

Coherent Signal Extraction for Stock and Flow Time Series

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Abstract:

This paper focuses on optimal signal extraction formulas for nonstationary continuous time processes that are either stock or flow sampled. We first discuss how to construct MSE optimal discrete filters from a given continuous-lag filter, and secondly we discuss how to construct MSE optimal discrete filters from a given continuous-time model. Thus we address two approaches to the construction of discrete filters: direct filter discretization and model discretization. Although the latter case has already been addressed in the literature, we present novel formulas that allow for interpolated estimates, at any generic sampling frequency. Our approach is analytical rather than computational, so that we are able to give exact formulas for stock and flow interpolants rather than using a State Space Form with associated State Space Smoother. This has the advantage of allowing interpolant estimates at any time points. A host of illustrations are provided, including the Local Level Model, the Smooth Trend Model, the Band Pass Filter, and the Henderson Filter. We present the general methodology, which involves the calculus of residues, in such a way that results for other models can be easily obtained.