Christian FRANCQ

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Date of birth : January 23, 1962.

DEGREE

— 1989 "Thèse de Doctorat" (PhD) in Mathematics (Montpellier, Advisor : A. Berlinet)

— 1997 "Habilitation à Diriger des Recherches" (tenure) (Lille I ; Examining board : A. Berlinet, D. Bosq, Y. Davydov, C. Gouriéroux, B. Massé, G. Mélard, X. Milhaud ; M.-C. Viano)

POSITION

— Assistant Professor at the University Lille I, Laboratory of Statistic and Probability, from 1990 to September 1998

— Full Professor of Mathematics at the University Littoral–Côte d'Opale, Laboratory LMPA Joseph Liouville, from September 1998 to September 2002, and at the University Charles-de-Gaulle Lille3, Laboratory EQUIPPE-GREMARS, since September 2002

— In 2010-2011, CNRS delegation at the laboratory GRECSTA, UMR2773 located at CREST, Paris.

— Since September 2011, on secondment at ENSAE-CREST, Paris.

TEACHING Data analysis, econometrics, probability, statistics, time series, risk measure (see my web page http://perso.univ-lille3.fr/~cfrancq/ for details).

RESEARCH

Research interests : Time Series Analysis, Statistics, Econometrics and Finance.

PUBLICATIONS

1. Main publications

1– Francq, C. and Thieu, L. Q. Qml inference for volatility models with covariates. *Econometric Theory*, 1-36, 2018.

2– Francq, C. and Sucarrat, G. An Exponential Chi-Squared QMLE for Log-GARCH Models Via the ARMA Representation. *Journal of Financial Econometrics* 16, 129–154, 2017.

3– Francq, C., Jimenez-Gamero, M. D. and Meintanis, S. Tests for conditional ellipticity in multivariate GARCH models. *Journal of Econometrics* 196, 305–319, 2017.

4– FRANCQ, C. and SUCARRAT, G. An Equation-by-Equation Estimation of a Multivariate Log-GARCH-X Model of Financial Returns. *Journal of Multivariate Analysis* 153, 16–32, 2017.

5– FRANCQ, C., Wintenberger, O. and ZAKOÏAN, J-M. Goodness-of-fit tests for Log-GARCH and EGARCH models. *TEST* publié en ligne `http://link.springer.com/article/10.1007/s11749-016-0506-2`

6– FRANCQ, C. and ZAKOÏAN, J-M. Estimating multivariate volatility models equation by equation. *Journal of the Royal Statistical Society : Series B* 78, 613–635, 2016.

7– FRANCQ, C. and ZAKOÏAN, J-M. Looking for efficient QML estimation of conditional value-at-risk at multiple risk levels. *Annals of Economics and Statistics* 123/124, 9–28, 2016.

8– DAROLLES, S., FRANCQ, C., LE FOL, G. and J-M. ZAKOÏAN Intrinsic Liquidity in Conditional Volatility Models. *Annals of Economics and Statistics* 123/124, 225–245, 2016.

9– AHMAD, A. and FRANCQ, C. Poisson QMLE of count time series models. *Journal of Time Series Analysis* 37, 291–314, 2016.

10– FRANCQ, C. and MEINTANIS, S. Fourier-type estimation of the power GARCH model with stable-Paretian innovations. *Metrika* 79, 389–424, 2016.

11– EL GHOURABI, M., FRANCQ, C and TELMOUDI, F. Consistent estimation of the Value-at-Risk when the error distribution of the volatility model is misspecified. *Journal of Time Series Analysis* 37, 46-76, 2016.

12– FRANCQ, C. and ZAKOÏAN, J-M. Risk-parameter estimation in volatility models. *Journal of Econometrics* 184, 158-173, 2015.

13– DUCHESNE, P. and FRANCQ, C. On testing for the mean vector of a multivariate distribution with generalized and $\{2\}$-inverses. *Statistics* 49, 475-496, 2015.

14– FRANCQ, C., HORVÁTH, L. and ZAKOÏAN, J-M. Variance targeting estimation of multivariate GARCH models. *Journal of Financial Econometrics* 14, 353–382, 2014.

15– FRANCQ, C. and ZAKOÏAN, J-M. Inference in non stationary asymmetric GARCH models, *Annals of Statistics* 41, 70-98, 2013.

16– FRANCQ, C., WINTENBERGER, O. and and ZAKOÏAN, J-M. Garch models without positivity constraints : exponential or log garch ? *Journal of Econometrics* 177, 34-46, 2013.

17– FRANCQ, C. and ZAKOÏAN, J-M. Estimating the marginal law of a time series with applications to heavy tailed distributions *Journal of Business & Economic Statistics* 31, 412-425, 2013.

18– FRANCQ, C. and ZAKOÏAN, J-M. Optimal predictions of powers of conditionally heteroskedastic processes, *Journal of the Royal Statistical Society - Series B* 75, 345–367 2013.

19– Francq, C. and Zakoïan, J-M. Strict stationarity testing and estimation of explosive and stationary GARCH models, *Econometrica* 80, 821–861, 2012.

20– Boubacar Mainassara, Y., Carbon, M. and Francq, C. Computing and estimating information matrices of weak ARMA models, *Computational Statistics and Data Analysis* 56, 345–361, 2012.

21– Francq, C. and Zakoïan, J-M. QML estimation of a class of multivariate asymmetric GARCH models, *Econometric Theory* 28, 179–206, 2012.

22– Francq, C., Lepage, G. and Zakoïan, J-M. Two-stage non Gaussian QML estimation of GARCH models and testing the efficiency of the Gaussian QMLE, *Journal of Econometrics* 165, 246–257, 2011

23– Francq, C., Horváth L. and Zakoïan, J-M. Merits and drawbacks of variance targeting in GARCH models, *Journal of Financial Econometrics* 9, 619–656, 2011.

24– Carbon, M. and Francq, C. Portmanteau Goodness-of-Fit Test for Asymmetric Power GARCH Models, *Austrian Journal of Statistics* 40, 55–64, 2011.

25– Francq, C., Roy, R. and Saidi, A. Asymptotic Properties of Weighted Least Squares Estimation in Weak PARMA Models, *Journal of Time Series Analysis* 32, 699–723, 2011.

26– Boubacar Mainassara, Y. and Francq, C. Estimating structural VARMA models with uncorrelated but non-independent error terms, *Journal of Multivariate Analysis* 102, 496–505, 2011.

27– Dabo-Niang, S., Francq, C. and Zakoïan, J-M. Combining Nonparametric and Optimal Linear Time Series Prediction, *Journal of the American Statistical Association* 105, 1554–1565, 2010.

28– Francq, C. and Zakoïan, J-M. Inconsistency of the MLE and inference based on weighted LS for LARCH models, *Journal of Econometrics* 159, 151–165, 2010.

29– Carbon, M., Francq, C. and Tran, L.T. Asymptotic normality of frequency polygons for random fields, *Journal of Statistical Planning and Inference* 140, 502–514, 2010.

30– Francq, C., Horváth L. and Zakoïan, J-M. Sup-tests for linearity in a general nonlinear AR(1) model, *Econometric Theory* 26, 965–993, 2009.

31– Francq, C. and Zakoïan, J-M. Bartlett's formula for a general class of non linear processes, *Journal of Time Series Analysis* 30, 449–465, 2009.

32– Francq, C. and Zakoïan, J-M. Testing the nullity of GARCH coefficients : correction of the standard tests and relative efficiency comparisons, *Journal of the American Statistical Association* 104, 313–324, 2009.

33– Francq, C. and Zakoïan, J-M. Estimating ARCH Models When the Coefficients are Allowed to be Equal to Zero, *Austrian Journal of Statistics* 37, 31–40, 2008.

34– Francq, C., Makarova, S. and Zakoïan, J-M. A class of stochastic unit-root bilinear processes : mixing properties and unit-root test, *Journal of Econometrics* 142, 312–326, 2008.

35– Francq, C. and Zakoïan, J-M. Deriving the autocovariances of powers of Markov-switching GARCH models, with applications to statistical inference, *Computational Statistics and Data Analysis* 52, 3027–3046, 2008.

36– Francq, C. and Zakoïan, J-M. Quasi-maximum likelihood estimation in GARCH processes when some coefficients are equal to zero, *Stochastic Processes and their Applications* 117, 1265–1284, 2007.

37– Francq, C. and Raïssi, H. Multivariate Portmanteau Test for Autoregressive Models with Uncorrelated but Nonindependent Errors, *Journal of Time Series Analysis* 28, 454–470, 2007.

38– Francq, C. and Zakoïan, J-M. HAC estimation and strong linearity testing in weak ARMA models, *Journal of Multivariate Analysis* 98, 114–144, 2007.

39– Carbon, M., Francq, C. and Tran, L.T. Kernel Regression Estimation for Random Fields, *Journal of Statistical Planning and Inference* 137, 778–798, 2007.

40– El Ghini, A. and Francq, C. Asymptotic Relative Efficiency of Goodness-of-Fit Tests Based on Inverse and Ordinary Autocorrelations, *Journal of Time Series Analysis* 27, 843–855, 2006.

41– Francq, C. and Zakoïan, J-M. Linear-representation Based Estimation of Stochastic Volatility Models, *Scandinavian Journal of Statistics* 33, 785–806, 2006.

42– Francq, C. and Zakoïan, J-M. Mixing properties of a general class of GARCH(1,1) models without moment assumptions on the observed process, *Econometric Theory* 22, 815–834, 2006.

43– Francq, C., Roy, R. and Zakoïan, J-M. Diagnostic Checking in ARMA Models with Uncorrelated Errors, *Journal of the American Statistical Association* 100, 532–544, 2005.

44– Francq, C. and Zakoïan, J-M. The L2 Structures of Standard and Switching-Regime GARCH Models, *Stochastic Processes and Their Applications* 115, 1557–1582, 2005.

45– Francq, C. and Zakoïan, J-M. A Central Limit Theorem for Mixing Triangular Arrays of Variables Whose Dependence is Allowed to Grow With the Sample Size, *Econometric Theory* 21, 1165–1171, 2005.

46– Francq, C. and Zakoïan, J-M. Maximum Likelihood Estimation of Pure GARCH and ARMA-GARCH Processes, *Bernoulli* 10, 605–637, 2004.

47– Francq, C. and Gautier, A. Large Sample Properties of Parameter Least Squares Estimates for Time-Varying ARMA Models, *Journal of Time Series Analysis* 25, 765–783, 2004.

48– Francq, C. and Gautier, A. Estimation of Time-Varying ARMA Models with Markovian Changes in Regime, *Statistics and Probability Letters* 70, 243–251, 2004.

49– Bibi, A. and Francq, C. Consistent and Asymptotically Normal Estimators for Time-Dependent Linear Models, *Annals of the Institute of Statistical Mathematics* 55, 41–68, 2003.

50– Francq, C. and Tran, L. T. Nonparametric Estimation of Density, Regression And Dependence Coefficients, *Nonparametric Statistics* 14, 729–747, 2002.

51– Francq, C. and Zakoïan, J-M. Autocovariance Structure of Powers of Switching-Regime ARMA Processes, *ESAIM P&S* 6, 259–270, 2002.

52– Francq, C. and Zakoïan, J-M. Comments on the paper by Minxian Yang "Some properties of vector Autoregressive processes with Markov-Switching coefficients, *Econometric Theory* 18, 815–818, 2002.

53– Broze, L., Francq, C. and Zakoïan, J-M. Efficient use of higher-lag autocorrelations for estimating autoregressive processes, *Journal of Time Series Analysis* 23, 287–312, 2002.

54– Broze, L., Francq, C. and Zakoïan, J-M. Non redundancy of high order moment conditions for efficient GMM estimation of weak AR processes, *Economics Letters* 71, 317–322, 2001.

55– Francq, C. and Zakoïan, J-M. Stationarity of multivariate Markov-switching ARMA models, *Journal of Econometrics* 102, 339–364, 2001.

56– Francq, C., Roussignol, M. and Zakoïan, J-M. Conditional heteroskedasticity driven by hidden markov chains, *Journal of Time Series Analysis* 22, 197–220, 2001.

57– Francq, C. and Zakoïan, J-M. Estimating weak GARCH representations, *Econometric Theory* 16, 692–728, 2000.

58– Francq, C. and Zakoïan, J-M. Covariance matrix estimation for estimators of mixing weak ARMA models, *Journal of Statistical Planning and Inference* 83, 369–394, 2000.

59– Francq, C. and Zakoïan, J-M. Multivariate ARMA models with generalized autoregressive linear innovation, *Stochastic Analysis and Applications* 18, 231–260, 2000.

60– Berlinet, A. and Francq, C. Estimation des covariances entre autocovariances empiriques de processus multivariés non linéaires, *La revue Canadienne de Statistique* 27, 525–546, 1999.

61– Carbon, M. and Francq, C. Estimación no paramétrica de la densidad y de la regresión–Previsión no paramétrica, *Revista de Matemática : Teoría y Aplicaciones* 6, 1–26, 1999.

62– Francq, C. ARMA models with bilinear innovations, *Stochastic Models* 15, 29–52, 1999.

63– Berlinet, A. and Francq, C. On the identification of minimal VARMA representations, *Statistical Inference for Stochastic Processes* 1, 1–15, 1998.

64– Francq, C. and Roussignol, M. Ergodicity of autoregressive models with Markov-switching and consistency of the maximum-likelihood estimator, *Statistics* 32, 151–173, 1998.

65– Francq, C. and Zakoïan, J-M. Estimating linear representations of nonlinear processes, *Journal of Statistical Planning and Inference* 68, 145–165, 1998.

66– Francq, C. and Roussignol, M. On white noises driven by hidden Markov chains, *Journal of Time Series Analysis* 18, 553–578, 1997.

67– Berlinet, A. and Francq, C. On Bartlett's formula for nonlinear processes, *Journal of Time Series Analysis* 18, 535–552, 1997.

68– Francq, C. and Menvielle, M. A model for the *am (Km)* planetary geomagnetic activity index and application to prediction, *Geophys. J. Int.* 125, 729–746, 1996.

69– Berlinet, A. and Francq, C. Identification of a univariate ARMA model, *Computational Statistics* 9, 117–133, 1994.

70– Berlinet, A. and Francq, C. Stationnarité et identification d'un processus purement bilinéaire et strictement superdiagonal, *Statistique et Analyse des Données* 15, 1–24, 1990.

2. Chapters of books and Handbooks

71– Francq, C. and Zakoïan, J-M. Multi-level Conditional VaR Estimation in Dynamic Models, in *Modeling Dependence in Econometrics*, Advances in Intelligent Systems and Computing. Edts : Huynh, Van-Nam and Kreinovich, Vladik and Sriboonchitta, Songsak. Springer International Publishing 251, 3–19, 2014.

72– Amendola, A. and Francq, C. Concepts of and tools for nonlinear time series modelling. *Handbook of Computational Econometrics*, Edts : D. Belsley and E. Kontoghiorghes, Wiley, 2009.

73– Francq, C. and Zakoïan, J-M. A tour in the asymptotic theory of GARCH estimation. *Handbook of Financial Time Series*, Edts : T. G. Andersen, R.A. Davis, J-P. Kreiss, T. Mikosch. Springer Statistics, 2009.

74– Francq, C. and Zakoïan, J.M. On Efficient Inference in GARCH Processes, *Dependence in Probability and Statistics*, Ed. by P. Bertail, P. Doukhan and P. Soulier, Lecture Notes in Statistics 187, Springer-Verlag New York, 305–377, 2006.

75– Francq, C. and Zakoïan, J-M. Recent results for linear time series models with non independent innovations, in *Statistical Modeling and Analysis for Complex Data Problems*, Duchesne, P. et Rémillard, B., Éditeurs, Springer, 241–266, 2005.

3. Comptes Rendus de l'Académie des Sciences

76– Francq, C. and Gautier, A. Estimation de modèles ARMA à changements de régime récurrents, *C. R. Acad. Sci. Paris*, 339, 55-58, 2004.

77– Francq, C., Roussignol, M. and Zakoïan, J-M. Modèles ARCH avec changement de régime markovien, *C. R. Acad. Sci. Paris*, 330, 1031–1034, 2000.

78– Francq, C. and Zakoïan, J-M. Stationnarité des modèles ARMA à changement de régime markovien, *C. R. Acad. Sci. Paris*, 330, 921–924, 2000.

79– Francq, C. and Zakoïan, J-M. Estimation de représentations GARCH faibles, *C. R. Acad. Sci. Paris*, 326, 495–498, 1998.

80– Francq, C. and Zakoïan, J-M. Estimation de la précision asymptotique dans l'estimation de modèles ARMA faibles, *C. R. Acad. Sci. Paris*, 326, 377–380, 1998.

81– Francq, C. and Zakoïan, J-M. Estimation de représentations ARMA faibles sous hypothèses de mélange, *C. R. Acad. Sci. Paris*, 323, 297–300, 1996.

4. Proceedings

82– Francq, C. and Meintanis, S.G. Fourier–type estimation of the power GARCH model with stable–Paretian innovations, *Proceedings of the 10th international conference Computer Data Analysis and Modeling*, Minsk, 2013.

83– Francq, C. and Zakoïan, J-M. Optimal predictions of powers of conditionally heteroskedastic processes, *Proceedings of the ninth international conference Computer Data Analysis and Modeling*, Minsk, 2010.

84– Duchesne, P. and Francq, C. On diagnostic checking time series models with portmanteau test statistics based on generalized inverses and {2}-inverses, *COMPSTAT 2008*, Proceedings in Computational Statistics, 143–154, 2008.

85– Francq, C. and Zakoïan, J-M. Autocovariance Structure of Markov-Switching ARMA and GARCH Processes. In : Mathematisches Forschungsinstitut *Oberwolfach Report* No. 12/2008 : Mini-Workshop on "Time Series with Sudden Structural Changes", 577–579, 2008, Oberwolfach, Germany.

86– Francq, C. and Zakoïan, J-M. Testing that some GARCH coefficients are equal to zero, *Proceedings of the eighth international conference Computer Data Analysis and Modeling*, Minsk, 1, 54–59, 2007.

87– Francq, C. and Zakoïan, J-M. Linear Representations based Estimation of Switching Regime GARCH Models, *NBER Time Series Conference Proceedings*, 1999.

88– Francq, C. and Zakoïan, J-M. Estimating the order of weak ARMA models, *Prague Stochastic'98 Proceedings*, 1, 165–168, 1998.

89– Berlinet, A. and Francq, C. Estimating the covariance between two sample autocovariances, *Transactions of the 12th Prague Conference,* Academy of Science of the Czech Republic, Prague, 35–38, 1994.

5. Other publications

90– C. Francq and Zakoian J-M. Comment on the paper "Quasi Maximum Likelihood Estimation of GARCH Models with Heavy-Tailed Likelihoods" by Jianqing Fan, Lei Qi and Dacheng Xiu, *Journal of Business & Economic Statistics*, 32, 198-201, 2014.

91– S. Auray, C. Francq et Zakoian J-M. Nobel 2011 d'économie – Quelques remarques sur les prix Nobel 2011 d'économie et la modélisation des séries économiques. *Images des Mathématiques, CNRS, 2012. En ligne, URL :* `http://images.math.cnrs.fr/Nobel-2011-d-economie.html`

92– D.A. Belsley, C.W.S. Chen, C. Francq, G. Gallo, L. Khalaf, E.J. Kontoghiorghes and van Dijk H.K. The sixth special issue on computational econometrics, *Editorial*, Computational Statistics and Data Analysis, 56, 3307-3308, 2012.

93– Amendola, A., Francq, C. and Koopman, S.J. Special Issue on Nonlinear Modelling and Financial Econometrics, *Editorial*, Computational Statistics and Data Analysis, 51, 2115–2117, 2006.

94– Carbon, M. and Francq, C. Estimation non paramétrique de la densité et de la régression, *Revue Modulad*, 15, 1–25, 1995.

6. Book

95– Francq, C. and Zakoïan, J-M. *Modèles GARCH : structure, inférence statistique et applications financières.* Economica, collection "économie et statistiques avancées", 2009, 605 pages.

96– Francq, C. and Zakoïan, J-M. *GARCH Models : structure, statistical inference and financial applications.* John Wiley, 2010, ISBN 978-0-470-68391-0.

7. Preprint

97– Cerovecki, C., Francq, C., Hormann, S. and Zakoïan, J-M. Functional GARCH models : the quasi-likelihood approach and its applications. MPRA Paper 83990

98– Francq, C. and Zakoïan, J-M. Joint inference on market and estimation risks in dynamic portfolios. MPRA Paper 68100

99– Darolles, S., Francq, C. and Laurent, S. Asymptotics of Cholesky GARCH Models and Time-Varying Conditional Betas. MPRA Paper 83988