Modeling Parameters in Stock Synthesis

Parameter elements

Specified in the SS3 control file.

Short parameter lines (7 elements)

```
#_Spawner-Recruitment Parameters
#_LO   HI  INIT   PRIOR   SD  PR_type PHASE
  5    20  10       9     10     -1     1     #Ln(R0)
```

Bounds | Initial value | Prior | Estimating phase | Optional comment

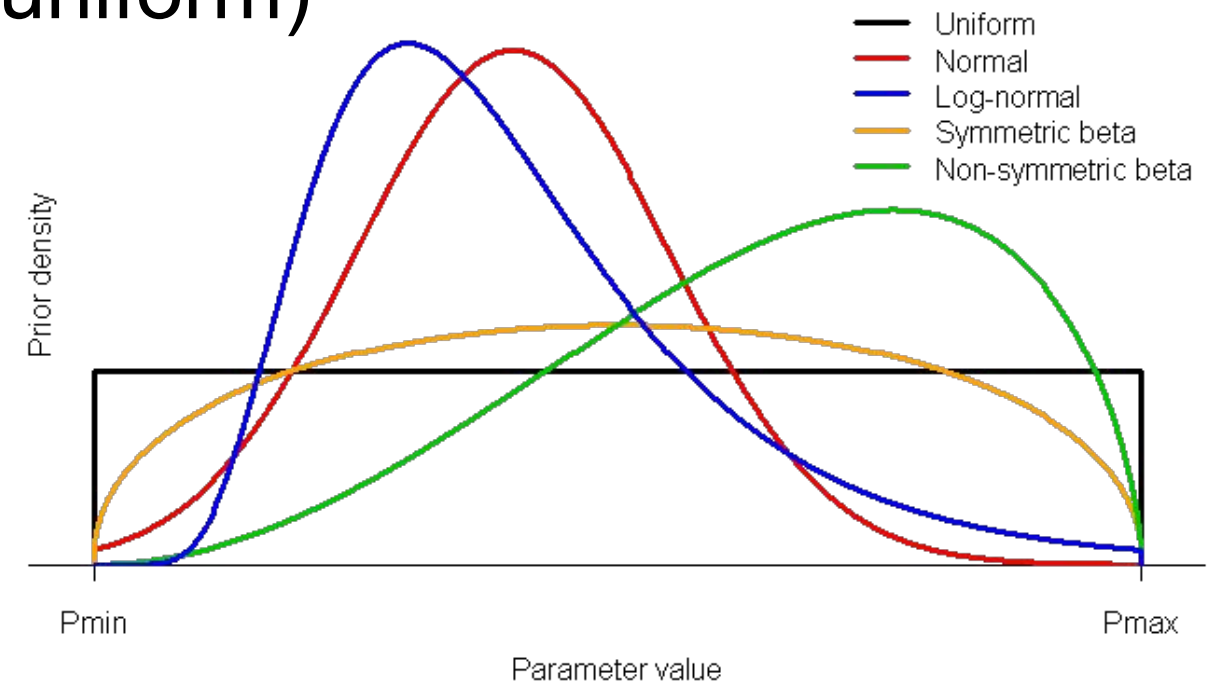
Full parameter lines (14 elements)

```
#Natural Mortality
#LO   HI    INIT  PRIOR  SD  PR_type  PHASE  env-var use_dev dev_minyr dev_maxyr dev_stddev  Block  Block_Fxn
0.01  0.50  0.15  -1.8   0.3    3       6       0       0        0         0          0        0        0      #M
```

Bounds | Initial value | Prior | Estimating phase | Time-varying properties | Optional comment

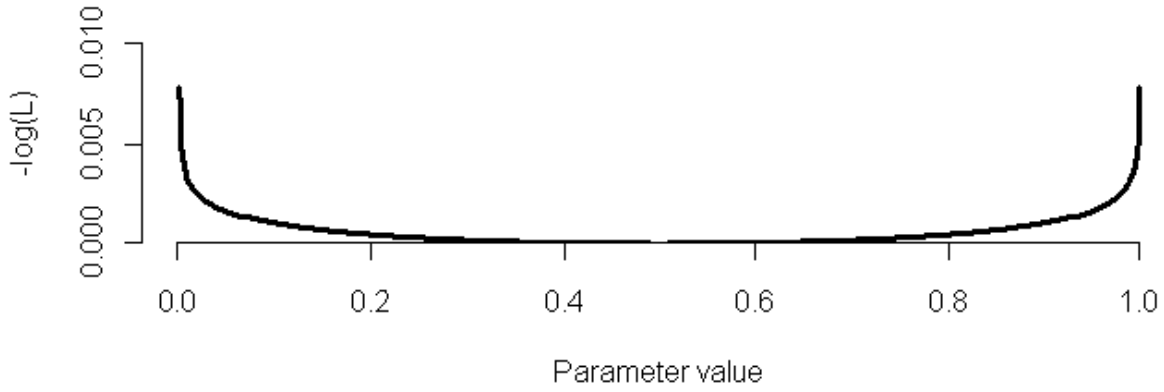
Bounds and priors

- All parameters bounded
- Prior options: uniform, normal, lognormal, symmetric and non-symmetric beta, or no prior (=uniform)



Soft bounds

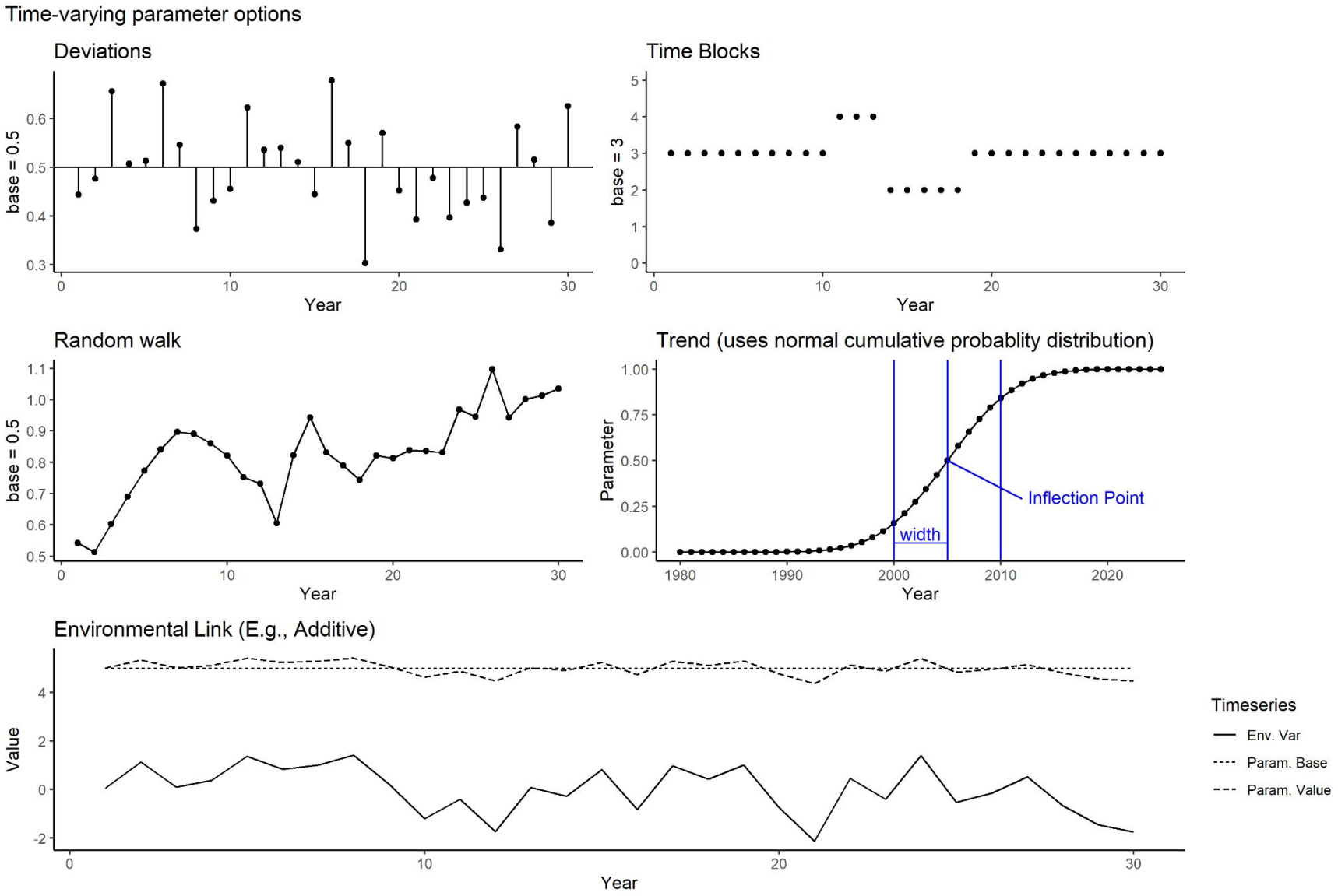
- Optional penalty applied to all parameters
- Keeps ADMB from getting stuck on bounds
- Acts along with user-specified priors
- Equivalent to symmetric beta with shape parameter = 0.001



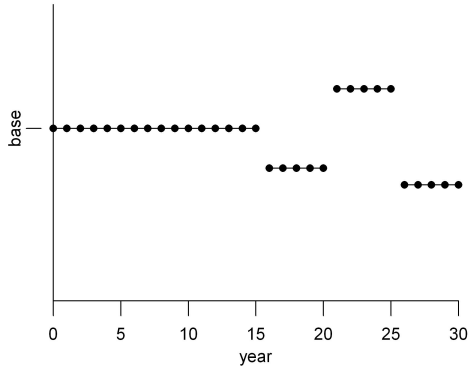
Offsets from other parameters

- Parameters for males often treated as offsets from females (can do reverse too)
  - growth
  - mortality
  - selectivity
- Additive or multiplicative options
- Makes hypothesis testing easy (either fix offset at 0 or estimate)
- Allows two-sex model with no additional data over single-sex model

Temporal variation



Temporal variation: blocks



- Requires conditional input for extra parameters lines (same as other variation types)
- Fixed time intervals specified in control file
- Additional parameters may be:
  - Multiplicative offset from base value
  - Additive offset from base value
  - Replace base value for interval of years
  - May have random walk from one block to next

Setup of blocks

- Each block has a start and end year
- Block patterns are referenced by sequential number in parameter line where it is applied
- Additional short parameter line to control value within each block

Archived assessment models > Widow rockfish > 2019 base model > Base_45 > 2019widow.ctl

```
24  10 #_Nblock_Patterns
25   3 2 1 1 1 1 3 1 1 1#_blocks_per_pattern
26  # begin and end years of blocks
27   1982 1989 1990 1997 1998 2010
28   1982 1989 1990 2010
29   1916 1982
30   1916 2001
31   1916 2002
32   1995 2012
33   1916 1982 1983 2001 2002 2010
34   1915 1915
35   1995 2004
36   1991 1998
```