>(Methods)          | Lecture  |
|            | Materials<br>(Required Readings) | To be distributed                                |
|            | Assignments                      | To be distributed                                |
| Week<br>14 | Learning Objectives              | Arbitrage pricing theory (APT) and factor models |
|            | Topics                           | APT<br>Three factor model of Fama and French     |
|            | Class Work<br>(Methods)          | Lecture  |
|            | Materials<br>(Required Readings) | To be distributed                                |
|            | Assignments                      | To be distributed                                |
| Week<br>15 | Learning Objectives              | Presentations of research reports by students    |
|            | Topics                           | Topics chosen by students                        |
|            | Class Work<br>(Methods)          | Presentation                                     |
|            | Materials<br>(Required Readings) | None   |
|            | Assignments                      | To be distributed                                |
| Week<br>16 | Learning Objectives              | Final examination                                |
|            | Topics                           |  |
|            | Class Work<br>(Methods)          |  |
|            | Materials<br>(Required Readings) |  |
|            | Assignments                      |  |



### VIII. Special Accommodations

For students with handicaps, assistance will be provided. The level of assistance will depend on the relevant circumstances.