


Some TSA Research Topics - to be discussed.

- In X12ARIMA, automodelling feature, best model to chosen according to smallest forecast errors. Most often, a model having unit roots is chosen. Can we have a better guess at a model by checking the ACFs/PACFs, degree of differencing required (prior weak stationarity checks from fitting polynomial to moving-averaged trend etc..) and sum of AR or MA coeffs? In other words, want to make automodelling more robust by selecting a range (shortlist) of possible non unit-root models using criteria and then selecting best from that set. Right now, we need to cycle through a range of models and then if a unit case is encountered, fine-tune the parameters to remove/add the overdifferencing/differencing, or, look at the forecasts to ensure they're not erratic if a unit root is to be retained.
- Aggregates of seasonally adjusted components not equal to directly seasonally adjusted totals? Better method rather than equally apportioning differences to all components to ensure their sum equals SAdjust total. Note that in my opinion, direct SA of an aggregate is more accurate - i.e. quality of SA is more accurate since the process of SA on components (e.g. states) adds noise to each component. The components have smaller numbers from surveys and are more subject to noise. Note that the greater the noise, the worse the quality of SA. An aggregate of these will not lead to robust SA for the aggregate. Aggregate => high S/N.
- Improve detection of changes in seasonal patterns. Use model based method to detect seasonal breaks. To detect variations in seasonality, fit multicomponent sinusoids (e.g., Harmonic regression) and look at ACF at all seasonal lags or FT at all seasonal frequencies as a criterion.
- Find/compute seasonal filter on a per series basis by computing the weights such that the ACF is minimised at the seasonal lags.
- Use Fourier methods to robustly filter out seasonality and all cycles in general.
- Filtering in the frequency domain, until residuals are white!
- Moving median for robust outlier rejection?
- Use multivariate/correlation methods (between different series) to improve revisions to series.
- Use a spectral method in determing importance/significance of "moving" calendar effects (e.g., Easter, trading day): look at all years that contain the specific effect/event occuring at the same time, compute FT/power spectrum to indentify their strength. In other words, need to re-scale time-axes to make moving calendar effects regular.
- Error propagation in X11-iterative procedure: confidence region (upper and lower estimates) on trend paths which includes possible revisions due to asymmetric filtering, seasonal adjustment process etc. Simulate a time series with known input variance/covariance structure. Run through X11 program and measure variance/covariance structure in D13 irregulars. See:  (Subject: Literature Review; Database: Time Series Analysis WDB; Author: Noel Hansen; Created: 15/11/2004; Doc Ref: NHAN-66R7UW)
- If seasonal factors for a month or qtr are consistent with 1 (null hypothesis) then why attempt to apply seasonal filter and bias the seasonal adjustment? Only perform seasonal adjustment if S*I values are significantly different from one. i.e., assume significant if probability of getting an observed S*I value is less than say 5%.

- Selection of optimal surrogate/asymmetric filter to apply to ends of series and also in the middle? Need a filter (or filters of varying length, shapes) which preserves real (non-irregular) movements in a series.
- Explore use of Principle Components Analysis (PCA) method in dissecting series with common theme (in group) as done in quasar spectra..?
- Steven Smale's problem of incorporating price adjustments into an economic dynamical model.
- diagnostic tests for additive/pseudo-additive model series not supported in SEASABS! Explore feasibility in exponentiating the series then treating it a a multiplicative model.
- For a series erroneously identified as multiplicative (ie. really additive), we will get the false impression of moving seasonality. How much of this moving seasonality can be attributed to bad model assumptions, ie. quantify. Are there any models, methods that avoid this?
- What is the relationship between BIC, AICC, AIC and LogL and what are the benefits for each if any? What is the optimal or minimum length of a series for a given set of parameters?
- Trading day signatures from spectra of D8 (S*I) or D13 (I) of Qtr series: current difficulty is that the 7-term HMA filters admit too much power at TD freqs therefore, this will cancel out when divided into originals to get D8 or D13 and therefore TD signature will be very weak or not exist at all. FIX: since the goal is simply to get a series stationary before computing a spectrum, why not de-trend using just a simple (eg. cubic) polynomial fit? No TD freqs will be lost! Trend Fitting is not trend filtering!
- More sharing of metadata with clients. i.e. instead of us trying to figure out the reason for a large movement in a time series, refer to the the actual survey data and the units its composed of to arrive at inferences for irregular patterns and outliers. This means more communications with survey methodologists.
- Seasonal break regARIMA project, submit SRs to improve existing functionality in SEASABS, see BPG.
- SA of short time series (needed for Tourism plus other areas)