

## **Periodic Unobserved Cycles in Seasonal Time Series: Identification and Estimation**

### **Abstract**

We discuss the identification and estimation of periodic unobserved component models with both seasonal and cyclical components. We derive a convenient state space form for exact maximum likelihood estimation, component estimation, testing and forecasting. We examine the applicability of our theoretical results in Monte Carlo experiments. Finally, we illustrate our methods on a time series for aggregate US unemployment and discover a clear periodic cycle.

## **Is there any indication of climate change in the coastal waters off Norway?**

### **A statistical analysis of temperature data**

#### **Abstract**

Some reports conclude that global warming will raise the sea temperature in the Northeast Atlantic (IPCC 2003, ACIA 2004 and NERSC 2005), and that the future temperature in the coastal waters off of Norway will be affected (Stenevik and Sundby 2004). Temperature is an essential indicator for climate change. Change in sea temperature will affect the production condition in the salmon farming industry and distribution of straddling fish stocks. Change in temperature has therefore economic consequences. The paper focuses on the following questions: Can we detect any climate change in the sea waters off Norway? How has the sea temperature in the Norwegian geographical areas developed over time? What statistical qualities have the temperature time series? Is the temperature stable over time or can we detect any changes in level and volatility?

## **Optimal Filtering for a Common Stochastic Cycle Shifted in Continuous Time**

### **Abstract**

In business cycle analysis leading, coincident and lagging variables are usually modelled by integer delay parameters. This practice is suboptimal when the underlying common process is in continuous time. In this paper it is shown how to carry out optimal filtering and maximum likelihood estimation of the continuous time delay for a stochastic cycle of the type used in structural time series models when the delay parameter is a real number. An application to the analysis of the Italian business cycle illustrates the technique.

## **Quantiles, Expectiles and Splines**

### **Abstract**

A time-varying quantile can be fitted to a sequence of observations by formulating a time series model for the corresponding population quantile and iteratively applying a suitably modified state space signal extraction algorithm. It is shown that such time-varying quantiles satisfy the defining property of fixed quantiles in having the appropriate number of observations above and below. Expectiles are similar to quantiles except that they are defined by tail expectations. Like quantiles, time-varying expectiles can be estimated by a state space signal extraction algorithm and they satisfy properties that generalize the moment conditions associated with fixed expectiles. Time-varying quantiles and expectiles provide information on various aspects of a time series, such as dispersion and

asymmetry, while estimates at the end of the series provide the basis for forecasting. Finally it is shown that, because the state space form can handle irregularly spaced observations, the proposed algorithm can be easily adapted to provide a viable means of computing spline-based non-parametric quantile and expectile regressions.

### **Time-Varying Exchange Rate Pass-Through: Experiences of Some Industrial Countries**

#### **Abstract**

This paper estimates exchange rate pass-through of six major industrial countries using a time-varying parameter with stochastic volatility model. Exchange rate pass-through is divided into impacts of exchange rate fluctuations to import prices (first-stage passthrough) and those of import price movements to consumer prices (second-stage pass-through). The paper finds that both stages of pass-through have declined over time for all the sample countries. The decline in second-stage pass-through is associated with the emergence of the low and stable inflation environment as well as a rise in import penetration, while the relationship to the inflation environment is weak for first-stage pass-through. For this paper, I construct the code for the MCMC using Ox.

### **Monetary Policy Credibility Before Adopting the Euro: Evidence from a Markov Regime-Switching Model**

#### **Abstract**

This paper uses a regime-switching model to examine the credibility of monetary policy in Central and Eastern European countries during 1994-2004. High credibility lowers risk premium and attracts more foreign capital by delivering stable financial market expectations. Low credibility as a result of monetary policy inconsistency is an important risk before the adoption of the Euro. Our theoretical hypothesis is based on models of monetary policy rules emphasizing the asymmetric behaviour of central banks towards output and inflation stabilization. We study the probability to switch between two credibility regimes - low and high, as a function of certain macroeconomic variables - interest rate differentials, output gap variability and inflation variability. We find that Central and Eastern European countries have put more emphasis on output stabilization, than on inflation stabilization during the studied period. In contrast, the policy of the EMS central banks before they adopted the Euro was by and large consistent with the ECB objective of price stability.

### **Comparing and Ranking Covariance Structures of M-GARCH Volatility Models**

#### **Abstract**

A large number of different parameterizations have been introduced to model conditional variance dynamics in a multivariate framework. A major problem with these models is the large number of parameters that have to be estimated and the many constraints, often difficult to make explicit, that have to be imposed to ensure semi-positive definiteness of the covariance matrices. This paper compares and ranks different multivariate GARCH type models in terms of their ability to estimate the in-sample conditional variance-covariance structure and the accuracy of their out-of-sample variance forecasts. The models are compared

using Hansens Superior Predictive Ability test redefined in a multivariate framework by providing three alternative metrics to evaluate the distance between variance matrices. In this paper we also test the preliminary version of our MGARCH Package for Ox, extension of Laurent and Peterss G@RCH Package. Up to date, the package includes: BEKK models (Full, Diagonal and Scalar), CCC-DCC models, RiskMetrics and the O-GARCH model.

### **Dynamic Conditional Correlation Models with Asymmetric Multivariate Laplace Innovations**

#### **Abstract**

In this paper we propose to estimate multivariate GARCH processes and a class of dynamic conditional correlation (DCC) models assuming that the  $n$ -dimensional returns series follow an Asymmetric Multivariate Laplace (AML) distribution. This multivariate distribution is able to capture leptokurtosis and asymmetry which characterise returns from financial assets. It preserves, under general conditions, desirable properties such as finiteness of moments and stability under geometric summation. We illustrate the methodology by fitting a sample of 21 FTSE All-World stock indices and 13 bond return indices. We provide clear evidence that in our data set this a AGDCC-MGARCH model with AML distribution overwhelmingly outperforms the class of models DCC-MGARCH models which assume normality of innovations.

### **The Volume-Volatility Relationship and the Opening of the Korean Stock Market to Foreign Investors after the Financial Turmoil in 1997.**

#### **Abstract**

This paper investigates the stock volatility-volume relation in the Korean market for the period 1995-2001. Previous research examined the impact of liberalization on the Korean stock market up to the period before the financial turmoil in 1997 although the crucial measures of the liberalization were introduced after the crisis under the International Monetary Fund program. One of the major features of the reformation was the financial opening to foreign investors. In this study the 'total' trading volume is separated into the domestic investors' and the foreign investors' volume. By doing this the information used by two different groups of traders can be separated. Further, in addition to the absolute value of the returns and their squares we use the conditional volatility from a GARCH-type model as an alternative measure of stock volatility. The following observations, among other things, are noted about the volume-volatility causal relationship. First, for the entire period there is a strong bidirectional feedback between volume and volatility. In most cases this causal relationship is robust to the measures of volume and volatility used. Second, volatility is related only to 'domestic' volume before the crisis whereas after the crisis a bidirectional feedback relation between 'foreign' volume and volatility begins to exist. In other words, 'foreign' volume tends to have more information about volatility in recent years, which suggests the increased importance of 'foreign' volume as an information variable.

### **Econometric Methodology Revisited**

#### **Abstract**

Econometric methodology concerns how to select an appropriate model. In addition to lack of knowledge of the data generation process in economics, or

even the local DGP in the space of the variables being modelled, non-constancies make empirical modelling and forecasting hard. Two central econometric methodologies dominate: theory--calibrate to data--confirm ('theory driven') and data--match to theory--confirm ('data driven'). A blend is usually claimed but rarely implemented. Theory is invaluable, but much data variation is due to major historical events, so modelling is essential. General-to-specific modelling based on automatic model selection to handle the complexities of both the economy and selection offers the potential to greatly enhance our empirical understanding. The main properties of PcGets are reviewed, and its capabilities to make appropriate assessed, concluding that it could revolutionize econometric modelling.

### **Implementing Automatic Regressor Selection in a Maximum-Likelihood Setting.**

#### **Abstract**

Recent work by Kevin Hoover, Stephen Perez, David Hendry and Hans-Martin Krolzig has shown the feasibility of automatic model selection in econometric regression models. By implementing a similar strategy in a maximum-likelihood setting, the approach can be extended to a range of other models that incorporate regression effects. Examples are the multivariate regression, ARFIMA and Logit models of PcGive, and the unobserved components models of STAMP. This approach leverages the Modelbase class of Ox. A multithreaded version of Ox is introduced to speed up computations on modern multiple-core hardware architectures. Efficient estimation of ARFIMA models is revisited.

### **Selecting a Regression Saturated by Indicators**

#### **Abstract**

We consider selecting a regression model, using a variant of general-to-specific, when there are more variables than observations, in the special case that the variables are impulse dummies (indicators) for every observation. We show that the setting is unproblematic if tackled appropriately, and obtain the finite-sample distribution of estimators of the mean and variance in a simple location scale model under the null that no impulses matter. A Monte Carlo simulation confirms the null distribution, and shows power against an alternative of interest.

### **Selecting Non-linear Models using PcGets**

#### **Abstract**

This paper develops a coherent general-to-specific strategy for selecting non-linear models which is designed to be embedded within the automatic model selection algorithm of PcGets. First, a GUM is formulated and a test of linearity is applied. We propose a new test for non-linearity that uses weighted combinations of squares and cross-products based on the eigenvectors of the variance-covariance matrix, circumventing problems of high dimensional systems and therefore providing a test that is appropriate for implementing at the stage of the GUM. If evidence of non-linearity is found, a non-linear functional form is generated using polynomial transformations of the regressors that are double de-meaned to remove potential collinearity. A set of  $T$  indicators are also generated and included in the GUM in order to detect outliers concurrently with selection of the specific model, and selection is performed using the techniques developed to

handle more variables than observations. F-tests are undertaken on subsets of the non-linear functions, commencing from the highest order terms, to remove any highly irrelevant non-linear functions. A potential problem arises if the F-tests on all subsets of non-linear functions are accepted, contradicting the results of the non-linearity test. Hence, we propose the use of a multi-stage strategy, analogous to that implemented in the PcGets pre-search stage, in which tests are undertaken at consecutively tighter significance levels. It is feasible that the p-value ellipsoid for a looser significance level does not nest the origin, whereas the ellipsoid for a tighter significance level does, and the resulting model after the pre-search stage must retain non-linear functions to correspond to the findings of the non-linearity test. The multi-path search is then implemented using a 'super-conservative' strategy for the non-linear functions, again applying the multi-stage strategy. Rules for the super-conservative strategy would be similar to those implemented for the Schwarz information criteria, and the selection strategy should deliver the undominated, congruent, specific, non-linear model. The paper demonstrates that it is essential to implement all four developments, including testing for non-linearity, mimicking an orthogonal representation, ensuring normality and the use of a super-conservative strategy, to achieve a successful algorithm, and that removing any one component can be seriously deleterious.

### **Type I and Type II Fractional Brownian Motions: a Reconsideration**

#### **Abstract**

This paper reviews the differences between the so-called type I and type II models of fractional Brownian motion, corresponding to the cases in which pre-sample shocks are either included in the lag structure, or suppressed. It is noted that there can be substantial differences between the distributions of these two processes, and of functionals derived from them, so that it becomes an important issue to decide which model to use as a basis for approximate inference based on Monte Carlo simulation. The main problem addressed is that of simulating the type I case. For models close to the nonstationarity boundary, the number of influential lags becomes very large, and truncating the sums to a computationally feasible number of terms results in significant distortions of the distribution. A simple method of overcoming this problem is implemented. The distributions of representative statistics for the type I and type II models are compared in Monte Carlo experiments. <http://people.ex.ac.uk/jehd201/fracbmtypes.pdf>.

### **Fractional Models to Credit Risk Pricing**

#### **Abstract**

This paper is centered on credit spread and has two main purposes. First, we investigate the empirical properties of credit spread, with specific reference to its long memory characteristics. Although a number of empirical studies on credit spread dynamics have been carried out, no research has been performed to date to investigate the long memory properties of credit spread. Our investigation aims at critically reassessing whether the dynamics of credit spread is consistent with the assumptions behind mainstream credit risk models, which are widely used by financial institutions. Second, we generalise our empirical findings by developing a new theoretical framework for credit spread dynamics. Specifically, we propose a continuous-time credit risk model that is consistent with the observed behaviour of credit spread and can be used for pricing credit sensitive instruments, including credit derivatives. We call this model 'fractional Merton model' and present comparative static results of credit spread and long memory sensitivities. We

also elaborate our analysis to the fractional version of the Black and Cox (1976) model, a well known extension of Merton (1974) model.