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Abstract

Title: Feature estimation for linear regression with time series regressors

There exists many real data examples, where the regressors of interest are high dimensional and come from a time series.

For example, in econometric applications when dealing with multivariate models, the variables of interest are often observed at different time frequencies, such as financial and macroeconomic variables. The former being observable at high frequencies (e.g. daily, hourly or minute-by-minute) and the latter at far lower frequencies (often monthly or quarterly). Similarly in geostatistical applications it is important to understand how climatological data impacts climate change indicators, such as ice-shelf extent. Again, the climatological data (such as temperature) can be observed at a very high frequency, whereas the climate change indicators are often observed yearly. Consistent parameter estimation is usually only achieved with regularisation, which is usually done through dimension reduction or an additive penality. But a disadvantage of most regularisation methods, is that the type of regularisation is tied to how the model is specified (smooth, sparse, periodic etc). Misspecification of the model can lead to spurious conclusions. However, if we treat the regressors as random variable, then the expectation of the normal equation will lead to a system of equations which are well posed (without the need to regularize). Therefore, in liue of any knowledge of the structure of the coefficients, the structure of the time series can be exploited to estimate the normal equations and thus consistently estimate the regression coefficients.

In this talk, we propose a method for estimating the coefficients in a high dimension linear regression model, where the regressors come from a second order stationary time series. The proposed approach is based on deconvolution. This estimates, both the regression coefficients and its Fourier transform, which allows us to estimate different types of features in the regression coefficients.

We show that the estimators are consistent and any finite subset are asymptotically normal. Further, we propose a method for estimating the asymptotic variance of coefficient estimators, which allows us to test the significance of each of the coefficients.

We apply our method to assessing the impact that daily temperatures have on size of the Arctic ice shelf.