

St. Gallen University (Switzerland)
Doctoral Program in Economics and Finance

No-Arbitrage Discrete-Time Asset Pricing

Fulvio Pegoraro

(Banque de France and CREST)

Content: The purpose of this course is to introduce students to the theory of *No-Arbitrage Discrete-Time Asset Pricing* following the Stochastic Discount Factor (SDF) modelling principle. The lectures will, first, rapidly remember basic notions of asset pricing in a one-period (static) model (Law of One Price, No-Arbitrage Principle, First and Second Fundamental Theorem of Asset Pricing) and, then, they will focus on the asset pricing modelling setting formalized by Bertholon, Monfort and Pegoraro (2008), and based on three main ingredients: *(i)* the historical discrete-time dynamics of the factor representing the information, *(ii)* the stochastic discount factor (SDF), and *(iii)* the discrete-time risk-neutral (R.N.) factor dynamics. In this general framework, we distinguish three modelling strategies: the direct modelling, the RN constrained direct modelling, and the back modelling. These modelling strategies will be applied to two important domain: *a)* security market models and associated European Option pricing models and *b)* yield curve models. Empirical examples will be also provided.

Structure of the course : The course will involve the following lectures :

- Wednesday, May 18, 2010. From 14:00 to 18:00.
- Thursday, May 19, 2010. From 08:00 to 12:00.
- Friday, May 20, 2010. From 08:00 to 12:00.
- Monday, May 23, 2010. From 08:00 to 12:00.
- Monday, May 24, 2010. From 08:00 to 12:00.
- Monday, May 25, 2010. From 08:00 to 12:00.

Course Literature :

- Bertholon, H., Monfort, A., and F. Pegoraro, (2006): "Pricing and Inference with Mixtures of Conditionally Normal Processes", CREST DP.
- Bertholon, H., Monfort, A., Pegoraro, F., (2008): "Econometric Asset Pricing Modelling", *Journal of Financial Econometrics*, 6(4), 407-458.
- Cochrane, J. H. (2005) : *Asset Pricing*, Revised Edition, Princeton University Press.
- Dai, Q., and K. Singleton (2002) : "Expectations Puzzles, Time-varying Risk Premia, and Affine Model of the Term Structure", *Journal of Financial Economics*, 63, 415-441.
- Dai, Q., and K. Singleton (2003) : "Term Structure Dynamics in Theory and Reality", *Review of Financial Studies*, 16, 631-678.
- Dai, Q., Singleton, K., and W. Yang (2007) : "Regime Shifts in a Dynamic Term Structure Model of U.S. Treasury Bond Yields", *Review of Financial Studies*, 20, 1669-1706.
- Darolles, S., Gouriéroux, C., and J. Jasiak, (2006) : "Structural Laplace Transform and Compound Autoregressive Models", *Journal of Time Series Analysis*, 24(4), 477-503.
- Gerber, H. U., and E. S. W. Shiu, (1994) : "Option Pricing by Esscher Transforms", *Transactions of Society of Actuaries*, 46, 99-191.
- Gouriéroux, C., Jasiak, J., and R. Sufana, (2009) : "The Wishart Autoregressive Process of Multivariate Stochastic Volatility", *Journal of Econometrics*, Vol. 150, Issue 2, 167-181.
- Gouriéroux, C., and A. Monfort, (2007) : "Econometric Specifications of Stochastic Discount Factor Models", *Journal of Econometrics*, 136, 509-530.
- Gouriéroux, C., Monfort, A. and V. Polimenis, (2003) : "Discrete Time Affine Term Structure Models", Crest DP.
- Gouriéroux, C., Monfort, A. and V. Polimenis, (2006) : "Affine Model for Credit Risk Analysis", *Journal of Financial Econometrics*, 4, 3, 494-530.

- Gouriéroux, C., and R. Sufana, (2003) : "Wishart Quadratic Term Structure Models", CREF working paper 03-10.
- Jardet, C., Monfort, A., and Pegoraro, F., (2009a): "Persistence, Bias, Prediction and Averaging Estimators", Banque de France Working Paper.
- Jardet, C., Monfort, A., and Pegoraro, F., (2009b): "New Information Response Functions", Banque de France Working Paper.
- Jardet, C., Monfort, A., and Pegoraro, F., (2009c): "No-Arbitrage Near-Cointegrated VAR(p) Term Structure Models, Term Premia and GDP Growth", Banque de France Working Paper.
- Jardet, C., Monfort, A., and Pegoraro, F., (2010a): "No-Arbitrage Near-Cointegrated VAR(p) Term Structure Models, Term Premia and GDP Growth", Working Paper (Revised Version).
- Jardet, C., Monfort, A., and Pegoraro, F., (2010b): "Online Appendix for 'No-arbitrage Near-Cointegrated VAR(p) Term Structure Models, Term Premia and GDP Growth' ", available at the website <http://www.crest.fr/pageperso/pegoraro/pegoraro.htm>.
- Le Roy, S. F., and J. Werner (2000) : *Principles of Financial Economics*, Cambridge University Press.
- Monfort, A., and F. Pegoraro, (2007a) : "Multi-Lag Term Structure Models with Stochastic Risk Premia", CREST DP.
- Monfort, A., and F. Pegoraro, (2007b) : "Switching VARMA Term Structure Models", *Journal of Financial Econometrics*, 5(1), 105-153.

About the exam : Groups of two students each are asked to write a report (20 pages maximum) about one of the following papers (other papers, linked to the course, may be included in the list). Groups of one student are allowed, upon request, only for specific reasons. The first part of the report has to include:

- i)* a precise and clear summary of the paper in which the relevance of the results is discussed;
- ii)* a motivated presentation of the features and limits (drawbacks) of the proposed asset pricing model and/or the associated empirical analysis.

In the second part of the report, the students have to propose a way to improve the paper's performances or to overcome its previously mentioned limits (i.e., limits affecting the specification of model and/or the empirical analysis). A small scale empirical analysis may therefore be introduced in the report.

The grade of the exam will be based on course participation (20%) and on the quality of the report (80%).

The report has to be sent at the email address pegoraro@ensae.fr and the deadline is June 25, 2011.

- Ang, A., Bekaert, G., Wei, M. (2008): "Term Structure of Real Rates and Expected Inflation", *The Journal of Finance*, 63(2), 797-849.
- Ang, A., Boivin, J., Dong, S., and Loo-Kung, R. (2010): "Monetary Policy Shifts and the Term Structure", forthcoming *Review of Economic Studies*.
- Bikbov, R., and Chernov, M., (2008): "Monetary Policy Regimes and the Term Structure of Interest Rates", London Business School, Working Paper.
- Bikbov, R., and Chernov, M., (2010): "No-Arbitrage Macroeconomic Determinants of the Yield Curve", London Business School, *Journal of Econometrics*, forthcoming.
- Chernov, M., and Mueller, P., (2008): "The Term Structure of Inflation Expectations", London Business School, Working Paper.
- Christoffersen, P. F., Jacobs, K. Ornthalalai, C., and Wang, Y. (2008): "Option Valuation with Long-Run and Short-Run Volatility Components", *Journal of Financial Economics*, 90, 272-297.

- Christoffersen, P. F., Jacobs, K., Karoui, L., and Mimouni, K. (2008): "Nonlinear Filtering in Affine Term Structure Models: Evidence from the Term Structure of Swap Rates", Working Paper, McGill University.
- Christoffersen, P. F., Heston, S., and Jacobs, K. (2006): "Option Valuation with Conditional Skewness", *Journal of Econometrics*, 131, 253-284.
- Christoffersen, P. F., Jacobs, K. (2004): "Which GARCH Model for Option Pricing?", *Management Science*, 50, 1204-1221.
- Dai, Q., Le, A., and K. Singleton (2010) : "Discrete-Time Affine^Q Term Structure Models with Generalized Market Prices of Risk", *The Review of Financial Studies*, 23, 2184-2227.
- Joslin, S., Priebisch, M., and Singleton, K., (2010): "Risk Premiums in Dynamic Term Structure Models with Unspanned Macro Risks", Graduate School of Business, Stanford University, Working Paper.
- Joslin, S., Le, A., and Singleton, K., (2010): "The Conditional Distribution of Bond Yields Implied by Gaussian Macro-Finance Term Structure Models", Graduate School of Business, Stanford University, Working Paper.
- Gouriéroux, C., Monfort, A. and R. Sufana, (2010) : "International Money and Stock Market Contingent Claim", *Journal of International Money and Finance*, forthcoming.