Valuation of Immature Timberstand

THREE STEP APPROACH

Background

Pre-commercial or immature timber does not hold immediate stumpage value but it has future potential for conversion into quality timber products. Therefore, appraisal of immature timber stand needs a cautious analysis. From an investor standpoint, immature timberland often brings two sets of property: a) timber-generally harvested at rotation age and; b) land- with a perpetual ownership. Value of pre-commercial timber changes annually and culminates with its progression towards a mature stand. Therefore, the following method should be used to estimate the value of an immature stand.

$$V_m = \frac{NV_t + LEV}{(1+i)^{t-m}} - LEV \qquad [1]$$

Where, V_m =Value of m aged immature timber stand, m=Age of immature stand, t=Rotation age, NV_t= Net value of income and costs associated with immature stand between year m and rotation age (t) and LEV= Land expectation value.

As clear from above, we need to know the value of bare land called Land Expectation Value (LEV). LEV is simply a Net Present Value (NPV) but it keeps into mind the perpetual nature of timber rotations. The following formula should be used to calculate LEV of forest stand.

$$LEV = \frac{NFV}{(1+i)^t - 1} \qquad [2]$$

where NFV= Net future value of one timber rotation. A few things are worth noting in the first formula. In the first part, we sum the value of timber between current age and rotation age of the stand (NV_t) with the value of land (LEV), and discount the summed amount (NV_t+LEV) to the current age of the stand. This provides the value of land and the timber. Now, when LEV is subtracted from this sum, we are left the value of the immature stand, which is what we are looking for.

We can use the above equations to obtain the value of an immature stand in three easy steps. The following example will clarify the use of the equations.

Example

A 30 year rotation (t) is prescribed for a loblolly pine forest in East Texas at the real interest rate of 4.5% (i=0.045). Site preparation and regeneration will cost $250/acre at the beginning. Annual management cost will be $2 per acre. First and second commercial harvesting at year 15 and 24 will generate revenue of $98/acre and $170/acre, respectively. Clear-cut at year 30 will generate $929/acre. If you want to sell stand at age 14, what should be the value of this immature stand?

First step: Calculate LEV

Year (Y)	Item	Amount/acre ($)	Compounding formula	Future value ($)
0	Site prep+ tree planting	250	$250*(1+0.045)^{30}$	-936.33
15	First thinning	98	$98*(1+0.045)^{30-15}$	189.66
24	Second thinning	170	$170*(1+0.045)^{30-24}$	221.38
30	Final harvest	929	$929*(1+0.045)^{30-30}$	929.00
1--30	Annual cost	2	$2*[\{(1+0.045)^{30}\}-1]/0.045$	-122.01
Net Future Value (NFV)				281.70
Land Expectation Value (use formula 2)				102.61

Second step: Calculate rotation age value

Year (Y)	Item	Amount/acre ($)	Compounding formula	Future value ($)
15	First thinning	98	$98*(1+0.045)^{30-15}$	189.66
24	Second thinning	170	$170*(1+0.045)^{30-24}$	221.38
30	Final harvest	929	$929*(1+0.045)^{30-30}$	929.00
1--30	Annual cost	2	$2*[\{(1+0.045)^{30-14}\}-1]/0.045$	-45.44
Obtain Net value (NV$_t$) at rotation age by summing all items.				281.70

Third step: Obtain results

Plug LEV and Net value (NV$_t$) in equation 1 (first page) and obtain the value of immature stand (V$_m$). In above example, value of immature timberstand is (Vm)=$588.27.

You can use the Timberland Decision Support System (TDSS) for most of these estimates. A very simple calculation, in the end, provides the value of the immature stand. Please see next pages (3-5) to know more.

Source: Thomas J. Straka and Steven H. Bullard, "Land Expectation Value Calculation in Timberland Valuation," The Appraisal Journal (October 1996): 399–405.

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Step 1: Open timberland investment calculator

Compound Interest
Real Rate/Nominal Rate
Periodic Constant Payment
and Rent/ Land Value
are Land Value
and Investment Calculator
and Management Simulator
ck Form
orestInfo.com

Discount Rate (%):	4.5
Rotation Age (yr):	30
Annual Net Cash Flow Per Acre ($):	-2

Other Cash Flow Per Acre: [Typical Activities]

Year	Activity	Cash Flow Range	Cash Flow Value
0	Site preparation ▼	- $500 to $0	$ -250
15	Timber Sales ▼		$ 98
24	Choose Activity ▼		$ 170
30	Choose Activity ▼		$ 929
	Choose Activity ▼		$
	Choose Activity ▼		$
	Choose Activity ▼		$
	Choose Activity ▼		$
	Choose Activity ▼		$

Other Cash Flow Per Acre: [Custom Activities]

Year	Activity	Cash Flow Range	Cash Flow Value
			$
			$

Run and obtain the value of bare land (LEV). It should be $102.61(see below):

Timberland Investment Analysis Output:

Basic Financial Calculators
  Compound Interest
  Real Rate/Nominal Rate
  Periodic Constant Payment
  Land Rent/ Land Value
  Bare Land Value
Timberland Investment Calculator
Timberland Management Simulator
Feedback Form
  TexasForestInfo.com

Discount Rate:	4.5%
Rotation Age:	30
Annual Cost:	$-2

Year	Activities	Cash Flows($)
0	Site preparation	-250
15	Timber Sales	98
24		170
30		929

Net Future Value at Rotation Age(NFV, $):	281.7
Net Present Value (NPV, $):	75.21
Internal Rate of Return (IRR, %):	5.48
Bare Land Value (BLV, $):	102.61

Exit   Edit

Step 2: Exit and reopen Timberland Investment Calculator. Since immature stand is already 14 years old, rotation age (30-14=16) and cash flow year need to be revised.

Timberland Investment Analysis Output:

sic Financial Calculators
 Compound Interest
 Real Rate/Nominal Rate
 Periodic Constant Payment
 Land Rent/ Land Value
 Bare Land Value
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nberland Management Simulator
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xasForestInfo.com

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Discount Rate (%): 4.5

Rotation Age (yr): 16

Annual Net Cash Flow Per Acre ($): -2

Other Cash Flow Per Acre: [Typical Activities]

Year	Activity	Cash Flow Range	Cash Flow Value
0	Site preparation ▾	- $500 to $0	$
1	Timber Sales ▾		$ 98
10	Choose Activity ▾		$ 170
16	Choose Activity ▾		$ 929
	Choose Activity ▾		$
	Choose Activity ▾		$
	Choose Activity ▾		$
	Choose Activity ▾		$
	Choose Activity ▾		$

Run and obtain the net future value at rotation age. It should be $1294.60 (see below). Ignore other estimates

Timberland Investment Analysis Output:

Basic Financial Calculators
 Compound Interest
 Real Rate/Nominal Rate
 Periodic Constant Payment
 Land Rent/ Land Value
 Bare Land Value
Timberland Investment Calculator
Timberland Management Simulator
Feedback Form
TexasForestInfo.com

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Discount Rate: 4.5%
Rotation Age: 16
Annual Cost: $-2

Year	Activities	Cash Flows($)
0	Site preparation	
1	Timber Sales	98
10		170
16		929

Net Future Value at Rotation Age(NFV, $): 1294.6
Net Present Value (NPV, $): 640.14

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Step 3: Sum values from Step 1 and 2($1294.60+$102.61=$1397.21), exit and open compound Interest calculator

Run and obtain the present value of immature stand and Land. It will be $690.88(see below)

Present value of immature stand= Present value of stand and land-present value of land **(i.e.** $690.88-$102.61=**$588.27)**