# SELECTED READINGS

## Focus on: Estela Bee Dagum

## September 2010

# INDEX

# INTRODUCTION

Dr. Estelle (Estela) Bee Dagum is currently full Professor of Statistics at the Faculty of Statistical Sciences of the University of Bologna, Italy, and Adjunct Professor of the Department of Economics at the University of Ottawa, Canada.

She has been Director of the Time Series Research and Analysis Division of Statistics Canada and Honorary Professor of the Department of Statistics and Actuarial Sciences at Western Ontario University, Canada.

Her research interests are: Time Series Analysis, Seasonal Adjustment, Trend-cycle, Forecasting, Nonparametric Kernels, Benchmarking, Reconciliation, and Econometric Modelling.

Dr. Dagum is author of the XII ARIMA, seasonal adjustment method officially adopted by the majority of the statistical bureaus of the world and also used by Central Banks, financial institutions and universities. She has published several books and papers in scientific journals in English, French, Spanish, German and Japanese.

Dr. Dagum has served as a Senior Advisor to various governments and private foreign institutions of the United States, Australia, France, Argentina, Mexico and Portugal. She was President of the International Institute of Forecasters and Guest Speaker of the Federal Reserve Board, Washington. She is a Fellow of the Asociación de Economía Aplicada (Spain), and of the American Statistical Association. Estelle Bee Dagum is an Elected Member of the Academy of Sciences of Bologna and of the International Institute of Statistics. She is First Recipient of the Julius Shiskin Award and an Elected Member of the Research Centre for Probability and Statistics (Ottawa and Carleton universities) as well of the International Association of Research in Income and Wealth. She serves as Editor of the International Journal of Forecasting and Associate Editor of the Journal of Business and Economic Statistics, the Canadian Journal of Statistics and the Journal of Survey Methodology.

The following list is a non-exhaustive, subjective selection of Estelle Bee Dagum's publications.

More information can be found at:

- The address of Estelle Bee Dagum's homepage at:

http://www2.stat.unibo.it/beedagum/.

Contact point: GianLuigi Mazzi, "Responsible for Euro-indicators and statistical methodology", Estat - D5 "Key Indicators for European Policies" gianluigi.mazzi@ec.europa.eu.

# 1 WORKING PAPERS AND ARTICLES

### 1.1 Elena Rusticelli, Richard Ashley, Estela Bee Dagum, Douglas Patterson, 2009, "A New Bispectral Test for Non Linear Serial Dependence", Econometric Reviews, Volume 28, Issue 1 - 3 January 2009, pages 279 – 293.

Nonconstancy of the bispectrum of a time series has been taken as a measure of non-Gaussianity and nonlinear serial dependence in a stochastic process by Subba Rao and Gabr (1980) and by Hinich (1982), leading to Hinich's statistical test of the null hypothesis of a linear generating mechanism for a time series. Hinich's test has the advantage of focusing directly on nonlinear serial dependence—in contrast to subsequent approaches, which actually test for serial dependence of any kind (nonlinear or linear) on data which have been pre-whitened. The Hinich test tends to have low power, however, and (in common with most statistical procedures in the frequency domain) requires the specification of a smoothing or window-width parameter. In this article, we develop a modification of the Hinich bispectral test which substantially ameliorates both of these problems by the simple expedient of maximizing the test statistic over the feasible values of the smoothing parameter. Monte Carlo simulation results are presented indicating that the new test is well sized and has substantially larger power than the original Hinich test against a number of relevant alternatives; the simulations also indicate that the new test preserves the Hinich test's robustness to misspecifications in the identification of a pre-whitening model.

*Full text available on-line at:*

http://ashleymac.econ.vt.edu/working_papers/maximal_bispectral.pdf

### 1.2 Estela Bee Dagum, Alessandra Luati ,2009,"A Cascade Linear Filter to Reduce Revisions and False Turning Points for Real Time Trend-Cycle Estimation", Econometric Reviews, Volume 28, Issue 1 – 3, January 2009 , pages 40 – 59.

The problem of identifying the direction of the short-term trend (nonstationary mean) of seasonally adjusted series contaminated by high levels of variability has become of relevant interest in recent years. In fact, major financial and economic changes of global character have introduced a large amount of noise in time series data, particularly, in socioeconomic indicators used for real time economic analysis. The aim of this study is to construct a cascade linear filter via the convolution of several noise suppression, trend estimation, and extrapolation linear filters. The cascading approach approximates the steps followed by the nonlinear Dagum (1996) trend-cycle estimator, a modified version of the 13-term Henderson filter. The former consists of first extending the seasonally adjusted series with ARIMA extrapolations, and then applying a very strict replacement of extreme values. The nonlinear Dagum filter has been shown to improve significantly the size of revisions and number of false turning points with respect to H13.

We construct a linear approximation of the nonlinear filter because it offers several advantages. For one, its application is direct and hence does not require some knowledge on ARIMA model identification. Furthermore, linear filtering preserves the crucial additive constraint by which the trend of an aggregated variable should be equal to the algebraic addition of its component trends, thus avoiding the selection problem of direct versus indirect adjustments. Finally, the properties of a linear filter concerning signal passing and noise suppression can always be compared to those of other linear filters by means of spectral analysis.

*Full text available on-line at:*

http://www.informaworld.com/smpp/content~db=all?content=10.1080/07474930802387837

### 1.3 Estela Bee Dagum, Silvano Bordignon, 2009, "Editorial: Special Issue on Statistical Inference on Time Series Stochastic and Deterministic Dynamics", Econometric Reviews, Volume 28, Issue 1 - 3 January 2009, pages 1 – 3.

No abstract available.

*Full text available on-line at:*

http://www.informaworld.com/smpp/content~db=all?content=10.1080/07474930802387720

### 1.4 Estela Bee Dagum, Silvia Bianconcini , 2008, "The Henderson Smoother in Reproducing Kernel Hilbert Space", Journal of Business and Economic Statistics. October 1, 2008, 26(4): 536-545.

The Henderson smoother has been traditionally applied for trend-cycle estimation in the context of nonparametric seasonal adjustment software officially adopted by statistical agencies. This study introduces a Henderson third-order kernel representation by means of the reproducing kernel Hilbert space (RKHS) methodology. Two density functions and corresponding orthonormal polynomials have been calculated. Both are shown to give excellent representations for short- and medium-length filters. Theoretical and empirical comparisons of the Henderson third-order kernel asymmetric filters are made with the classical ones. The former are shown to be superior in terms of signal passing, noise suppression, and revision size.

*Full text available on-line at:*

http://pubs.amstat.org/doi/abs/10.1198/073500107000000322

### 1.5 Estela Bee Dagum, ,Theodore Alexandrov, Silvia Bianconcini, Peter Maass, and Tucker S. McElroy , 2008, "A Review of Some Modern Approaches to the Problem of Trend Extraction", U. S. Census Bureau Research Report series, (Statistics #2008-3).

Trend extraction is one of the major tasks of time series analysis. The trend of a time series is considered as a smooth additive component that contains information about global change.

This paper presents a review of some modern approaches to trend extraction for one-dimensional time series. We do not aim to review all the novel approaches, but rather to observe the problem from different viewpoints and from different areas of expertise. The paper contributes to understanding the concept of a trend and the problem of its extraction. We present an overview of advantages and disadvantages of the approaches under consideration, which are: the Model-Based Approach, nonparametric linear filtering, Singular Spectrum Analysis, and wavelets. The Model-Based Approach assumes the specification of a stochastic time series model for the trend, which is usually either an ARIMA model or a state space model. The

nonparametric filtering methods (i.e., the Henderson, LOESS, and Hodrick-Prescott filters) do not require specification of a model; they are quite easy to apply and are used in all applied areas of time series analysis. For these well-known methods we show how their properties can be improved by exploiting Reproducing Kernel Hilbert Space methodology. In addition to these extremely popular approaches, we consider Singular Spectrum Analysis (SSA) and wavelet-based methods. Singular Spectrum Analysis is widespread in the geosciences; its algorithm is similar to that of Principal Components Analysis, but SSA is applied to time series. Wavelet-based methods are currently a de facto standard for denoising in many fields. We summarize how the powerful wavelets approach can be used for trend extraction.

*Full text available on-line at:*

http://www.census.gov/ts/papers/rrs2008-03.pdf

### 1.6 Estela Bee Dagum, C. Dagum, 2006, "Stochastic and Deterministic Trend Models", Statistica, 2006, 3, pp. 269-280.

No abstract available.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers%5CSTOCHASTIC_AND_DETERMINISTIC_TRENDFINAL%5B1%5D.pdf

### 1.7 Estela Bee Dagum, S. Bianconcini, 2006, "A Theoretical Comparison between Classical and Reproducing Kernel Hilbert Space Henderson Predictors", Euroindicators Working Paper, Catalogue number: KS-DT-06-003-EN-N, Eurostat, Luxembourg.

The Henderson smoother (1916) has been traditionally applied for trend-cycle estimation in the context of nonparametric seasonal adjustment software such as Census X11, X11/X12 ARIMA, officially adopted by statistical agencies. Particularly, the 13-term filter has shown to possess good properties to detect an upcoming turning point but it has the shortcoming of introducing large revisions for the most recent estimates when new observations are added to the series. This limitation is of serious consequences for short-term trend analysis. In this study we introduce a Henderson third order kernel representation by means of the reproducing

kernel Hilbert space (RKHS) methodology. Two density functions and corresponding orthonormal polynomials up to the second degree have been calculated. One is based on the Henderson weighting function applied in the least square fitting minimization procedure. The other is the biweight density with the associated Jacobi polynomials. Both are shown to give excellent representations for short and medium length filters. The asymmetric weights are derived by adapting the third order kernel functions to the length of the various filters. A comparison of the Henderson third order kernel asymmetric filters is made with the classical ones developed by Musgrave (1964a and 1964b). The former are shown to be superior in terms of signal passing, noise suppression and speed of convergence to the symmetric filter.

*Full text available on-line at:*

http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-DT-06-003/EN/KS-DT-06-003-EN.PDF

### 1.8 Estela Bee Dagum, S. Giannerini, 2006, "A Critical Investigation on Detrending Procedures for Nonlinear Processes", Special Issue on Chaos and Nonlinear Dynamics in Econometrics, Journal of Macroeconomics, 2006, vol. 28, pp.175-191.

The purpose of this paper is twofold. First, we study theoretically the impact of mis-specifying the trend upon the correlation structure of the process that has generated the observations. In particular, we consider the cases of (i) a regression on integrated processes and (ii) differencing processes with a deterministic trend. Second, we assess the effects of such mis-specifications on hypothesis testing when the data generating process is non-linear. The performances of several commonly employed tests for detecting the presence of a unit root and of non-linearity are investigated in a large scale simulation study. In particular, we will focus on some cases that can violate the assumptions at the basis of the application of the tests but, at the same time, represent situations commonly encountered in the field of Macroeconomics. The results suggest that much care has to be dedicated to the detrending procedure since a wrong specification can bias severely the subsequent analysis.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/sdarticle.pdf

**1.9 Estela Bee Dagum and Alessandra Luati, 2004, "Relationship between Local and Global Nonparametric Estimators Measures of Fitting and Smoothing", Studies in Nonlinear Dynamics & Econometrics: Vol. 8: No. 2, Article 17.**

Following Henderson (1916) who developed a smoothing measure as a function of the weight system of a linear filter, Dagum and Luati (2002a) proposed a set of local statistical measures of bias, variance and mean square error which are intrinsic to the smoother and, thus, independent of the data to which they will be applied on. Theoretical measures of local fitting (LMSE) and smoothing (S) are calculated on the basis of the weight systems of the following nonparametric function estimators, Loess of degree 1 and 2, the cubic smoothing spline, the Gaussian kernel, and the 13-term Henderson filter. Our aim is to evaluate the extent to which these local or weight-based measures of fitting and smoothing can be used to obtain a priori general information on the global (data-based) goodness of fit and smoothness when such filters are applied to real time series. A priori knowledge of a smoother fit and smoothness performances when applied to real data is relevant, among others, for current economic analysis, the main interest of which is the detection of true turning points. For each function estimator, we calculate global measures of fitting (MSE) and smoothing (Q) using two large samples of real and simulated series characterized by different degrees of variability. The results show that the theoretical (weight-based) local smoothing measures are always in agreement with the global empirical ones. Similarly, the local (weight-based) mean square error, analyzed in terms of bias and variance composition, provides sound a priori information on the global goodness of fit given by the symmetric filters of each nonparametric estimator. For the asymmetric filters, the above analysis must be done taking into consideration also the impact of phase shifts which can be inferred from the smoothing measures.

*Full text available on-line at:*

http://www.bepress.com/snde/vol8/iss2/art17/

**1.10 Estela Bee Dagum , A. Luati, 2004, "Time Path of Kernels Asymmetric Filters for Non-stationary Mean Prediction of Seasonally Adjusted Series", in Linear and Nonlinear Dynamics in Time Series, (E. B. Dagum, S. Bordignon, N. Cappuccio, M. Riani, and T. Proietti eds), Pitagora Publishers, Bologna, 2004, pp.267-281.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1395-1410.pdf

### 1.11 Estela Bee Dagum, A. Luati, 2003, "A Linear Transformation and its Properties with Special Applications in Time Series Filtering", Linear Algebra and Its Applications, 2003.

The main purpose of this paper is to introduce a linear transformation, called *t*, and to derive its algebraic properties by means of permutation matrices that represent it.

To demonstrate the importance of the *t*-transformation for the estimation of latent variables in time series decomposition, we obtain a general expression for smoothing matrices characterized by symmetric and asymmetric weighting systems.

We show that the submatrix of the symmetric weights (to be applied to central observations) is *t*-invariant whereas the submatrices of the asymmetric weights (to be applied to initial and final observations) are the *t*-transform of each other. By virtue of this relation, the properties of the *t*-transformation provide useful information on the smoothing of time series data.

Finally, we illustrate the role of the *t*-transformation on the weighting systems of several smoothers often applied for trend-cycle estimation, such as the locally weighted regression smoother (loess), the cubic smoothing spline, the Gaussian kernel and the 13-term trend-cycle Henderson filter.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1355-1366.pdf

### 1.12 Estela Bee Dagum, A. Luati, 2003, "Global and Local Statistical Properties of Fixed-Length Nonparametric Smoothers", Statistical Methods and Applications, Springer-Verlag, vol.11.3, 2003, pp. 313-333.

The main purpose of this study is to analyze the global and local statistical properties of nonparametric smoothers subject to a priori fixed length restriction. In order to do so, we introduce a set of local statistical measures based on their weighting system

shapes and weight values. In this way, the local statistical measures of bias, variance and mean square error are intrinsic to the smoothers and independent of the data to which they will be applied on. One major advantage of the statistical measures relative to the classical spectral ones is their easiness of calculation. However, in this paper we use both in a complementary manner. The smoothers studied are based on two broad classes of weighting generating functions, local polynomials and probability distributions. We consider within the first class, the locally weighted regression smoother (loess) of degree 1 and 2 (L1 and L2), the cubic smoothing spline (CSS), and the Henderson smoothing linear filter (H); and in the second class, the Gaussian kernel (GK). The weighting systems of these estimators depend on a smoothing parameter that traditionally, is estimated by means of data dependent optimization criteria. However, by imposing to all of them the condition of an equal number of weights, it will be shown that some of their optimal statistical properties are no longer valid. Without any loss of generality, the analysis is carried out for 13- and 9-term lengths because these are the most often selected for the Henderson filters in the context of monthly time series decomposition.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1325-1346.pdf

### 1.13 Estela Bee Dagum, A. Luati, 2002, "Smoothing Seasonally Adjusted Time Series", Proceedings of the Business and Economic Statistics Section, Annual Meetings of the American Statistical Association, New York, 2002.

This paper deals with the properties of several nonparametric estimators in the context of seasonal adjustment. The smoothers discussed are Loess, the Cubic smoothing spline and the Gaussian kernel, all constrained to a fix span of 13 terms for comparison with the Henderson filter widely applied in time series decomposition. Because of this constraint, the smoothers statistical properties are affected, and no longer optimal as when their respective smoothing parameters are optimally estimated according to data-driven automated selection methods.

We perform the comparison by means of spectral techniques, deriving the symmetric and asymmetric weights of each smoother and calculating the corresponding gains

and phase shift functions. These latter provide information on the type of "signal" passed and "noise" suppressed by each smoother.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1347-1354.pdf

**1.14 Estela Bee Dagum, A. Luati, 2002, "Properties of Estimators Based on Local Polynomial Functions and Probability Distribution Functions in Time Series Analysis", Proceedings of the XLI Riunione Scientifica della Società Italiana di Statistica, 2002, CLEUP Publishers, pp. 205-208.**

*Full text available on-line at:*

http://www.sis-statistica.it/files/pdf/atti/RSMi0602p205-208.pdf

**1.15 Estela Bee Dagum, A. Luati, 2001, "A Study of Asymmetric and Symmetric Weights of Kernel Smoothers and their Spectral Properties", in Estadistica, Special Issue on Time Series Analisis, 2001, vol. 53. pp.215-258.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1279-1324.pdf

**1.16 Estela Bee Dagum, 2001, "Time Series Seasonal Adjustment", in International Encyclopedia of the Social and Behavioral Sciences, Statistical Methodology, S.E. Fienberg, and J.B. Kadane editors, Elsevier Publisher, The Netherlands, 2001, vol. 23, pp.15739-15746.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1067-1076.pdf

**1.17 Estela Bee Dagum, A. Luati, 2001, "Predictive Performance of some Nonparametric Linear and Nonlinear Smoothers for Noisy Data", Statistica, 2000, Anno LX vol.4, pp.635-654.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1231-1252.pdf

**1.18 Estela Bee Dagum, V. Beritich, E. Martinez and N. Pereira, 2000, "Limitaciones de las series desestacionalizadas para el analisis de la tendencia del corto plazo: El Caso Argentino", Estadistica, 2000, vol. 52, pp. 109-123.**

No abstract available.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1215-1230.pdf

**1.19 Estela Bee Dagum, Capitanio Antonella, 2000, "Short term trend estimation and turning point prediction",Serie Ricerche 2000 No. 6, Dipartimento di Scienze Statistiche "Paolo Fortunati", Università degli Studi di Bologna.**

*Full text available on-line at:*

http://amsacta.cib.unibo.it/2278/1/quaderni_ricerche_EBD_AC_short_term.pdf

**1.20 Estela Bee Dagum, P.A. Cholette, 1999, "Extension of the Gauss-Markov Theorem for Non-Stationary Random Effects", in Advances in Econometrics, Income Distribution and Philosophy of Sciences. In Honor of Camilo Dagum, D. Slottje ed., Springer- Verlag, New York, 1999, pp. 27-39.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/0393-0406.pdf

**1.21 Estela Bee Dagum, A. Capitanio, 1999, "Cubic Spline Spectral Properties for Short Term Trend-Cycle Estimation", in Proceedings of the Business and Economic Section of the American Statistical Association, 1999, pp. 100-105.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1179-1186.pdf

**1.22 Estela Bee Dagum, N. Chaab and M. Morry, "Further Results on Alternative Trend-Cycle Estimators for Current Economic Analysis", in Revista Estadistica, 1999, vol-49-51, pp. 231-257.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1187-1214.pdf

### 1.23 Estela Bee Dagum, B.C. Sutradhar, 1998, "Bartlett Type Modified Test for Moving Seasonality with Applications", The Statistician, 1998 vol.47, pp. 191-206.

Socioeconomic time series are often presented in a seasonally adjusted form so that the underlying short-term trend can be more easily analysed, and current socioeconomic conditions can be easily assessed. As a first step towards seasonally adjusting a series, it is essential to test for a changing (moving) seasonal pattem against a stable seasonal pattern over time. To test for moving seasonality, Sutradhar and Dagum have applied a modified Bartlett test to trend-free data consisting of seasonality only. In general, however, such trend-free or detrended data appear to consist of seasonality plus irregular components. This makes the estimation of the parameters more complicated than was the case for Sutradhar and Dagum. We discuss this estimation problem in the present paper in connection with three Canadian export series. As Sutradhar and Dagum did, we then develop a modified Bartlett test under the new set-up and apply the test for testing for moving seasonality in the three Canadian export series.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1049-1066.pdf

### 1.24 Estela Bee Dagum, Z.G. Chen and P.A. Cholette, 1998, "A Unified View of Signal Extraction, Benchmarking", Interpolation and Extrapolation of Time Series, International Statistical Review, 1998, vol.66, n.3 pp. 245-269.

Time series data are often subject to statistical adjustments needed to increase accuracy, replace missing values and/or facilitate data analysis. The most common adjustments made to original observations are signal extraction (e.g. smoothing), benchmarking, interpolation and extrapolation. In this article, we present a general dynamic stochastic regression model, from which most of these adjustments can be performed, and prove that the resulting generalized least square estimator is minimum variance linear unbiased. We extend current methods to include those cases where the

signal follows a mixed model (deterministic and stochastic components) and the errors are autocorrelated and heteroscedastic.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/0431-0456.pdf

**1.25 Estela Bee Dagum, A. Capitanio, 1998, "Smoothing methods for Short-term Trend Analysis: Cubic Splines and Henderson Filters", Statistica, 1998, anno LVIII, n.1, pp.5-24.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1157-1178.pdf

**1.26 Estela Bee Dagum, Z.G. Chen and P.A. Cholette, 1997, "A Nonparametric Method for Benchmarking Survey Data via Signal Extraction", Journal of the American Statistical Association, 1997, vol.92, nn.440, pp.1563-1571.**

This article introduces a nonparametric method to estimate the covariance matrix for the stationary part of the signal (hidden in data), to enable benchmarking via signal extraction. Some discussions and simulations are carried out to compare the proposed benchmarking method to the regression method development by Cholette and Dagum and the signal extraction method developed by Hillmer and Trabelsi suggesting autoregression integrated moving average (ARIMA) models for the signal. The results show that the nonparametric method is feasible, robust, and almost as efficient as the signal extraction method when the true model for the signal is known.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/0421-0430.pdf

**1.27 Estela Bee Dagum, A. Capitanio, 1997, "New Results on Trend-Cycle Estimation and Turning Point Detection", in Proceedings of the Business and Economic Section of the American Statistical Association, pp. 223-228.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1149-1156.pdf

**1.28 Estela Bee Dagum, N. Chhab and K. Chiu, 1996, "Derivation and Analysis of the X11ARIMA and Census X11 Linear Filters", Journal of Official Statistics, Vol. 12, No. 4, 1996, pp. 329-347.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1029-1048.pdf

**1.29 Estela Bee Dagum, 1996, "A New Method to Reduce Unwanted Ripples and Revisions in Trend-Cycle Estimates from X11ARIMA", Survey Methodology, 1996, Vol. 22, No. 1, pp. 77-83.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1133-1140.pdf

**1.30 Estela Bee Dagum, M. Morry and N. Chhab, 1996, "Trend-Cycle Estimators for Current Economic Analysis", Proceeding of the Business and Economic Section, American Statistical Association, 1996, pp. 140-145.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1141-1148.pdf

**1.31 Estela Bee Dagum, P.A. Cholette, 1994, "Benchmarking Time Series with Autocorrelated Survey Errors", International Statistical Review, 1994, Vol. 62, pp. 365-377.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/0407-0420.pdf

**1.32 Estela Bee Dagum, B. Quenneville, 1993, "Dynamic Linear Models for Time Series Components", Annals Issue of the Journal of Econometrics, 1993, Vol. 55, pp. 333-351.**

This paper describes a general state space approach for the modelling of the unobserved components; trend cycle, seasonality, trading-day variations, and

irregulars of a time series and the calculation of the mean square errors of the estimated unobserved components. The unobserved components models are presented in a state space form. The Kalman filter and fixed interval smoother are applied on the observed series to obtain the estimates of the unobserved components and their corresponding variances. Implementation problems related to the estimation of the initial conditions and the initial values for the variances of both the observation noise and noise processes of the unobserved components are solved using the estimates of the unobserved components from X-11-ARIMA [Dagum (1980)]. The estimation of the signal to noise ratio is made by maximum likelihood using the method of scoring. The MLE of the noise variance is obtained analytically, conditional on the estimates of the signal to noise ratios. Statistical tests to distinguish between alternative models are also provided.

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/0373-0392.pdf

**1.33 Estela Bee Dagum, B. Quenneville and B. Sutradhar, 1992, "Trading-Day Variations Multiple Regression Models with Random Parameters", International Statistical Review, Vol. 60, 1, 1992, pp. 57-73.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/0355-0372.pdf

**1.34 Estela Bee Dagum, B.C. Sutradhar and B. Solomon, 1991, "An Exact Test for the Presence of Stable Seasonality with Applications", in Survey Methodology Journal, Vol. 17, No. 2, pp. 153-161.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1019-1028.pdf

**1.35 Estela Bee Dagum, N. Chhab and B. Solomon, 1991, "The Autocorrelation of Residuals from the X11ARIMA Method", Journal of Official Statistics, 1991, Vol. 2, pp. 181-194.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1003-1018.pdf

**1.36 Estela Bee Dagum, B. Quenneville, 1990, "Calculation of Prediction Intervals for Seasonally Adjusted Labour Force Series", Proceedings of the Business and Economic Statistics Section of the American Statistical Association, 1990, pp. 628-633.**

*Full text available on-line at:*

http://www.amstat.org/sections/SRMS/proceedings/papers/1990_107.pdf

**1.37 Estela Bee Dagum, 1989, "The Future of the Forecasting Profession", International Journal of Forecasting, 5, Vol. 2, 1989, pp. 155-157.**

*Full text available on-line at:*

http://www.sciencedirect.com/science/article/B6V92-45Y7GVY-1/2/9df6f58d7727afc37d08756dcd153972

**1.38 Estela Bee Dagum, 1988, "The X11 ARIMA/88 Seasonal Adjustment Method – Foundations and Users Manual", Time Series Research and Analysis Division, Statistics Canada, 1988, pages 1-130.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/0677-0796.pdf

**1.39 Estela Bee Dagum, G. Huot and M. Morry, 1988, "A New Look at an Old Problem – Finding Temporal Patterns in homicide eeries – The Canadian Case", The Canadian Journal of Statistics, Vol. 16, No. 2, 1988, pp. 117-133.**

It is believed by criminologists that the incidence of crimes committed against persons is highest in the summer. Knowledge about the annual patterns and other temporal behavior of such crimes can help authorities in prevention. The objective of this study is to reveal the temporal behavior of murders in Canada and assess if they are affected by trend-cyclical and/or seasonal influences. The series analyzed comprise the period

1961 to 1980 and are classified according to suspects and victims. Only the quarterly series display a significant seasonal pattern, with the peak occurring in the third quarter. We have also analyzed the relationship between the trend cycle of the murder series and two other variables, namely unemployment rate and rate of growth of the 15-to-44 age group.

*Full text available on-line at:*

http://www3.interscience.wiley.com/journal/121577490/abstract?CRETRY=1&SRETRY=0

**1.40 Estela Bee Dagum, C. Dagum, 1988, "Trends", in Encyclopedia of Statistical Sciences (S. Kotz and N. Johnson, editors), Vol. 9, John Wiley and Sons, 1988, pp. 321-324.**

*Full text available on-line at:*

http://www2.stat.unibo.it/beedagum/Papers/1127-1132.pdf

**1.41 Estela Bee Dagum, 1988, "Seasonality", in Encyclopedia of Statistical Sciences, (S. Kots and N. Johnson, editors), Vol. 8, John Wiley and Sons, 1988, pp. 321-326.**

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