

Lecture VIII: Simulated Annealing and Wrap-up

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Differential Operators

I am working on the asset level specification in the difference between Accrual/Historical based accounting and market value accounting. As a part of this effort, I sent Appendix E of the Agricultural Finance book to everyone. I am interested here in the difference between economic and accounting asset valuation.

Accounting Depreciation

There are three major types of accounting depreciation:

- Straight Line Depreciation,
- Declining Balance Method (either double declining balance or 150 % declining balance), or
- Sum-of-the-Year's Digits.

The text explains the nuts and bolts of each.

Economic Depreciation

There are two major categories of economic depreciation:

- National Income Accounting depreciation - estimated based on the economically useful life.
- Market Value depreciation – change in market value.

Synthesis

I want to compare each of the varieties of depreciation. As a starting point, assume that the value of assets are determined by a stochastic difference equation

$$\frac{\Delta V_{it}}{V_{it}} = \alpha_{0i} + \alpha_{1i}(r_t - k_t) + \delta_{it} + \xi_{it} \quad (1)$$

where V_{it} is the value of asset i at time t , α_{0i} and α_{1i} are factor specific parameters to the differential equation, r_t is the rate of return on assets, k_t is the cost of capital, and δ_{it} is a failure rate (i.e., the rate at which assets are retired).

Assets

In this example, I am envisioning four asset:

1. Land - no decay rate
2. Tractors - Long lived decay rate of 0.01
3. Trucks - Less long lived than tractors (more use) decay rate of 0.15
4. Combines - Lots of moving parts, heavy rate of obsolescence datay rate of 0.50

First, I generate the asset values consistent with Equation 1

$$V_{it} = V_{i,t-1} \times \left(1.0 + \frac{\Delta V_{it}}{V_{it}} \right) \quad (2)$$

Compute the Observed Decay

As a second step, I simulate an observed decay rate for each asset

$$u_{jit} \sim U(0, 1) \Rightarrow \text{If } u_{jit} \geq 0.01 \rightarrow F_{jit} = 1 \quad (3)$$

The third step is to combine the results of the first two steps

$$\tilde{V}_{jit} = F_{jit} V_{it} \quad (4)$$

Aggregation

Finally, I average across all firms

$$\bar{V}_{it} = \frac{1}{N} \sum_{j=1}^N \tilde{V}_{jit} \quad (5)$$

Land Value Draww

Time	1	2	3	4	5	6
1	100	100	100	100	100	100
2	102	97	100	100	99	99
3	106	97	103	98	104	98
4	109	99	103	102	112	100
5	111	99	107	108	115	108
10	118	112	108	119	130	114
15	126	116	111	121	137	120
20	121	114	118	124	151	126
25	126	121	135	137	151	138
30	143	138	158	142	175	151
35	174	157	191	143	171	147
40	194	167	194	176	185	159
45	194	173	197	210	189	176
50	208	182	220	223	179	203

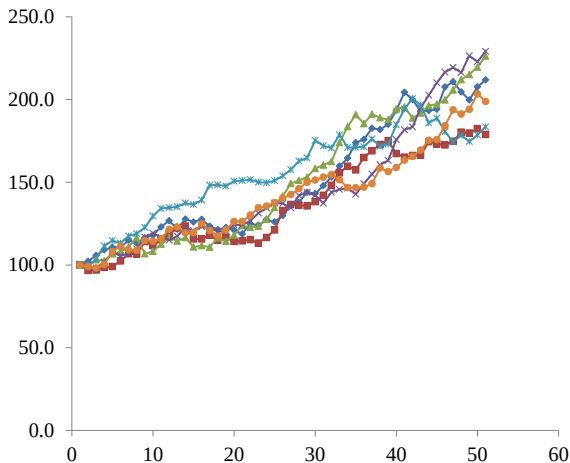


Figure: Farmland Values

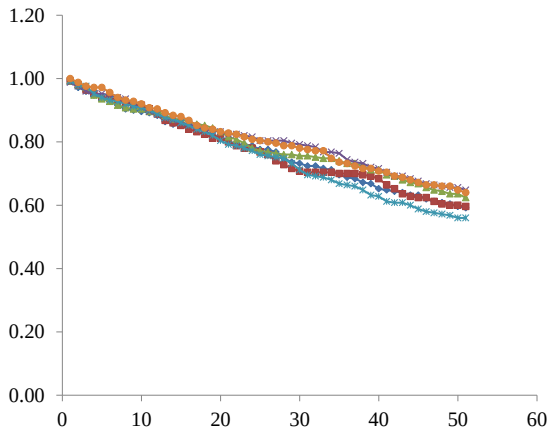


Figure: Machine Remaining

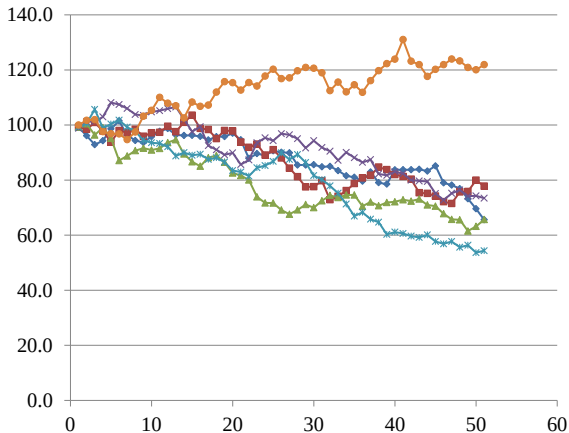


Figure: Machine Value

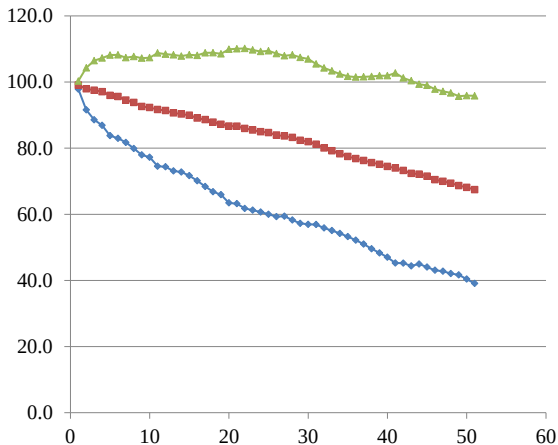


Figure: Machine Value - Mean/Std Dev