



Programa

Contenido:

Módulo I: **Teoría Asintótica: Análisis Univariado Estacionario**

Erick Lahura

Módulo II: **Raíces Unitarias: Análisis Univariado No Estacionario**

Gabriel Rodríguez

Módulo III: **Análisis Multivariado: Cointegración**

Gabriel Rodríguez

Módulo IV: **Modelos No Lineales: Volatilidad**

Alberto Humala

Evaluación:

Ejercicios Calificados: 4 (uno por módulo/ 15% c/u) 60%

Examen Parcial 20%

Examen Final 20%

Horario:

Miércoles: 07:00 - 10:00 horas

Sábado: 13:00 - 14:00 horas

Aula:

N-303

N-222

Módulo I: Análisis Univariado Estacionario

Objetivos:

Se proporcionará a los estudiantes una base teórica adecuada sobre los modelos estacionarios ARMA y teoría asintótica para series de tiempo.

Requisitos del Curso:

Haber cursado satisfactoriamente los cursos de Econometría 1 y 2 o cursos equivalentes. Se asume que el alumno maneja herramientas de algebra matricial, estadística matemática y cálculo matemático.

Contenido:

Sesión 1.1: Procesos estacionarios ARMA.

- Estacionariedad y Ergodicidad
- Procesos AR(p), MA(q) y ARMA(p,q)
- Predicción de Series de Tiempo.
- Estimación por Máxima Verosimilitud
- Metodología Box Jenkins

Sesión 1.2: Teoría Asintótica para observaciones dependientes:

- Ley de Grandes Números y Teorema del Limite Central
- Propiedades del estimador Mínimos Cuadrados Ordinarios
- Movimientos Brownianos y Teorema del Limite Central Funcional.

Sesión 1.3: Filtro de Kalman

- Representación Estado Espacio de un sistema dinámico
- Filtro de Kalman. Suavizamiento.

Bibliografía Obligatoria

1. Hamilton, James (1994) “*Time Series Analysis*”. New Jersey: Princeton University Press. Capítulos 1, 2, 3, 4, 5, 7, 8 y 13

Bibliografía Complementaria

1. Enders, Walter (2009) “*Applied Econometric Time Series*”. [3ra ed.] New York: John Wiley & Sons.
2. Greene, William (2007) “*Econometric Analysis*”. [6ta ed] New York: Mc Millan, 2007.
3. Grimmett, Geoffrey R. and David R. Stirzaker (2001) “*Probability and Random Processes*”. [3ra ed.] Oxford : Oxford University Press.
4. Sargent, Thomas J. (1987) “*Macroeconomic Theory*” [2da ed.] Boston: Academic Press.
5. White, Halbert (2000) “*Asymptotic Theory for Econometricians*” Orlando, Florida: Academic Press.

Módulo II: Raíces Unitarias: Análisis Univariado No Estacionario

Objetivos:

En este módulo se desarrollan algunos temas similares a cursos regulares de series de tiempo pero con mayor énfasis en la formalidad y el desarrollo analítico. Asimismo se desarrollarán algunos nuevos temas en la literatura que complementarán la formación del estudiante. El dictado del curso pondrá énfasis en la presentación y discusión de programas elaborados en el programa econométrico Gauss lo que permitirá ilustrar los principales temas discutidos. Asimismo, el dictado contempla la discusión de textos relevantes en la literatura econométrica.

Computador:

Unos de los objetivos del curso es el análisis empírico univariado y/o multivariado de series macroeconómicas y/o financieras. En este sentido, el uso del computador es un elemento importante en el desarrollo del curso. En general, los estudiantes son libres de desarrollar los ejercicios en el programa econométrico de su preferencia. Sin embargo, en el curso haremos uso de los programas Gauss. En algunos casos podemos usar otros programas como Eviews, Matlab, R, Rats, Ox-Metrics o WinBugs. Se recomienda leer alguna guía introductoria o práctica relacionada con el programa Gauss. La dirección <http://faculty.washington.edu/ezivot/gaussfaq.htm> contiene algunas direcciones que pueden ser útiles a este respecto. De otro lado, un programa que puede resultar útil es el llamado Jmulti, el cual es gratuito y permite la aplicación de diversas metodologías. Este programa puede ser obtenido gratuitamente entrando a la página web del Profesor Helmut Lütkepohl.

Contenidos:

Sesión 2.1: Tests de Raíces Unitarias

- Clásicos
- Recientes
- Cambio Estructural
- Condición Inicial
- Covariables
- Outliers
- Aplicaciones

Sesión 2.2: Outliers

- Efectos
- Identificación y Modelización
- Aplicaciones

Sesión 2.3: Tests de Cambio Estructural con Perturbaciones Estacionarias o No Estacionarias

Sesión 2.4: Estimación de Modelos con Cambio Estructural

Módulo III: Análisis Multivariado: Cointegración

Contenidos:

Sesión 3.1: Cointegración

- Tests
- Distribuciones
- Aplicaciones

Sesión 3.2: Modelos de Volatilidad

Sesión 3.3: Descomposición de Tendencia y Ciclo

- Filtro de Kalman
- Otros

Sesión 3.4: Introducción a Econometría Bayesiana

Referencias:

El campo de series temporales se ha desarrollado de manera importante en los últimos 15-20 años y consecuentemente debemos hacer algunas priorizaciones debido al corto tiempo del curso. Una lista de referencias (no exhaustiva) es otorgada con la finalidad de completar detalles o profundizar en ciertos temas de mayor interés del estudiante. Ningún libro es obligatorio como manual del curso. Sin embargo, el material dictado en las clases teóricas y prácticas es el material fundamental para la comprensión y el éxito del curso. A continuación se presenta una lista de referencias (libros y papers). Es necesario notar que la lista de papers incluye aplicaciones empíricas en la mayoría de los casos.

Libros:

1. Anderson, T. W. (1971), The Statistical Analysis of Time Series, John Wiley & Sons.
2. Banerjee, A., J. J. Dolado, J. W. Galbraith and D. F. Hendry (1993), Cointegration, Error Correction and the Econometric Analysis of Non Stationary Data, Oxford University Press.
3. Bierens, H. J. (1996), Topics in Advanced Econometrics, Cambridge University Press.
4. Billingsley, P. (1979), Probability and Measure, New York: John Wiley.
5. Brockwell, P. J. y R. A. Davis (1991), Time Series: Theory and Methods, Segunda Edición, Springer-Verlag.
6. Davidson, J. (1997), Stochastic Limit Theory, Oxford University Press.
7. Davidson, R. and J. G. MacKinnon (1993), Estimation and Inference in Econometrics, Oxford University Press.
8. Enders, W. (2004), Applied Econometric Time Series, John Wiley Second Edition.
9. Franses, P. H. (1999), Time Series Models for Business and Economic Forecasting, Cambridge University Press.
10. Franses, P. H. y Dick van Dijk (1999), Non-Linear Time Series Models in Empirical Finance, Cambridge University Press.
11. Hamilton, J. D. (1994), Time Series Analysis, Princeton University Press.
12. Harvey, A. C. (1981), Time Series Models, MIT Press.
13. Hatanaka, M. (1998), Time Series-Based Econometrics, Oxford University Press.

14. Hendry, D. F. (1997), *Dynamic Econometrics*, Oxford University Press.
15. Johansen, S. (1999), *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, Oxford University Press.
16. Juselius, K. (2006), *The Cointegrated VAR Model: Methodology and Applications*, Oxford University Press
17. Kim, Ch.-J. and Ch. R. Nelson (1999), *State-Space Models with Regime Switching*, MIT Press.
18. Koops, G. (2003), *Bayesian Econometrics*, John Wiley and Sons.
19. Koops, G., D. Poirier, and J. Tobias (2007), *Bayesian Econometric Methods*, Cambridge University Press (Volume 7 in the *Econometrics Exercises Series* edited by Karim Abadir, Jan Magnus and P.C.B Phillips)
20. Maddala, G. S. and I. M. Kim (1998), *Unit Roots, Cointegration and Structural Change*, Cambridge University Press.
21. Mills, T. C. (1990), *Time Series Techniques for Economists*, Cambridge University Press.
22. Mills, T. C. (1993), *The Econometric Modelling of Financial Time Series*, Cambridge University Press.
23. Priestley, M. B. (1981), *Spectral Analysis and Time Series*, Academic Press.
24. Taniguchi, M. y Y. Kakizawa (2000), *Asymptotic Theory of Statistical Inference for Time Series*, Springer Verlag.
25. van der Vaart, A. W. (2000), *Asymptotic Statistics*, Cambridge University Press.
26. Wang, P. (2003), *Financial Econometrics*, Routledge.
27. White, H. (1999), *Asymptotic Theory for Econometricians*, Academic Press.

Papers:

Tests de Raiz Unitaria

1. Banerjee, A., R. Lunsdaine, and J. H. Stock (1992), .Recursive and Sequential Tests of the Unit Root and Trend Break Hypothesis,. *Journal of Business and Economic Statistics* 10, 271-288.
2. Campbell, J. Y. and P. Perron (1991), .Pitfalls and Opportunities: What Macroeconomists Should Know About Unit Roots,. in *NBER Macroeconomics Annual*, O. J. Blanchard and S. Fisher, Editors, Vol. 6, 141-201.
3. Christiano, L. (1992), .Searching for Breaks in GNP,.*Journal of Business and Economic Statistics* 10, 237-250.
4. Elliott, G., T. J. Rothenberg and J. H. Stock (1996), .Efficient Tests for an Autoregressive Unit Root. *Econometrica* 64, 813-836.
5. Niels Haldrup, and Morten Ørregaard Nielsen, 2007, .Estimation of Fractional Integration in the Presence of Data Noise., *Computational Statistics and Data Analysis* 51, 3100-3114.
6. Kwiatkowski, D., P. C. B. Phillips, P. Schmidt, and Y. Shin (1992), .Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root: How sure are we that economic time series have a unit root,.*Journal of Econometrics* 54, 159-178.
7. Nelson, C. R. and C. I. Plosser (1982), .Trends and Random Walks in Macroeconomic Time Series: Some Evidence and Implications,.*Journal of Monetary Economics* 10, 139-162.
8. Ng, S. and P. Perron (1995), .Unit Root tests in ARMA Models with Data Dependent Methods for the Selection of the truncation Lag,.*Journal of the American Statistical Association* 90, 268-281.
9. Ng, S. and Perron, P. (2001), . Lag Length Selection and the Construction of Unit Root Tests with Good Size and Power,.*Econometrica* 69, 1519-1554.

10. Perron, P. (1989), .The Great Crash, the Oil Price Shock and the Unit Root Hypothesis,,*Econometrica* 57, 1361-1401.
11. Perron, P. (1990), .Testing for a Unit Root in a Time Series with a Changing Mean,,*Journal of Business and Economic Statistics* 8, 153-162.
12. Perron, P. (1994), .Trend, Unit Root and Structural Change in Macroeconomic Time Series,,in *Cointegration for the Applied Economist*, B. B. Rao (Editor), Macmillan Press, 113-146.
13. Perron, P.(1997), .Further Evidence on Breaking Trend Functions in Macroeconomic Variables,,*Journal of Econometrics* 80, 355-385.
14. Perron, P. and S. Ng (1996), .Useful Modi.cations to Some Unit Root Tests with Dependent Errors and their Local Asymptotic Properties,,*Review of Economic Studies* 63, 435-463.
15. Perron, P. and G. Rodríguez (2003), .Eç cient Unit Root Tests and Structural Change,,*Journal of Econometrics* 115, 1-27.
16. Perron, P. and G. Rodríguez (2003), .Searching for Additive Outliers in Nonstationarity Time Series,,*Journal of Time Series Analysis*, 24(2), 193-220.
17. Perron, P. and T. Vogelsang (1992), .Nonstationarity and Level Shifts with an Application to Purchasing Power Parity,, *Journal of Business and Economic Statistics* 12, 471-478.
18. Phillips, P. C. B. and P. Perron (1988), .Testing for a Unit Root in Time Series Regression,,*Biometrika* 75, 335-346.
19. Phillips, P. C. B. and Z. Xiao (1998), .A Primer on Unit Roots,,*Journal of Economic Surveys*, 12 (5), 423-469.
20. Rodríguez, G. (2004), .An Empirical Note about Additive Outliers in Latin American In.ation Series,,*Empirical Economics* 29 (2), 361-372.
21. Said, S. E. and D. A. Dickey (1984), .Testing for Unit Root in Autoregressive-Moving Average Models of Unknown Order,,*Biometrika* 71, 599-607.

22. Stock, J. H. (1994), .Unit Roots and Trend Breaks,. in Handbook of Econometrics, Vol. 4, R. F. Engle and D. MacFaden, Editors, Elsevier.
23. Vogelsang, T. J. (1999), .Two Simple Procedures for Testing for a Unit Root when there are Additive Outliers,.Journal of Time Series Analysis 20, 237-252.
24. Zivot, E. and D. W. Andrews (1992), .Further Evidence on the Great Crash, the Oil Price Shock and the Unit Root Hypothesis,. Journal of Business and Economic Statistics 10, 251-270.

Outliers

1. Baldé, T. A. and G. Rodríguez (2005), .Finite sample effects of additive outliers on the Granger-causality test with an application to money growth and inflation in Peru,. Applied Economics Letters 12, 841-844.
2. Chang, I., Tiao, G. C. and Chen, C. (1988), .Estimation of Time Series Parameters in the Presence of Outliers,.Technometrics 30, 193-204.
3. Chen, C. and L. Liu (1993), .Joint Estimation of Model Parameters and Outlier Effects in Time Series,.Journal of the American Statistical Association 74, 427-431.
4. Fajardo, F., V. Reisen, y F. Cribari-Neto (2009), .Robust Estimation in Long-Memory Processes under Additive Outliers,.Journal of Statistical Planning and Inference 139, 2511.2525
5. Franses, P. H. and N. Haldrup (1994), .The Effects of Additive Outliers on Tests for Unit Roots and Cointegration,. Journal of Business & Economic Statistics 12, 471-478.
6. Hawkins, D. M. (1973), .Repeated Testing for Outliers,.Statistica Neerlandica, 27, 1-10.
7. Peña, D. (1990), .Influential Observations in Time Series,. Journal of Business & Economic Statistics 8, 235-241.
8. Perron, P. and G. Rodríguez (2003), .Searching for Additive Outliers in Nonstationarity Time Series,.Journal of Time Series Analysis, 24(2), 193-220.

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10. Vogelsang, T. J. (1999), .Two Simple Procedures for Testing for a Unit Root when there are Additive Outliers,.,*Journal of Time Series Analysis* 20, 237-252.
11. Gómez, V. and A. Maravall (1992b), .Time Series Regression with ARIMA Noise and Missing Observations. Program TRAM,., European University Institute, Working Paper ECO 92/81.

Tests de Cambio Estructural, Estimación de Modelos con Cambio Estructural

1. Bai, J., and P. Perron (1998), .Estimating and Testing Linear Models with Multiple Structural Changes,.,*Econometrica* 66, 47-78.
2. Bai, J., and P. Perron (2003), .Computation and Analysis of Multiple Structural Change Models,.,*Journal of Applied Econometrics* 18, 1-22.
3. Carlino, G. A. and L. O. Mills (1993), .Are US Regional Incomes Converging?., *Journal of Monetary Economics* 32, 335-346.
4. Fallahi, F., and G. Rodríguez (2011), .Persistence of Unemployment in the Canadian Provinces,., *International Regional Science Review* 34(4) 438-458. It appears as Working Paper 286, Department of Economics, Pontificia Universidad Católica del Perú.
5. Perron, P. and Yabu, T. (2009), "Testing for Shifts in Trend with an Integrated or Stationary Noise Components," *Journal of Business and Economics Statistics* 27, 369-396.
6. Perron, P. and Yabu, T. (2009), "Estimating Deterministic Trends with an Integrated or Stationary Noise Components," *Journal of Econometrics* 151, 56-69.
7. Rodríguez, G., and Y. Samy (2003), .Analyzing the Effects of Labor Standards on U.S. Export Performance. A Time Series Approach with Structural Change,.,*Applied Economics* 35, 1043-1051.

8. Tomljanovich, M. and T. J. Vogelsang (2002), .Are US. Regions Converging? Using New Econometric Methods to Examine Old Issues., *Empirical Economics* 27 (1), 49-62.
9. Vogelsang, T. J. (1997), .Testing for a Shift in Trend when Serial Correlation is of Unknown Form., CAE Working Paper 97-11, Cornell University.
10. Vogelsang, T. J. (1998), .Trend Function Hypothesis Testing in the Presence of Serial Correlation., *Econometrica* 66 (1), 123-148.

Cointegración

1. Elliott, G., M. Jansson, and E. Pesavento (2005), "Optimal Power for Testing Potential Cointegrating Vectors with Known Parameters for Nonstationarity," *Journal of Business & Economic Statistics* 23 (1), 34-48.
2. Engle, R. F. and C. W. J. Granger (1987), "Co-Integration and Error Correction: Representation, Estimation and Testing," *Econometrica* 55, 251-276.
3. Granger, C. W. J. and P. Newbold (1974), "Spurious Regression in Econometrics," *Journal of Econometrics* 2, 111-120.
4. Hansen, B. E. (1992), "Efficient Estimation and Testing of Cointegration Vectors in the Presence of Deterministic Trends," *Journal of Econometrics* 53, 87-121.
5. Hubrich, K., H. Lütkepohl and P. Saikkonen (1998), "A Review of Systems Cointegration Tests," Unpublished manuscript, Institut for Statistik und Okonometrie, Humboldt-Universitat Zu Berlin.
6. Johansen, S. (1988), "Statistical Analysis of Cointegration Vectors," *Journal of Economics, Dynamics and Control* 12, 231-254.
7. Johansen, S. (1991), "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," *Econometrica* 59, 87-121.
8. Johansen, S. and K. Juselius (1990), "Maximum Likelihood Estimation and Inference on Cointegration with an Application to the Demand for Money," *Oxford Bulletin of Economics and Statistics* 52, 169-210.

9. Johansen, S. and K. Juselius (1992), "Testing Structural Hypotheses in a Multivariate Cointegration Analysis of the PPP and the UIP for UK," *Journal of Econometrics* 53, 221-244.
11. King, R., C. I. Plosser, J. H. Stock and M. W. Watson (1991), "Stochastic Trends and Economic Fluctuations," *American Economic Review* 81, 819-840.
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13. Pesavento (2007), "Residual-Based Tests for the Null of No-Cointegration: An Analytical Comparison," *Journal of Time Series Analysis* 28 (1), 111-137.
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16. Stock, J. H. (1987), "Asymptotic Properties of Least Squares Estimates of Cointegration Vectors," *Econometrica* 55, 1035-1056.
17. Stock, J. H. (1999): "A Class of Tests for Integration and Cointegration," in Engle, R.F. and H. White (eds.), *Cointegration, Causality and Forecasting. A Festschrift in Honour of Clive W.J. Granger*, Oxford University Press, 137-167.
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19. Sims, C. A., J. H. Stock and M. W. Watson (1990), "Inference in Linear Time Series Models with some Unit Roots," *Econometrica* 58, 113-144.
20. Watson, M. W. (1994), "Vector Autoregression and Cointegration," in *Handbook of Econometrics*, Vol. 4, R. F. Engle and D. MacFaden, Editors, Elsevier.

Modelos de Volatilidad

1. Bollerslev, T. (1986), .Generalised Autoregressive Conditional Heteroskedasticity,. Journal of Econometrics 31, 307-27.
2. Bollerslev, T. R., R. Chou, y K. Kroner (1992), .ARCH Modeling in Finance,.Journal of Econometrics 52, 5-59.
3. Engle, R. F. (1982), .Autoregressive Conditional Heterocedasticity with Estimates of the Variance of United Kingdom., Econometrica 50 (4), 987-1007.
4. Engle, R. (1983), .Estimates of the Variance of US In.ation Based on the ARCH Model,.Journal of Money, Credit and Banking 15, 286-301.
5. Humala, A., and G. Rodríguez (2012), .Some Stylized Facts of Returns in the Stock and Foreign Exchange Markets in Peru., forthcoming in Studies in Economics and Finance. It appears as Working Paper 2010-17, Central Bank of Peru. It also appear as Working Paper 325, Department of Economics, Ponticia Universidad Católica del Perú.
6. Lu, Y. K. y P. Perron (2010), "Modeling and Forecasting Stock Return Volatility Using a Random Level Shift Model," Journal of Empirical Finance 17, 138-156.
7. Nelson, D. B. (1991), .Conditional Heteroskedasticity in Asset Returns,.Econometrica 59, 347-370.
8. Perron, P. y Qu (2010), "Long-Memory and Level Shifts in the Volatility of Stock Market Return Indices," Journal of Business and Economic Statistics 28, 275-290.
9. Qu, Z. y P. Perron (2010), "A Stochastic Volatility Model with Random Level Shifts: Theory and Applications to S&P 500 and NASDAQ Return Indices," Working Paper, Boston University. Forma Espacio Estado, Filtro de Kalman y Descomposición de Tendencia y Ciclo

Forma Espacio Estado, Filtro de Kalman y Descomposición de Tendencia y Ciclo

1. Baxter, M. and R. G. King (1999), .Measuring Business Cycles: Approximate Band-Pass Filter for Economic Time Series,.The Review of Economics and Statistics 79, 551-563
2. Beveridge, S. and C. R. Nelson (1981), .A New Approach to Decomposition of Economic Time Series into Permanent and Transitory Components with particular attention to measurement of the business cycle,. Journal of Monetary Economics 7, 151-174.
3. Canova, F. (1998), Detrending and Business Cycle Facts, Journal of Monetary Economics 41, 475-512.
4. Christiano, L. J., and T. J. Fitzgerald (2003). .The Band Pass Filter,.International Economic Review 44ics 8, 231-247.
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8. Harvey, A. C. (1987), .Applications of the Kalman Filter in Econometrics,. in Advances in Econometrics, Vol. 1, T. F. Bewley (Editor), Econometric Society Monograph # 13, 285-313.
9. Kim, C.-J. and C. R. Nelson (1999), .Friedman.s Plucking Model of Business Fluctuations: Tests and Estimates of Permanent and Transitory Components,. Journal of Money, Credit and Banking 31, 317-334.
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14. Rodríguez, G. (2010), "Using A Forward-Looking Phillips Curve to Estimate the Output Gap in Peru," *Review of Applied Economics*. It appears published as Working Paper 2009-010, Department of Research, Central Bank of Peru.
15. Rodríguez, G. (2010), .Application of Three Non-Linear Econometric Approaches to Identify Business Cycles in Peru., *Journal of Business Cycle Measurement and Analysis* 2. It appears published as Working Paper 284, Department of Economics, Pontificia Universidad Católica del Perú.
16. Watson, M. W. (1986), "Univariate Detrending Methods with Stochastic Trends," *Journal of Monetary Economics* 18, 29-75.

Módulo IV: Modelos No Lineales: Volatilidad

Objetivos:

Se proporcionará a los estudiantes una base teórica adecuada sobre los modelos de regímenes cambiantes (de transición determinística y estocástica). Se mostrará la aplicación de estos modelos al análisis de series macroeconómicas y financieras. Al concluir el módulo, los estudiantes podrán evaluar literatura aplicada de econometría no lineal y conducir sus propias investigaciones.

Metodología:

El curso consta de 4 sesiones teóricas de 3 horas y 3 sesiones prácticas de 2 horas. Las presentaciones teóricas serán complementadas con discusiones de artículos aplicados relevantes y con el uso del software adecuado para estimar los modelos presentados. Los estudiantes deben revisar la bibliografía referida para cada sesión.

Contenido:

Sesión 4.1: Modelos de Cambios de Régimen de Transición Determinística

- Introducción a los modelos de regímenes cambiantes
- Modelos autoregresivos de umbral
 - Modelos de umbral (TAR)
 - Modelos de auto-activación de umbral (SETAR)
- Modelos de transición gradual
 - Modelos de transición suave (STAR)
 - Estimación y selección del modelo
- Aplicación: Modelo SETAR de PPP

Sesión 4.2: Modelos de Cambios de Régimen de Transición Estocástica

- Cadenas de Markov
- Distribuciones simultáneas
- Modelos de cambios Markov (MS-VAR, MS-VECM)
 - Descripción del proceso
 - Inferencia, filtrado y suavizamiento
- Aplicación: Modelo MS-VAR de crisis cambiarias

Sesión 4.3: Estimación de Modelos de Markov

- Máxima verosimilitud y algoritmo EM
- Selección y evaluación del modelo
 - Linealidad vs. no linealidad
 - Número de regímenes
 - Especificación del modelo
 - Pruebas de errores
- Extensiones
 - Modelos de Markov con probabilidades variantes
 - Modelos de Markov con heteroscedasticidad
- Aplicación: Modelo MS de inflación

Sesión 4.4: Modelos de Cambios de Régimen para Volatilidad

- Modelos estándar ARCH y GARCH
- Modelos GARCH de transición determinística
- Modelos GARCH de transición estocástica
- Aplicación: Modelo MS-GARCH de volatilidad bursátil

Referencias por sesión:

Sesión 4.1

Franses y van Dijk (2000)
Juvenal y Taylor (2008)
Krolzig (2002)

Sesión 4.2

Abiad (2007)
Hamilton (1994)
Krolzig (2002)

Sesión 4.3

Castillo, Humala y Tuesta (2011)
Hamilton (1994)
Krolzig (2002)

Sesión 4.4

Chiang, Qiao y Wong (2011)
Franses y van Dijk (2000)
Teräsvirta (2009)

Bibliografía Teórica Obligatoria:

1. Franses, Philip Hans y Dick van Dijk (2000). *Non-linear time series models in empirical finance*. Cambridge University Press, Primera edición. Capítulos 3 - 4.
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