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REM
REM CCF1.bas
REM Peter Lohmander 090416
REM http://www.Lohmander.com
REM Peter@Lohmander.com
REM
REM A dynamic diameter distribution model for numerical economic
REM optimization of continuous cover forest management
REM
REM (Very preliminary version 090416. All comments are welcome!)
REM
REM Acknowledgements:
REM My thanks go to Prof. Dr. Jean-Philippe Schutz.
REM Several of the equations in this preliminary computer model
REM were obtained from his article found below. Furthermore, he
REM showed me interesting experiments in Switzerland.
REM
REM References:
REM Schutz, J-P. (2006) Modelling the demographic sustainability
REM of pure beech plenter forests in Eastern Germany,
REM Ann.For.Sci. 63 (2000), 93-100
REM http://dx.doi.org/10.1051/forest:2005101
REM
OPEN "CCF1out.dat" FOR OUTPUT AS #1

CLS

DIM n(20), i(20), p(20), e(20), gcum(20), sapt(20), v(20), h(20), np(20)
DIM nnext(20), nharv(20)
pi = 3.141593

r = .03
p0 = 25
p1 = 2.5

Stockmin = 150
Dlimit = 50
Klimit = INT(Dlimit / 5)

TotPV = 0
TotHarv = 0
gcum(2) = 0

b0 = 1.506969
b1 = .94255
b2 = -.000183455#

FOR k = 1 TO 20
d = k * .05
h(k) = 3 * k - (k / 8) ^ 2
n(k) = .1
i(k) = 0
p(k) = 0
e(k) = 0
sapt(k) = pi * (d / 2) ^ 2
v(k) = .5 * sapt(k) * h(k)
np(k) = p0 + p1 * k
NEXT k

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REM ***** Time loop *****
FOR t = 1 TO 200
disc = 1 / (1 + r) ^ t
n(2) = 100

Stock = 0
FOR k = 1 TO 20
Stock = Stock + n(k) * v(k)
NEXT k

StDif = 0
IF Stock > Stockmin THEN StDif = Stock - Stockmin

FOR k = 20 TO Klimit STEP -1
e(k) = 0
volk = v(k) * n(k)
hshare = StDif / (volk + .001)
e(k) = hshare
IF hshare > 1 THEN e(k) = 1

StDif = StDif - e(k) * volk

nharv(k) = n(k) * e(k)
n(k) = n(k) * (1 - e(k))
NEXT k

harv = 0
prof = 0
FOR k = 20 TO Klimit STEP -1
prof = prof + nharv(k) * np(k) * v(k)
harv = harv + nharv(k) * v(k)
NEXT k

TotPV = TotPV + disc * prof
TotHarv = TotHarv + harv

FOR k = 1 TO 20
gcum(k) = 0
NEXT k

REM Calculation of GCUM
FOR k = 1 TO 20
FOR j = k + 1 TO 20
gcum(k) = gcum(k) + n(j) * sapt(j)
NEXT j
NEXT k

REM Calculation of diameter increments
FOR k = 1 TO 20
d = k * 50
i(k) = b0 + b1 * LOG(d) + b2 * gcum(k) ^ 3
IF i(k) < 0 THEN i(k) = 0
NEXT k

REM Calculation of the probabilities to move up
FOR k = 1 TO 20
p(k) = i(k) / 50
NEXT k

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FOR k = 2 TO 20
nnext(k) = n(k) + p(k - 1) * n(k - 1) - p(k) * n(k)
NEXT k

FOR k = 2 TO 20
n(k) = nnext(k)
NEXT k

IF t < 200 GOTO 100

YearHarv = TotHarv / 200

PRINT #1, "Rate of interest = "; r; " D-limit = "; Dlimit
PRINT #1, "Total Stock = "; Stock; " Harvest per Year = "; YearHarv
PRINT #1, "Present Value = "; TotPV
PRINT #1, "  t  d  n"
FOR k = 2 TO 20
PRINT #1, USING "####"; t; 5 * k; n(k)
NEXT k

100 REM

NEXT t

CLOSE #1

END
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Real Rate of Interest 3%

Rate of interest = .03 D-limit = 50
 Total Stock = 269.4913 Harvest per Year = 13.40928
 Present Value = 9439.002

t	d	n
200	10	94
200	15	78
200	20	64
200	25	54
200	30	48
200	35	43
200	40	41
200	45	40
200	50	6
200	55	0
200	60	0
200	65	0
200	70	0
200	75	0
200	80	0
200	85	0
200	90	0
200	95	0
200	100	0

Rate of interest = .03 D-limit = 60
 Total Stock = 345.7441 Harvest per Year = 13.69293
 Present Value = 9292.434

t	d	n
200	10	96
200	15	68
200	20	51
200	25	41
200	30	34
200	35	30
200	40	27
200	45	25
200	50	24
200	55	24
200	60	4
200	65	0
200	70	0
200	75	0
200	80	0
200	85	0
200	90	0
200	95	0
200	100	0

Rate of interest = .03 D-limit = 70
 Total Stock = 410.7229 Harvest per Year = 13.61433
 Present Value = 8698.839

t	d	n
200	10	98
200	15	59
200	20	42
200	25	33
200	30	27
200	35	22
200	40	20
200	45	18
200	50	16
200	55	16
200	60	15
200	65	15
200	70	2
200	75	0
200	80	0
200	85	0
200	90	0
200	95	0
200	100	0

Rate of interest = .03 D-limit = 80
 Total Stock = 466.8857 Harvest per Year = 13.45937
 Present Value = 7888.022

t	d	n
200	10	98
200	15	52
200	20	35
200	25	26
200	30	20
200	35	17
200	40	15
200	45	13
200	50	12
200	55	11
200	60	10
200	65	10
200	70	10
200	75	10
200	80	2
200	85	0
200	90	0
200	95	0
200	100	0

Real Rate of Interest 2%

Rate of interest = .02 D-limit = 50
 Total Stock = 269.4913 Harvest per Year = 13.40928
 Present Value = 19371.83

t	d	n
200	10	94
200	15	78
200	20	64
200	25	54
200	30	48
200	35	43
200	40	41
200	45	40
200	50	6
200	55	0
200	60	0
200	65	0
200	70	0
200	75	0
200	80	0
200	85	0
200	90	0
200	95	0
200	100	0

Rate of interest = .02 D-limit = 60
 Total Stock = 345.7441 Harvest per Year = 13.69293
 Present Value = 20128.17

t	d	n
200	10	96
200	15	68
200	20	51
200	25	41
200	30	34
200	35	30
200	40	27
200	45	25
200	50	24
200	55	24
200	60	4
200	65	0
200	70	0
200	75	0
200	80	0
200	85	0
200	90	0
200	95	0
200	100	0

Rate of interest = .02 D-limit = 70
 Total Stock = 410.7229 Harvest per Year = 13.61433
 Present Value = 20011.59

t	d	n
200	10	98
200	15	59
200	20	42
200	25	33
200	30	27
200	35	22
200	40	20
200	45	18
200	50	16
200	55	16
200	60	15
200	65	15
200	70	2
200	75	0
200	80	0
200	85	0
200	90	0
200	95	0
200	100	0

Rate of interest = .02 D-limit = 80
 Total Stock = 466.8857 Harvest per Year = 13.45937
 Present Value = 19353.99

t	d	n
200	10	98
200	15	52
200	20	35
200	25	26
200	30	20
200	35	17
200	40	15
200	45	13
200	50	12
200	55	11
200	60	10
200	65	10
200	70	10
200	75	10
200	80	2
200	85	0
200	90	0
200	95	0
200	100	0
