Simulation and estimation of trawl processes

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Introduction

Trawl processes are a novel way of describing continuous-time integer-valued autocorrelated processes that are either stationary or non-stationary. Such integer-valued processes appear in various applications, including actuarial science, econometrics and finance.

Traditionally, the focus in the literature has been on two types of processes: discrete autoregressive moving average models (Jacobs and Lewis (1978a), Jacobs and Lewis (1978b)), and integer valued processes resulting from thinning operations (Weiß (2008)). The advantage of the former class is the flexibility in handling marginal distributions, but this comes at the cost of rather unrealistic sample paths. For the latter processes, the sample paths appear to be more realistic, but the possible marginal distributions are restricted.

Barndorff-Nielsen et al. (2014b) introduce the class of integer-valued trawl process which allow for a flexible autocorrelation structure in combination with any kind of marginal distribution within the class of integer-valued infinitely divisible distributions. The trawl processes are nested within the class of ambit fields (Barndorff-Nielsen and Shephard (2013), Barndorff-Nielsen et al. (2014a)).

Originally, trawl processes were stationary processes where all moves are fleeting. However, Shephard and Yang (2017) introduced a mixture process of a trawl process combined with a pure Lévy process with the same basis. In their paper, this process describes intra-day price changes in futures prices. Recently, Veraart (2018) provides a multivariate framework for trawl processes which is motivated by the joint behaviour of orders and cancellations.

```
summary(cars)
```

```
##      speed           dist       
##  Min.   : 4.0   Min.   :  2.00  
##  1st Qu.:12.0   1st Qu.: 26.00  
##  Median :15.0   Median : 36.00  
##  Mean   :15.4   Mean   : 42.98  
##  3rd Qu.:19.0   3rd Qu.: 56.00  
##  Max.   :25.0   Max.   :120.00
```

Simulation

Univariate trawl processes

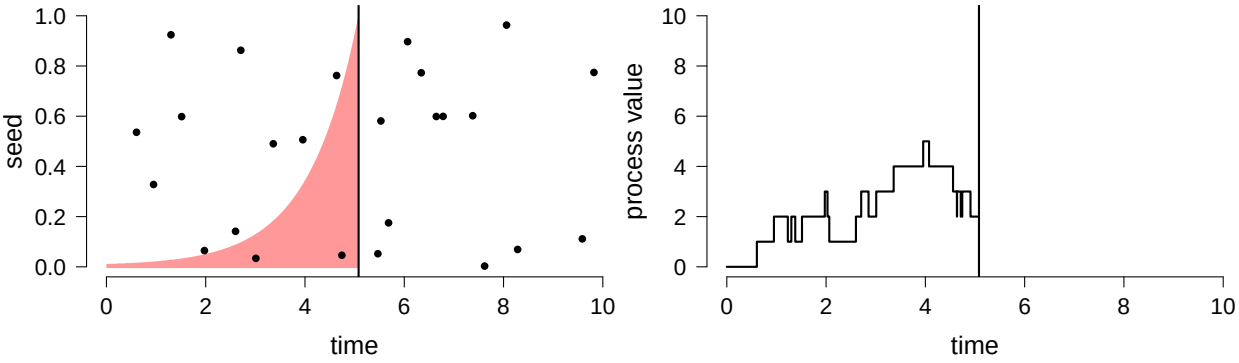
Multivariate trawl processes

Estimation

Univariate trawl processes

Multivariate trawl processes

You can also embed plots, for example:



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