Stochastic agricultural production model

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Motivation

Agricultural production is (Just and Pope, 2001):

- relatively long-lasting
- affected by weather and pests
- managed by farmers who responds to what happens

Nevertheless, standard economic models of agricultural production have

- no duration of growing season
- no unexpected events, only average weather and pest damage
- no need to respond to the unexpected
A stochastic agricultural production model needs:

- a growing season with discrete points in time, \( t = 1, \ldots, T \), \( T \geq 2 \), approximating continuous plant growth and nature
- a soil-crop-harvesting model, \( s = S(s_{t-1}, w_t, x_t) \), where the state of crop and nature at \( t \), \( s_t \), is function of previous state, current nature \( w_t \) and farmer intervention \( x_t \)
- a model of nature in terms of contingent probability distributions, \( \pi(w_t|s_{t-1}) \)
- decision rules, \( x_t = X_t(s_{t-1}, w_t) \), which is optimizing some objective with respect to prospects at the end of the growing season
A stochastic equilibrium model:

- needs implementation of the stochastic production model
- returns forward and spot equilibrium prices