



## **Programa**

### **Contenido:**

- Módulo I: **Teoría asintótica, análisis univariado estacionario**  
Erick Lahura
- Módulo II: **Raíces Unitarias, Outliers y Cambio Estructural**  
Gabriel Rodríguez
- Módulo III: **Cointegración, Modelos de Volatilidad e Introducción a la Econometría Bayesiana**  
Gabriel Rodríguez
- Módulo IV: **Modelos no lineales. Volatilidad.**  
Gabriel Rodríguez

### **Evaluación:**

Ejercicios Calificados: 4 (uno por módulo / 15% cada uno)	60%
Examen Parcial:	20%
Examen Final: (en semana 17)	20%

### **Horario:**

Miércoles 7:00-10:00pm

### **Aula:**

N 113



## Módulo I: Análisis Univariado de Series de Tiempo Estacionarias

### *Contenido:*

**Sesión 1.1 y 1.2:** Ecuaciones en Diferencia y Operadores de Rezagos

**Sesión 1.3 y 1.4:** Procesos Estacionarios ARMA

**Sesión 1.5 y 1.6:** Teoría Asintótica para observaciones independientes.

**Sesión 1.7 y 1.8:** Teoría Asintótica para observaciones dependientes.

### *Bibliografía Obligatoria*

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

### *Bibliografía Complementaria*

Enders, Walter (2009) “*Applied Econometric Time Series*”. [3ra ed.] New York: John Wiley & Sons.

Greene, William (2007) “*Econometric Analysis*”. [6ta ed] New York: Mc Millan, 2007.

Grimmett, Geoffrey R. and David R. Stirzaker (2001) “*Probability and Random Processes*”. [3ra ed.] Oxford : Oxford University Press.

Sargent, Thomas J. (1987) “*Macroeconomic Theory*” [2da ed.] Boston: Academic Press.

White, Halbert (2000) “*Asymptotic Theory for Econometricians*” Orlando, Florida: Academic Press.



## Módulo II: Raíces Unitarias, Outliers y Cambio Estructural

### *Contenido:*

- Sesión 2.1 y 2.2:** Tests de Raíces Unitarias (Clásicos, Recientes, Cambio Estructural, Condición Inicial, Covariables, Outliers, Aplicaciones)
- Sesión 2.3 y 2.4:** Outliers (Efectos, Identificación y Modelización, Aplicaciones)
- Sesión 2.5 y 2.6:** Tests de Cambio Estructural
- Sesión 2.7 y 2.8:** Estimación de Modelos con Cambio Estructural

### *Bibliografía:*

#### Libros

Anderson, T. W. (1971), *The Statistical Analysis of Time Series*, John Wiley & Sons.

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.

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Hatanaka, M. (1998), *Time Series-Based Econometrics*, Oxford University Press.

Hendry, D. F. (1997), *Dynamic Econometrics*, Oxford University Press.

Johansen, S. (1999), *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*, Oxford University Press.

Koops, G. (2003), *Bayesian Econometrics*, John Wiley and Sons.

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)

Maddala, G. S. and I. M. Kim (1998), *Unit Roots, Cointegration and Structural Change*. Cambridge University Press.

Mills, T. C. (1990), *Time Series Techniques for Economists*, Cambridge University Press.

Mills, T. C. (1993), *The Econometric Modelling of Financial Time Series*, Cambridge University Press.

Wang, P. (2003), *Financial Econometrics*, Routledge.



Papers:

### Tests de Raiz Unitaria

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.

Campbell, J. Y. and P. Perron (1991) “*Pitfalls and Opportunities: What Macro-economists Should Know About Unit Roots*”, in NBER Macroeconomics Annual, O.J. Blanchard and S. Fisher, Editors, Vol. 6, 141-201.

Christiano, L. (1992) “*Searching for Breaks in GNP*”. Journal of Business and Economic Statistics 10, 237-250.

Elliott, G., T. J. Rothenberg and J. H. Stock (1996) “*Efficient Tests for an Autoregressive Unit Root*”. Econometrica 64, 813-836.

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.

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.

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.

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.



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.

Perron, P. (1989) *“The Great Crash, the Oil Price Shock and the Unit Root Hypothesis”*,.Econometrica 57, 1361-1401.

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.

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Perron, P.(1997) *“Further Evidence on Breaking Trend Functions in Macroeconomic Variables”*.Journal of Econometrics 80, 355-385.

Perron, P. and S. Ng (1996) *“Useful Modifications to Some Unit Root Tests with Dependent Errors and their Local Asymptotic Properties”*.Review of Economic Studies 63, 435-463.

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Perron, P. and G. Rodríguez (2003) *“Searching for Additive Outliers in Nonstationarity”*. Time Series,.Journal of Time Series Analysis, 24(2), 193-220.

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.

Phillips, P. C. B. and P. Perron (1988) *“Testing for a Unit Root in Time Series Regression”*,.Biometrika 75, 335-346.

Phillips, P. C. B. and Z. Xiao (1998) *“A Primer on Unit Roots”*. Journal of Economic Surveys, 12 (5), 423-469.



Rodríguez, G. (2004) “*An Empirical Note about Additive Outliers in Latin American Inflation Series*”. *Empirical Economics* 29 (2), 361-372.

Said, S. E. and D. A. Dickey (1984) “*Testing for Unit Root in Autoregressive-Moving Average Models of Unknown Order*”. *Biometrika* 71, 599-607.

Stock, J. H. (1994) “*Unit Roots and Trend Breaks*”. In *Handbook of Econometrics* Vol. 4, R. F. Engle and D. MacFaden, Editors, Elsevier.

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.

Zivot, E. and D. W. Andrews (1992), .Furhter Evidence on the Great Crash, the Oil Price Shock and the Unit Root Hypothesis, *Journal of Business and Economic Statistics* 10, 251-270.

### **Outliers (Efectos, Identificación and Modelización)**

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.

Chang, I., Tiao, G. C. and Chen, C. (1988) “*Estimation of Time Series Parameters in the Presence of Outliers*”. *Technometrics* 30, 193-204.

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.

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, 471-478.5

Hawkins, D. M. (1973) “*Repeated Testing for Outliers*”. *Statistica Neerlandica*, 27, 1-10.



Peña, D. (1990) "*Influential Observations in Time Series*". Journal of Business & Economic Statistics 8, 235-241.

Perron, P. and G. Rodríguez (2003) "*Searching for Additive Outliers in Nonstationarity Time Series*". Journal of Time Series Analysis, 24(2), 193-220.

Rodríguez, G. (2004) "*An Empirical Note about Additive Outliers in Latin American Inflation Series*". Empirical Economics 29 (2), 361-372.

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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 y Estimación de Modelos con Cambio Estructural**

Bai, J., and P. Perron (1998) "*Estimating and Testing Linear Models with Multiple Structural Changes*". Econometrica 66, 47-78.

Bai, J., and P. Perron (2003) "*Computation and Analysis of Multiple Structural Change Models*". Journal of Applied Econometrics 18, 1-22.

Carlino, G. A. and L. O. Mills (1993) "*Are US Regional Incomes Converging?*" Journal of Monetary Economics 32, 335-346.

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Perron, P. and Yabu, T. (2005) "*Testing for Shifts in Trend with an Integrated or Stationary Noise Components*" Working Paper, Department of Economics, Boston University.





Perron, P. and Yabu, T. (2006) "*Estimating Deterministic Trends with an Integrated or Stationary Noise Components.*" Working Paper, Department of Economics, Boston University.

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.

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.

Vogelsang, T. J. (1997) "*Testing for a Shift in Trend when Serial Correlation is of Unknown Form*".CAE Working Paper 97-11, Cornell University.

Vogelsang, T. J. (1998) "*Trend Function Hypothesis Testing in the Presence of Serial Correlation*..Econometrica 66 (1), 123-148.



**Módulo III: Cointegración, Modelos de Volatilidad, Filtros e Introducción a la  
Econometría Bayesiana**

***Contenido:***

**Sesión 3.1 y 3.2:** Cointegración (Tests, Distribuciones, Aplicaciones)

**Sesión 3.3 y 3.4:** Tendencias Estocásticas (Teoría y Aplicaciones)

**Sesión 3.5 y 3.6:** Modelos de Volatilidad (ARCH, GARCH, EGARCH, Otros y Aplicaciones)

**Sesión 3.7 y 3.8:** Filtros o Introducción a Econometría Bayesiana

***Bibliografía:***

**Cointegración (Tests, Distribuciones, Aplicaciones)**

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.

Engle, R. F. and C. W. J. Granger (1987), "Co-Integration and Error Correction: Representation, Estimation and Testing," *Econometrica* 55, 251-276.

Granger, C. W. J. and P. Newbold (1974), "Spurious Regression in Econometrics," *Journal of Econometrics* 2, 111-120.

Hansen, B. E. (1992), "Efficient Estimation and Testing of Cointegration Vectors in the Presence of Deterministic Trends," *Journal of Econometrics* 53, 87-121.



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.

Johansen, S. (1988), "Statistical Analysis of Cointegration Vectors," *Journal of Economics, Dynamics and Control* 12, 231-254.

Johansen, S. (1991), "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," *Econometrica* 59, 87-121.

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.

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.

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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Stock, J. H. and M. W. Watson (1989), "Testing for Common Trends," *Journal of the American Statistical Association* 83, 1097-1107.

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.

Watson, M. W. (1994), "Vector Autoregression and Cointegration," in *Handbook of Econometrics*, Vol. 4, R. F. Engle and D. MacFaden, Editors, Elsevier.

### **Tendencias Estocásticas (Teoría y Aplicaciones)**

King, R., C. I. Plosser, J. H. Stock and M. W. Watson (1991), "Stochastic Trends and Economic Fluctuations," *American Economic Review* 81, 819-840.

Mellander, E., A. Vredin, and A. Warne (1992), "Stochastic Trends and Economic Fluctuations in a Small Open Economy," *Journal of Applied Econometrics* 7, 369-394.

Misas, M., E. López, and D. Vásquez (2003), "Tendencias Estocásticas Comunes y Fluctuaciones en la Economía Colombiana: 1950-2002," Banco de la República de Colombia.

Warne, A. (1993), "A Common Trend Model: Identification, Estimation and Inference", manuscript.



### **Modelos de Volatilidad (ARCH, GARCH, EGARCH, Otros y Aplicaciones)**

Bollerslev, T. (1986), "Generalised Autoregressive Conditional Heteroskedasticity," *Journal of Econometrics* 31, 307-27.

Engle, R. F. (1982), "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom", *Econometrica* 50 (4), 987-1007.

Nelson, D. B. (1991), "Conditional Heteroskedasticity in Asset Returns," *Econometrica* 59, 347-370.

### **Filtros, Descomposición Tendencia-Ciclo**

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.

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.

Canova, F. (1998), Detrending and Business Cycle Facts, *Journal of Monetary Economics* 41, 475-512.

Clark, P. K. (1987), "The Cyclical Component of U.S. Economic Activity," *Quarterly Journal of Economics* 102, 798-814.

Engle, R. F. and M. W. Watson (1987), "The Kalman Filter: Applications to Forecasting and rational Expectations Models," In *Advances in Econometrics*, Vol. 1, Fifth World Congress, T. F. Bewley (Editor), *Econometric Society Monograph* # 13, 245-285 (more references in this paper).



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Hodrick, R. and E. Prescott (1997), *Postwar US Business Cycles: An Empirical Investigation*, *Journal of Money, Credit and Banking* **29**,1-16.

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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Rodríguez, G. (2004), "Identifying Canadian Regional Business Cycles using the Plucking Model," *Canadian Journal of Regional Science* **27**(1), 61-78. Rodríguez, G. (2010), "Estimating Output Gap, Core Inflation, and the NAIRU for Peru," *Applied Econometrics and International Development* **10**(1), 149-160. It appears also published as Working Paper 2009-009, Department of Research, Central Bank of Peru.

Rodríguez, G. (2010), "Application of Three Non-Linear Econometric Approaches to Identify Business Cycles in Peru," forthcoming in *Journal of Business Cycle Measurement and Analysis*. It appears published as Working Paper 2007-007, Department of Research, Central Bank of Peru.

Rodríguez, G. (2010), "Using A Forward-Looking Phillips Curve to Estimate the Output Gap in Peru," forthcoming in *Review of Applied Economics*. It appears published as Working Paper 2009-010, Department of Research, Central Bank of Peru.

Watson, M. W. (1986), *Univariate Detrending Methods with Stochastic Trends*, *Journal of Monetary Economics* **18**, 29-75.



#### Módulo IV: Modelos no lineales. Volatilidad

##### *Contenido:*

**Sesión 4.1 y 4.2:** Descomposición Tendencia-Ciclo

**Sesión 4.3 y 4.4:** Filtro de Desestacionalización

**Sesión 4.5 y 4.6:** Modelos de Transición Suave (STAR)

**Sesión 4.7 y 4.8:** Modelos de Cambio de Régimen de Markov (MS)

##### *Bibliografía:*

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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.

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

Kim, Chang-Jin y Charles R. Nelson (1999) .State-space models with regime switching. Classical and Gibbs-sampling approaches with applications.. The MIT Press, Cambridge Massachusetts, Londres Inglaterra. Capítulo 4.

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Gray, Stephen F. (1996). Modeling the conditional distribution of interest rates as a regime-switching process.. Journal of Financial Economics, Vol. 42, 27 - 62.

Haas, Markus; Stefan Mittnik; y Marc S. Paolella (2004). A new approach to Markov-switching GARCH models.. Journal of Financial Econometrics, Vol. 2, 493 – 530.

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DEL PERÚ**

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Teräsvirta, T. (1998) .Modelling Economic Relationships with Smooth Transition Regressions. En A. Ullah y D. E. A. Giles Eds.), Handbook of Applied Economic Statistics, New York: Marcel Dekker, 507.552.

Wang, P. (2003). Financial Econometrics., Routledge.