7 Financial Considerations

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Owning forestland can have many benefits, including economical and recreational. Some benefits, however, are non-monetary. As with any investment, forestry has risks as well as benefits.

Benefits over other investments include a wider range of markets, multiple products, recreational opportunities, and intangible items. Risks include the long amount of time before revenues are realized and natural disasters such as hurricanes, tornadoes, ice storms, or pest and disease outbreaks. Other items to consider are taxes which are covered in Chapter 12.

Timber production requires a long-term approach to investing. Therefore, many landowners may not be able to evaluate their timber's financial opportunity and then compare it with other financial investments. Time and interest rates play a very important role in evaluating the financial alternatives. Money has a time value, and we can account for differences in this value by using compound interest techniques (Bullard and Straka 1998).

Sources of income you can expect from your forestry investment include revenues from thinning and final harvest, as well as annual lease payments for recreational activities such as hunting, fishing, and wildlife watching. Other income sources can include harvesting of pine straw and other non-timber products.

Potential costs you should expect include regeneration costs, timber stand improvements, and taxes. Of course, depending on your amount of forest management and your desired objectives, you may have more or less sources of income and cost.

One important consideration for evaluating forestry investments is the interest rate to use in the calculations. The interest rate should consider and reflect the risk factors associated with the various forestry investments. The rate of return should be comparable to landowners' alternative investments. Research has shown that forestry investments have similar risks and returns to those of common stocks. So, what interest rate should you use as a landowner? It varies for each individual landowner. You should consider alternative uses for your money, or the rates you would expect to earn on similar investments. A study by Bullard et al. (2002) indicated

that Mississippi forest landowners desired nominal (includes inflation) interest rates varying from 8% (for investments lasting five years) to 13.1% (for investments lasting 25 years). Of course, your desired interest rate may differ from these, depending on your current situation.

Five investment terms often used in evaluating forestry investments are Net Present Value, Benefit Cost Ratio, Equivalent Annual Income, Rate of Return, and Land Expectation Value. Using your sources of income and cost, you can perform the following calculations to evaluate your forestry investment. Your forestry investment can then be compared with alternative investments. A brief description of each investment term follows.

As an example of how to apply the forestry investment terms presented in this chapter, consider the following forestry investment scenario:

A landowner wants to know if planting a pine plantation to be harvested in 30 years is a good investment. The pine plantation will have some initial costs and will require a mid-rotation thinning.

The landowner has estimated the following costs and revenues for the 30-year pine plantation investment. Costs include $120/acre for site preparation and $38/acre for pine seedlings and planting, which are both incurred at the beginning of the investment, and an annual management cost of $5/acre, which will accrue each year.

Revenues include $500/acre for the mid-rotation thinning at age 16 and $2,800/acre for the final harvest at age 30. The landowner wishes to evaluate this forestry investment at a 6% interest rate, which is a comparable rate of return with other investments the landowner is considering. There are some basic compounding formulas needed to understand and use the forestry investment terms discussed in this chapter:

$$\text{Future value} = \text{Present value} * (1 + \text{interest rate})^n$$

$$\text{Present value} = \frac{\text{Future value at age n}}{(1 + \text{interest rate})^n}$$

$$\text{Present value of annual costs} = \text{annual cost} \left[\frac{(1 + \text{interest rate})^n - 1}{\text{interest rate } (1 + \text{interest rate})^n} \right]$$

where: n = the number of periods or years

In the pine plantation investment example, the establishment costs are examples of present values, and the thinning and final harvest are examples of future values. These three formulas will be necessary to understand the five forestry investment terms presented.

Net Present Value (NPV) is the difference between the present value of all costs (present and future) and income at a given interest rate. A positive NPV indicates that the investment furnishes a higher return than the selected interest rate, and is, therefore, an acceptable investment. An NPV of zero indicates an investment that equals the selected rate. The selected interest rate usually indicates the investor's minimum objective or alternative investment opportunity. The NPV is the correct financial measurement to use to compare two or more mutually exclusive choices (i.e., when only one investment choice is possible). NPV is used to evaluate capital investments and is also commonly called Net Present Worth, Present Net Value, and Present Net Worth. The NPV formula is:

NPV = [Present value of all revenues] – [Present value of all costs]

All revenues and costs must be discounted to present values to calculate NPV. The following example demonstrates how to calculate NPV. From our example, the present value of all costs is $226.82. That includes $120 for site preparation and $38 for planting, which are both already expressed as present values, and $68.82 as the present value of the annual management cost. The present value of annual management costs is calculated as:

$$\text{Present value of annual costs} = \text{annual cost} \left[\frac{(1 + \text{interest rate})^n - 1}{\text{interest rate } (1 + \text{interest rate})^n} \right]$$

$$\text{Present value of annual costs} = \$5 \left[\frac{(1 + .06)^{30} - 1}{.06 (1 + .06)^{30}} \right]$$

Present value of annual costs = $68.82

Present value of all costs = $68.82 + $120 + $38 = $226.82

The present value of the revenues is $684.33, which includes the present value of $196.82 from the thinning at age 16 and the present value of $487.51 from the final

harvest at age 30. The present value of revenues is calculated as:

$$\text{Present value} = \frac{\text{Future value at age n}}{(1 + \text{interest rate})^n}$$

$$\text{Present value of thinning} = \frac{\$500}{(1 + .06)^{16}} = \$196.82$$

$$\text{Present value of final harvest} = \frac{\$2800}{(1 + .06)^{30}} = \$487.51$$

Present value of all revenues = $196.82 + $487.51 = $684.33

Now that all costs and revenues are expressed as present values, the net present value (NPV) for the pine plantation investment can be calculated.

NPV = [Present value of all revenues] – [Present value of all costs]

NPV = $684.33 – $226.82 = $457.51

The estimated NPV for this forestry investment is $457.51 per acre.

Benefit Cost Ratio (B/C) is the present value of revenues divided by the present value of costs. A ratio greater than one indicates the investment should be undertaken. This investment criterion is used for a group of investments that are not mutually exclusive (i.e., more than one investment may be chosen). The investment is acceptable if the ratio is greater than one. The B/C ratio is often referred to as the profitability index of a project. The B/C ratio formula is explained below:

B/C = [Present value of all revenues] ÷ [Present value of all costs]

For our example, the present value of all revenues was calculated to be $684.33, and the present value of all costs is $226.82. Thus, the benefit cost ratio for this investment is 3.02.

B/C = $684.33 ÷ $226.82 = 3.02

This investment is financially attractive at a 6% interest rate, since the B/C is greater than 1.

Equivalent Annual Income (EAI) is the NPV of an investment at a given interest rate that has been annualized. Annualizing the NPV of an investment is useful in investment analysis to compare or rank investments of different lengths. It can be used to compare a forestry investment with other land uses (e.g., agriculture crops) that generate income each year. An investment is acceptable if the EAI is greater than zero. EAI is also known as Annual Equivalent, Annual Income Equivalent, Equal Annual Income, and Net Annual Equivalent.

$$\text{EAI} = \text{NPV}\ [\{i\ (1+i)^n\} \div \{(1+i)^n - 1\}]$$

Where: i = interest rate in decimal percent
n = the number of periods

Using our example, we know the NPV at a 6% interest rate is $457.51. Using this information, we can calculate the EAI.

$$\text{EAI} = \text{NPV}\ [\{i\ (1+i)^n\} \div \{(1+i)^n - 1\}]$$
$$\text{EAI} = \$457.51\ [\{.06\ (1+.06)^{30}\} \div \{(1+.06)^{30} - 1\}]$$
EAI = $33.24/acre/year

If the landowner incurs the costs and revenues during the 30- year rotation, the pine plantation investment will produce returns equivalent to an annual income of $33.24 per acre.

Rate or Return (ROR) is the rate of compound interest that is earned by the funds invested, or the average rate of capital appreciation over the life of the investment. It is the compound interest rate used where the NPV is zero. In other words, the rate of return is the compound interest rate that equates the present value of all future incomes with the present value of all future costs. All incomes are assumed to be reinvested at the same rate of return. ROR is also called Internal Rate of Return and Return on Investment. Investments with only one cost and one revenue can be calculated directly. However, for investments with more than one cost and revenue, an iterative process must be used to estimate the interest rate that equates the present value of revenues with the present value of costs. ROR is useful in accept/reject decisions; however, it is not recommended for ranking investments.

From our example, we know that the NPV at 6% is $457.51. Therefore, the ROR must be greater than 6% since ROR is the interest rate where NPV is zero. ROR can only be solved using an iterative process to determine the interest rate that results in a NPV of zero. An interest rate of 12% results in a NPV of -$23.26, and a rate

of 11% produces an NPV of $14.99. So the ROR is between 11% and 12%. Continuing this iterative process until NPV equals zero results in a ROR of 11.36%. Thus, the 30- year pine plantation investment would earn the landowner a rate of return (ROR) of 11.36% .

Land Expectation Value (LEV) estimates the value of bare land used for growing timber. The LEV formula is a special case of NPV that considers all revenues and costs involved with timber production for an infinite series of identical rotations (even aged management) or cutting cycles (uneven aged management). LEV is the maximum amount an investor would be willing to pay for bare land and still earn an acceptable rate of return that would be equal to the discount rate used in the LEV calculation. Since LEV assumes an infinite series of rotations, it considers the value of future timber growth, allowing for a meaningful comparison of management regimes of unequal time periods. Thus, LEV can be used to rank investments when evaluating alternative rotation ages or management regimes. LEV is also commonly called Bare Land Value, Soil Expectation Value, and Faustmann's formula after Martin Faustmann who first published the formula in 1849. The LEV formula is:

$$\textbf{LEV} = [\textbf{Net Value in Year n}] \div [(1+i)^n - 1]$$

Where: i = interest rate in decimal percent
n = the rotation age in years

To use the LEV formula, compound all of the costs and revenues associated with timber production to the end of the first rotation or cutting cycle and subtract costs from revenues to determine the net value in year n.

Using the 30-year rotation pine plantation example values, the net value in year 30 is $2,627.69, which is calculated as follows:

The final harvest value of $2,800 at year 30 is already expressed as a future value. The revenue from the thinning at year 16 has to be compounded 14 years into the future.

$$\textbf{Future value} = \textbf{Present value} * (1 + \text{interest rate})^n$$

Future value of thinning revenue at year 30 =
$500 (1 + .06)14 = $1,130.45

Future value of site preparation cost at year 30 =
$120 $(1 + .06)^{30}$ = $689.22

Future value of seedlings and planting costs at year 30 =
$38 $(1 + .06)^{30}$ = $218.25

Future value of annual management costs at year 30 = $395.29

$$\textbf{Future value of annual costs} = \textbf{annual cost} \left[\frac{(1 + \text{interest rate})^n - 1}{\text{interest rate}} \right]$$

$$\$5 \left[\frac{(1 + .06)^{30} - 1}{.06} \right] = \$395.29$$

Thus, the net value in year 30 is

Net value in year 30 =
$2,800 + $1,130.45 – $689.22 – $218.25 – 395.29

Net value in year 30 = $2, 627.69

$$\textbf{LEV} = [\textbf{Net Value in Year n}] \div [(1+i)^n - 1]$$
$$\textbf{LEV} = \$2{,}627.69 \div [(1+.06)^{30} - 1]$$
$$\textbf{LEV} = \$553.96$$

The most a landowner should be willing to pay for bare land that could be used for a 30- year pine plantation investment, given the assumptions about costs and revenues used in the calculation, would be $553.96 per acre.

The book *Basic Concepts in Forest Valuation and Investment Analysis* by Bullard and Straka (1998) is a good reference book. It covers all of the above- mentioned terms and provides detailed examples for forestry investments. Another useful application for forestry investment analysis is FORVAL Online – Timberland Investment Calculator, developed at Mississippi State University. This online program will allow you to input your revenues and incomes and also set your desired interest rate. FORVAL will then calculate your NPV, B/C ratio, ROR, and EAI among other financial calculations. You may access FORVAL Online at http://www.cfr.msstate.edu/forval/.

Another useful online application for forestland investment analysis is Timberland Decision Support System (TDSS), developed by the Texas Forest Service. Like FORVAL, TDSS will allow you to use the above financial criteria. It also includes a loblolly pine growth and yield model which will allow you to simulate the potential growth of your loblolly pine forests and include this in your financial investment analysis. You may access TDSS online at http://tfsfrd.tamu.edu/tdss/default.htm.

References

Bullard, S.H. and T.J. Straka. 1998. Basic Concepts in Forest Valuation and Investment Analysis. 2nd Edition. Copyright Bullard-Straka, Preceda Education and Training, Auburn, AL. 270 p.

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