Management Procedure

Biomass Dynamic

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Introduction

In Management Strategy Evaluation (MSE) an Operating Model (OM) is used to simulate resource dynamics in trials in order to evaluate the performance of a Management Procedure (MP). Where the MP is the combination of pre-defined data, together with an algorithm to which such data are input to provide a value for a management control measure.

The `mpb` package has various methods for developing MPs using a biomass dynamic stock assessment model.

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Installation

The simplest way to obtain mpb is to install it from CRAN by using the following command in the R console:

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Quick Start

So that users may have a better idea of what functions are available, which one to choose, or where to seek help, this section provides a general overview of the package. In particular it highlights the various elements, what they do, and provides some examples of usage. More details are given in later sections.

First, load the `mpb` package:

```
library(mpb)
library(plyr)
```

Harvest Control Rules

fwd

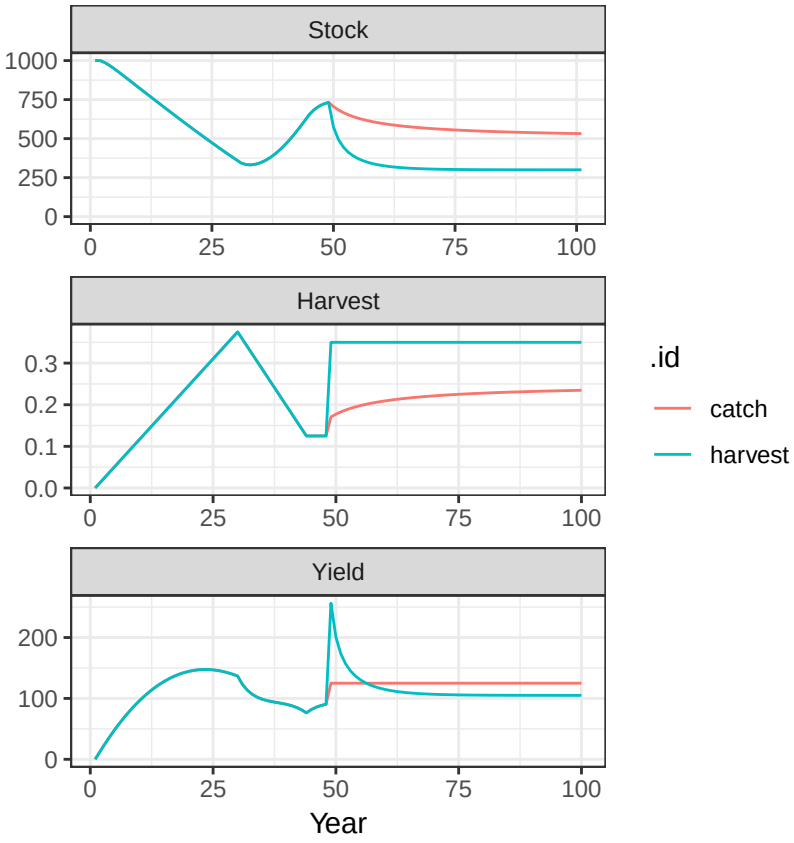
```
fwd(object, catch = NULL, harvest = NULL,
  stock = NULL, hcr = NULL, pe = NULL, peMult = TRUE, minF = 0,
  maxF = 2, bounds = list(catch = c(Inf, Inf)), lag = 0, end = NULL,
  starvationRations = 0.75, ...)
```

```
bd=sim()
```

```
bd=fwd(bd,catch=FLQuant(125,dimnames=list(year=49:100)))
```

```
bd=fwd(bd,FLQuants("catch"  =FLQuant(125,dimnames=list(year=49:100)),
                   "harvest"=FLQuant(.35,dimnames=list(year=49:100))))

plot(bd)
```



Proportional, Integral, Derivative (PID) Controller

$TAC_{y+1} = min\left\{max\left\{exp(u_y^1), exp(u_y^2)\right\}, exp(u_y^3)\right\} TAC_y$

where

$u_y = K_P e_y + K_I \sum_{z=y-\delta}^{y} e_z + K_D(e_y - e_{y-1})$

u_y is the control signal in year y that is used for the TAC adjustment, in control theory this type of system

is known as a proportional, integral, derivative (PID) controller. The control signal is calculated from e_y, giving the divergence of an index relative to a reference point. The estimate can be calculated either directly from a survey or through an assessment. The desired closed-loop behaviour is then obtained by tuning the three parameters K_P, K_I and K_D where δ denotes the historical time period used to calculate the integrated (I) part of the control signal e_y. The three control parameters of the HCR (K_P, K_I and K_D) can be tuned. Using a historical period δ means that "moving targets" are considered, since divergence is always relative to the index in a previous year.

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More information

- You can submit bug reports, questions or suggestions on `FLPKG` at the `FLPKG` issue page,[1] or on the *FLR* mailing list.
- Or send a pull request to https://github.com/flr/FLPKG/
- For more information on the FLR Project for Quantitative Fisheries Science in R, visit the FLR webpage.[2]
- The latest version of `FLPKG` can always be installed using the `devtools` package, by calling

```
library(devtools)
install_github('flr/FLPKG')
```

Software Versions

- R version 3.4.1 (2017-06-30)
- FLCore: 2.6.8
- FLPKG:
- **Compiled**: Mon Jul 16 12:39:15 2018
- **Git Hash**: 03e4119

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References

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[1] https://github.com/flr/FLPKG/issues
[2] http://flr-project.org