

**National Research University Higher School of Economics
The International College of Economics and Finance
Syllabus**

**FINANCIAL ECONOMETRICS
2020-2021**

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1. Course description

a) Course Pre-requisites:

Mathematics for Economics and Finance, Financial Economics I (Asset pricing), Econometrics I&II.

b) Course summary:

Financial Econometrics is a one-semester course taught to the second-year students of the ICEF Master program in Financial Economics. It is designed to cover essential tools for working with financial data, including return forecasting, volatility and econometrics of asset pricing, such as testing the market models. We focus on the empirical techniques that are mostly used in the analysis of financial markets and on how they are applied to actual data.

The course starts with an overview of the financial data. Then it covers the event-study methodology and continues with analyzing return predictability and the volatility effects of the market data (asymmetric GARCH). We then proceed to testing market models (Fama-McBeth regressions, etc.) and stochastic discount factor models. Other important topics can be covered subject to time availability. All the models are accompanied with real-data examples in standard computer packages.

2. Learning Objectives

The main objectives of the course are to introduce the students to the modern methods of analysis of financial data and prepare them for individual work, in particular on their master's theses.

Upon completion of the course students will be able to:

- use event-study methodology in applied research;
- forecast financial data using high-level econometric techniques and measure their effectiveness;
- test the standard asset pricing models.

3. Methods of Instruction

The class consists of lectures (2 hours per week), class section (2 hours per week), self-study in the computer lab, and self-study with literature. Home assignments will be assigned throughout the course with both analytical and practical exercises. During lectures, students might be asked to take short quizzes. The lecturer will be available for office hours. In total, there are 30 hours of lectures and 30 hours of classes.

Cold calling may be used to check how well students are prepared. There will be 3-4 assignments for this course, with the due dates announced in class. This course covers a large amount of material in significant depth. It is structured so that each lecture builds upon the concepts

introduced in the prior sessions. You are strongly encouraged to be prepared for class and to keep up with the material as we go along, since it will be difficult to catch up if significant lags in preparation occur. You should also be sure to attend class sessions and/or consult with the instructors if you feel that you are falling behind.

4. Reading List:

Main reading:

1. John Campbell, Andrew Lo, Archie MacKinlay (1997). The Econometrics of Financial Markets, Princeton University Press. (**CLM**)
2. Ruey S. Tsay (2010). Analysis of Financial Time Series. (**RT**)
3. John H. Cochrane (2009). Asset Pricing, Revised Edition, Princeton University Press. (**JC**)

Journal articles for the corresponding topics are listed in the Course Plan. Additional sources may be provided during lectures. Useful internet links for particular topics will be given in class.

Additional reading:

1. Eric Jondeau, Ser-Huan Poon and Michael Rockinger (2007). Financial Modelling under Non-Gaussian Distributions, Springer. (**JPR**)
2. Elliott, G. and Timmermann, A. (Eds.) . (2013). Handbook of Economic Forecasting, North-Holland (**ET**)
3. Chris Brooks (2002). Introductory econometrics for finance, Cambridge University Press. (**CB**)
4. Walter Enders (2003). Applied econometric time series, Wiley. (**WE**)
5. Juergen Franke, Wolfgang Haerdle, Christian Hafner (2004). Statistics of Financial Markets, Springer. (**FHH**)
6. Hamilton, J. (1994), Time Series Analysis, Princeton University Press, Princeton. (**JH**)

5. Special Equipment and Software:

Software: The main software used in the course is R. The students may use other statistical software for solving the problem sets. MS Teams or other software might be used for quizzes.

Equipment: computer, projector, Internet connection.

6. Grading System and Examination Type:

The course grade consists of the grades for the home assignments, quizzes, group presentation and report, and the final exam. The final exam is in writing.

The formula for the final grade for the course G is the following:

$$G = 0.15 \cdot G_{HA} + 0.05 \cdot G_{quiz} + 0.2 \cdot G_{present} + 0.6 \cdot G_{final},$$

where G_{HA} is the average grade for the home assignments, G_{quiz} is the average grade for the quizzes, $G_{present}$ is the grade for the group presentation and report, and G_{final} is the grade for the final exam.

All grades are given initially out of 100 points. The final grades are also converted to 10- and 5-points grades. The conversion scale can be found in the [ICEF grading regulation](#). Note that according to these regulations, the final exam is a blocking element, i.e., a passing total grade for the course can be assigned only if the student receives a passing grade for the final exam.

Only the final exam is subject to retake. Information on how the retakes are organized and how the final grade is determined in case of a retake can be found in the regulations as well.

Sample materials for knowledge assessment are available in the ICEF Information system.

Assessment criteria

The grade for final exam is equal to the sum of the grades for the problems included in the final exam (normalized to 100). The number of points awarded for each individual problem is stated in the text of the final.

7. Course Plan

1. Stylized facts of financial returns and sources of financial data.

Reading:

- CLM: Ch. 1
- RT: Ch. 1

a. Stylized facts of the stock market returns: predictability, distribution, factor structure, CAPM

Reading:

- Cont, R. (2001) “Empirical properties of asset returns: stylized facts and statistical issues”, Quantitative Finance, 1, pp. 223–36.

b. Stylized facts on the bond returns and yield curve: predictability, yields, Nelson-Siegel curves

Additional reading:

- Nelson, C., A. F. Siegel (1987) “Parsimonious modelling of yield curves”, Journal of Business, 60 (4), pp.473-89.
- Litterman, R. and J. Scheinkman (1991) “Common factors affecting bond returns”, Journal of Fixed Income, Vol. 1, pp. 51-61.

c. Simulation-based analysis and derivatives: example of mortgage-backed securities.

Additional reading:

- Fabozzi, F. J., Bhattacharya, A. K. and W.S. Berliner (2008) “Introduction to Mortgage-Backed Securities, Handbook of Finance, 3 (32).

2. Event studies

Reading:

- CLM: Ch. 4

a. Methodology of the event studies

- Boehmer, E., Musumeci, J. and A. Poulsen, 1991, Event-Study Methodology under Conditions of Event-Induced Variance, Journal of Financial Economics 30, 253-272.
- Fama, E., Fisher, L., Jensen, M. and R. Roll, 1969, The Adjustment of Stock Prices to New Information, International Economic Review 10, 1-21.
- Prabhala, N., 1997, Conditional Methods in Event Studies and an Equilibrium Justification for Standard Event-Study Procedures, Review of Financial Studies 10, 1-38

b. Event studies in consulting: fraud on the market cases

Additional reading:

- Allen, M., R. E. Hall, and V. A . Lazear (2011) “Reference guide on estimation of economic damages”, in “Reference Manual on Scientific Evidence”, The National Academic Press.

3. Tests of return predictability

Reading:

- CLM: Ch. 2-3
- ET: Ch. 6

a. Forecast selection and comparison

Reading:

- Diebold, F. X. and Lopez, J. A.: 1996, Forecast evaluation and combination, in G. Maddala and C. Rao (eds), The Handbook of Statistics, Vol. 14, Elsevier North Holland.
- Diebold, F. (2014) “Comparing predictive accuracy, twenty years later: A personal perspective on the use and abuse of Diebold-Mariano tests”, Journal of Business and Economic Statistics, 33, pp. 1-24.
- Diebold, F.X. and R.S. Mariano (1995), “Comparing predictive accuracy,” Journal of Business and Economic Statistics, 13, 253–263.
- Giacomini, R. and White (2006) “Tests of conditional predictive ability”, Econometrica, 74, pp. 1545-78

Additional reading:

- Giacomini, R. and B. Rossi (2009) “Detecting and predicting forecast breakdowns”, Review of Economic Studies, 76, 669-705.
- Clark, T.E. and M.W. McCracken (2013), “Advances in forecast evaluation,” In G. Elliott and A. Timmerman (eds.), Handbook of Economic Forecasting, Volume 2, Elsevier, 1107-1201.
- Hanse, P. R. A. Lunde, and J.N. Nason (2010), “Model confidence set”, Econometrica, 79(2), pp.453-97.

b. Interpreting predictability, Campbell-Shiller decomposition, forecasting with persistent predictors

Reading:

- Lo, A., 1991, "Long-Term Memory in Stock Market Prices," Econometrica 59, 1279-1313.
- Lo, A. and C. MacKinlay, 1988, "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test," Review of Financial Studies 1, 41-66.
- Campbell, J. Y. (1991) “A variance decomposition for stock returns”, Economic Journal 101 (405), pp. 157-79.
- Stambaugh, R. (1999) “Predictive regressions “, Journal of Financial Economics, 54, pp. 375-421.
- Welch, I. and A. Goyal (2008) “A comprehensive look at the empirical performance of equity premium prediction”, Review of Financial Studies, 21, 1455-508.

c. Performance evaluation: trading strategies and mutual funds

Reading:

- Sullivan, R., A. Timmermann, A. and H. White (1999) “Data-snooping, technical trading rule performance, and the bootstrap”, Journal of Finance 54, pp.1647–91.
- Berk, J. and J. van Binsbergen (2014) “Measuring skill in the mutual fund Industry”, Journal of Financial Economics, 118, Issue 1, pp. 1-20.

Additional reading:

- Cowles, A. (1933) “Can stock market forecasters forecast?” Econometrica, 1, pp. 309-324.
- White, H. (2000) “A reality check for data snooping”, Econometrica 68, pp. 1097–126.
- Ingersoll, E., M. Spiegel, W. Goetzmann, and I. Welch (2007) "Portfolio performance manipulation and manipulation-proof performance measures," Review of Financial Studies 20-5, pp. 1503-463.

4. Markov switching model

Formulation of Markov switching model, properties, estimation, filtered and smoothed probabilities.

Reading:

- RT: Ch. 4, 10

Additional reading:

- Gray , S. F., 1996, Modeling the conditional distribution of interest rates as aregime switching process. Journal of Financial Economics 42, 27-62.
- McCullogh, R. E., and Tsay, R.S. 1994, Statistical analysis of economic time series via Markov switching models. Journal of Time Series Analysis 15, 523-539.

5. Kalman filter

Asset pricing with time varying parameters.

Reading:

- RT: Ch. 4, 10
- Meinhold, R. J. and Singpurwalla, N. D. (1983) “Understanding the Kalman Filter”, *The American Statistician*, 37, pp. 123-127

6. Volatility modeling

Reading:

- RT: Ch. 3,4.

a. Volatility clustering, ARCH and GARCH

Additional reading:

- Engle, R. F. (1982) “Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation, *Econometrica*, 50, pp. 987–1008.
- Bollerslev, T. (1986) “Generalized autoregressive conditional heteroscedasticity, *Journal of Econometrics* 31, pp. 307–27.
- Engle, R.F., Patton, A., 2001, What good is a volatility model?, *Quantitative Finance* 1, 237-245

b. Asymmetric extensions to GARCH models

Additional reading:

- Andersen, T.G., T. Bollerslev, T., P.F. Christoffersen and F.X. Diebold (2013) "Financial risk measurement for financial risk management", in *Handbook of the Economics of Finance, Vol.II* (eds. George Constantinides, Milton Harris and Rene Stulz), Chapter 17, pp.1127-1220. Amsterdam: Elsevier Science B.V.
- Zakoian, J. M. (1994) “Threshold heteroscedastic models”, *Journal of Economic Dynamics and Control* 18, pp. 931-55.
- Andersen, T. G. and T. Bollerslev, T. (1998) “Answering the skeptics: Yes, standard volatility models do provide accurate forecasts”, *International Economic Review*, 39(4), pp. 885–905.
- Engle, R. F., Lilien, D. M. and Robins, R. P.: 1987, Estimating time varying risk premia in the term structure: The arch-m model, *Econometrica* 55, 391–407.
- Lunde, A. and Hansen, P. R.: 2001, A forecast comparison of volatility models: Does anything beat a garch(1,1)?, Working Papers 2001-04, Brown University, Department of Economics.
- Nelson, D. B. (1991). Conditional heteroscedasticity in asset returns: A new approach. *Econometrica* 59, 347-370.

7. Cross-sectional asset pricing

Reading:

- CLM: Ch. 5-6
- RT: Ch. 9
- JC: Ch. 12, 14

a. Tests of CAPM and stock characteristics, Fama-MacBeth regressions

Reading:

- Chen, N.-F., R. Roll and S. Ross (1986), “Economic forces and the stock market”, *Journal of Business*, 59 (3), pp. 383–403.
- Fama, E. F. and J.D. MacBeth, J. D. (1973) “Risk, return, and equilibrium: Empirical tests”, *The Journal of Political Economy*, 81, pp. 607–36.
- Fama, E. F. and K.R. French (1993) “Common risk factors in the returns on stocks and bonds”, *Journal of Financial Economics*, 33 (3), pp.3-56.

b. Generalized Method of Moments

Reading:

- JC: Ch. 10-11, 13, 15-16

Additional reading:

- Hansen, L. P. (1982) “Large sample properties of generalized method of moments estimators”, *Econometrica* 50(4), pp. 1029–54.
- Hansen, L. P. and K. Singleton (1982) “Generalized instrumental variables estimation of nonlinear rational expectations models”, *Econometrica* 50(5), pp. 1269-86.
- Hansen, L. P. and Jaganathan, R.: 1997, Assessing specification errors in stochastic discount factor models. *The Journal of Finance* 52, 557-590.

c. Testing asset pricing models with GMM: SDF and linear factor models

Reading:

- JC: Ch. 10-11, 13, 15-16

d. Pitfalls of cross-sectional asset pricing: identification, p-hacking, etc.

Reading:

- Campbell R. Harvey Yan Liu Heqing Zhu (2016) “... and the cross-section of stock returns”, *Review of Financial Studies*, 29 (1), pp. 5-68.
- Berk, J. and J. van Binsbergen (2016) “Assessing asset pricing models using revealed preference,” *Journal of Financial Economics*, 119 (1), pp. 1-21
- Burnside, C. (2011) “The cross-section of foreign currency risk premia and consumption growth risk: comment”, *American Economy Review*, 101 (7), pp. 3456-76.

Additional reading:

- Lewellen, J., S. Nagel and J. Shanken (2010) “A skeptical appraisal of asset pricing tests”, *Journal of Financial Economics*, 96 (2), pp. 175-194.
- Gospodinov, N., R. Kan and C. Robotti (2014) “Misspecification-robust inference in linear asset-pricing models with irrelevant risk factors”, *Review of Financial Studies*, 27, pp. 2139–70

8. Forecasting in big data environment

a. Dimension reduction with Principal Components

Reading:

- RT: Ch. 9

Additional reading:

- Litterman, R. and J. Scheinkman (1991) “Common factors affecting bond returns”, *Journal of Fixed Income*, Vol. 1, pp. 51-61.
- Stock, J.H. and M. Watson (2002), “Forecasting using principal components from a large number of predictors”, *Journal of the American Statistical Association*, 97 (460), pp. 1167-79
- Stock, J.H. and M. Watson (2006), “Macroeconomic forecasting using many predictors”, *Handbook of Economic Forecasting*, Graham Elliott, Clive Granger, Allan Timmerman (eds.), North Holland.

b. Forecasting with many predictors: sparsity and lasso

Reading:

- Brodie, J., C. De Mol, D. Giannone, I. Daubechies and I. Loris (2009) “Sparse and stable Markowitz portfolios”, *Proceedings of the National Academy of Science (PNAS)*, 106 (30), pp. 1267-72.

Additional reading:

- Tibshirani, R. (1996): “Regression shrinkage and selection via the lasso,” *Journal of the Royal Statistical Society Series B*, 58, pp. 267–288.
- De Miguel, V., L. Garlappi, F.J. Nogales and R. Uppal (2009): “A generalized approach o portfolio optimization: Improving performance by constraining portfolio norms”, *Management Science*, 55(5), pp. 798-812.

- Hastie, T., R. Tibshirani and J. Friedman (2009) “The elements of statistical learning: Data Mining, Inference, and Prediction”, Springer.

Topic	Total hrs	Expected learning outcomes (ELO) to be assessed	Assessment formats
	Lectures		
	Seminars		
	online/student work		
Stylized facts of financial returns	2	- become familiar with stylized facts of financial time series and get an overview of main questions in applied finance literature	Problem sets, quizzes, and exam
	2		
	4		
Event studies	4	- be able to design and conduct the event studies	Problem sets, quizzes, and exam
	4		
	8		
Tests of return predictability	5	- learn different approaches to assessing predictive ability of models and how to apply them to answer the question of whether the financial returns are predictable	Problem sets, quizzes, and exam
	5		
	20		
Markov switching model	3	- be able to model and estimate situations in which an economy can be in multiple regimes	Problem sets, quizzes, and exam
	3		
	10		
Kalman filter	2	- be able to model situations in which an economy can be in multiple states, with the state variables being unobserved. - be able to use the Kalman filter for financial and macroeconomic data	Problem sets, quizzes, and exam
	2		
	8		
Volatility modeling	4	- be able to model dependence in conditional variance of times series data and become familiar with the concept of realized and implied volatility; - be able to estimate the basic models of conditional heteroskedacticity using statistical software	Problem sets, quizzes, and exam
	4		
	10		
Cross-sectional asset pricing	6	- learn about factor analysis approach, and Fama-French factor models, in particular; - be able to test asset pricing models on the data	Problem sets, quizzes, and exam
	6		
	22		
Forecasting in big data environment	4	- learn specifics of forecasting when many potential predictors are available; - be able to apply principal components analysis and several machine learning techniques to tackle such questions	Problem sets, quizzes, and exam
	4		
	10		
Hours for types of classes:	30		
	30		
	92		
Total hours	152		

8. Organization of Studies for Persons with Limited Mobility and Disabilities

If necessary, learners with limited mobility or a disability (as per his/her application), as well as per his/her individual rehabilitation programme, may be offered the following options for receiving learning information with due consideration of his/her individual psycho-physical needs (e.g., via eLearning studies or distance technologies):

- i. *for persons with impaired vision*: enhanced fonts in hard copy documents; e-documents; audio files (transfer of study materials to an audio-format); hard copy documents with the use of Braille; individual consultation with a facilitated communicator; individual assignments and mentoring;
- ii. *for persons with hearing impairments*: in hard copy; e-documents; video materials with subtitles; individual consultation with a facilitated communicator; individual assignments and mentoring;
- iii. *for persons with a muscular-skeleton disorder*: in hard copy; e-documents; audio-files, individual assignments and mentoring.