Approaches to forestry investment in Ireland

Henry Phillips

Rathonorogh, Sligo

Abstract

The ultimate economic question about commercial forestry is 'what is it worth'? Confusion and misunderstanding surrounds the analysis of forestry investments. Forestry practitioners and private investors are unfamiliar with the terminology and techniques used. In the absence of a tradable market in forests in Ireland, it is generally recognised that discounted cash flow (DCF) is the most acceptable technique for the valuation of forestry investments. This is particularly appropriate to Ireland where the majority of investment concerns the establishment of new plantations. The various elements involved in carrying out a DCF analysis are discussed including risk elements – wind, disease, frost etc. – which up to now have to a large extent been ignored. Indicative returns based on economic analysis are given, together with published data.

Keywords: Discount rate, discounted cash flow, disease, fire risk, financial rotation, forestry investment, frost risk, internal rate of return, interest rate, markets, net present value, sustainable forest management, taxation, wind risk.

Introduction

The ultimate economic question about commercial forestry is 'what is it worth'? (Price, 1989). Forestry is a capital intensive investment. Capital is required for land purchase, crop establishment, roading and on-going operations and maintenance. In addition to the capital nature of the investment, forestry is unique in terms of the long delay before any revenue come on stream. Typically, under Irish conditions, rotation lengths for coniferous species vary from between thirty to sixty years.

To evaluate forestry investments there are a number of well-established techniques available. Most, but not all, take account of the two main distinguishing features of forestry that set it aside from most other investments – (a) the time scale involved and (b) the cash flow pattern of costs and revenues. The most widely used technique is discounted cash flow (DCF) which uses a discount rate to equalise or compare future costs and revenues in terms of today's costs and prices. Other techniques include historic cost and market value (Price, 1989). Ultimately however, forestry must be considered on a similar basis to any other type of business investment.

A lot of confusion and misunderstanding surrounds the analysis of forestry investments. Many forest practitioners and private investors are unfamiliar with the terminology and techniques used. Quite often returns are quoted which at first glance appear attractive but on closer examination are sometimes based on a wide number of over-simplistic assumptions and little analysis of the risks involved.

At the end of the day, the real value of a forestry investment is a combination of what price the purchaser is willing to pay and what price the investor is willing to dispose of the asset. The purchaser would prefer a low valuation and the seller would prefer a high valuation. In a free market, equilibrium would be established between the two. However, the market for forest sales in Ireland is only developing and we are confined to the use of the techniques referred to above to arrive at a valuation. It should be remembered that

such valuations are *only indicative* and provide a *best estimate* which only time will reveal its validity.

Discounted Cash Flow

General

It is generally recognised that DCF is the most acceptable technique for the valuation of forestry investments (Fraser *et al.*, 1977). This is particularly appropriate to Ireland, where the majority of investment concerns the establishment of new plantations. The key feature of DCF analysis is that it is designed to assess the worth of a project taking account of the *timing* as well as the amount of cash flows. Underlying the technique is the assumption that investors behave in a rational manner and prefer returns sooner rather than later – time has a money value.

In DCF analysis, costs and revenues are equated to present day values through the use of discounting and discount rates. The basic formula is:

$$V_0 = V_n / (1+ r)^n$$

where

V_0	=	the value today (present value),
r	=	interest rate (expressed in decimal format),
n	=	the projected number of years from the present to cost or revenue occurrence,
V_n	=	value of the cost or revenue in n years time,
$1/(1 + r)^n$	=	the discount factor.

Interest Rates and Discount Rates

The interest rate charged to the project is logically the highest known rate that the money can earn elsewhere in the best alternative investment. This is sometimes referred to as the *'Guiding Rate'* and is also called the *Opportunity Cost* of money, since there is the opportunity to do something else with it.

To understand interest rates better, they can be considered as being composed of three elements: (a) the pure rate, (b) the expected inflation rate and (c) the risk rate. The pure rate is the equivalent of the interest rate net of inflation earned by risk free investments. This is typically the return on something like Government Bonds and is normally in the range of 2-4%. For long term investments like forestry, a view has to be taken as regards how inflation will average over the investment period. The investors can have their own opinion that may be either more optimistic or pessimistic than official government figures. The risk rate is that rate which describes the degree of risk associated with the investment. A high risk investment may have a high potential profit but it also has a high risk that one will lose everything. The risk rate varies from industry to industry. In general terms, forestry is considered either a low or medium risk.

The relationship between the interest and discount rate is:

Discount Rate = Interest Rate – Expected Inflation Rate
= Pure Rate + Risk Rate

The discount rate assumes that both costs and revenues increase at the same rate over the life of the investment. In doing this, the inflation rate is removed from the calculation

and everything is expressed in terms of present value i.e. in today's money. If a cost or revenue item is expected to persistently inflate (or deflate) in price at a rate that differs from the average inflation rate, then it should be considered in the analysis and treated differently.

A lot of discussion and opposing views are expressed concerning what discount rate to use in the analysis of forestry investments. The rate chosen can determine the viability of a forest investment, be it either the purchase of land or the roading of a given property. A high discount rate favours short-term projects, while a low discount rate favours longer-term projects. High discount rates express a desire to receive money sooner rather than later.

Traditionally discount rates of between 3% and 5% have been used in relation to state forestry valuation in Ireland. Justification for the use of low discount rates include (a) unquantified non-wood benefits associated with the investment, (b) social aspects associated with investment in rural areas and (c) belief that the real rate of increase in timber prices will outstrip costs by anything from 0.5% to 1.5% on an annual basis.

In the private sector, higher discount rates are used, reflecting the natural desire for higher returns on investment and greater expectations. Typically discount rates of between 5% and 7% have been used.

Internal Rate of Return

The internal rate of return (IRR) of an investment is the discount rate at which discounted costs equal discounted revenues – the rate at which the present value (PV) equals zero. In simple terms the IRR is the earning power of the investment.

The IRR can give misleading results when the investment has a positive cash flow throughout its life, as can happen under the current grant and premium payments. In addition, the IRR does not allow for the inclusion of risk in the rate arrived at, as do present value calculations. Thus treatment of risk when using IRR must be either included in the inputs (prices, costs etc.), which is not always possible or alternatively, the IRR determined be reduced to account for risk.

Net Present Value (NPV)

The net present value of an investment is the sum of discounted revenues (DR) – including grants(s) and premiums where applicable – minus the sum of discounted costs (DC) – including land cost if appropriate. It represents the return over and above the discount rate used in the analysis. Typically DCF analysis produces a value for NPV. This value should however be treated with caution, as it is only indicative. A more prudent approach is to use NPV as an indicator for choosing between two or more possible options for investment, as for example a choice of species to plant. The use of DCF here will indicate the preferred option i.e. the one that is likely to yield a better return.

Risks

General

There is no such thing as a completely risk free investment. Governments have been known to fall, stock markets to crash, freak weather to devastate vast areas, banks to go bankrupt etc. The same applies to forestry. There are risks and it is important to state them clearly and where possible to account for them in any valuation we undertake.

Wind

Ireland is a windy country relative to most others in Western Europe. The incidence of high wind speeds and gales is well documented by the Meteorological Office. Wind coupled with wet mineral or organic soils predispose forest crops to windthrow, often cutting short the preferred rotation. On drier soil types wind can cause leader damage and breakage. Over the past five years an estimated 1m m^3 of timber has been windthrown in Ireland.

How do we account for the risk associated with wind? The most common method is to classify the crop rotation in terms of top height (Insley *et al.*, 1987). In Coillte (The Irish Forestry Board) crops are assigned a stability class with an associated rotation length defined in terms of top height. This is similar to the wind hazard classification adopted by the Forestry Commission (Anon, 1988).

The reduced rotation will incur a cost, as it is typically less than the financial optimum, if the crop had the ability to grow to maturity. This is relatively easy to quantify in terms of its effect on present value or IRR.

In terms of valuation, the top height site classification is critical. Both practitioners and potential investors have sometimes fallen into the trap of being overoptimistic in determining rotation lengths and have suffered the loss of revenue through windthrow and breakage. Conversely some practitioners have erred on the safe side and felled crops in anticipation of windthrow, many years prior to the onset of any damage. This too has a cost and reduces the value of the investment. An alternative approach to reducing the rotation length is to increase the discount rate used to allow for the additional risk associated with windthrow. This approach is more subjective and not recommended.

Finally in areas of high wind risk, it may be a better option to adopt a no-thinning regime. This will enable the crop to grow on further, but will reduce average tree size with consequent impact on revenues. A balance needs to be struck between revenue forgone by not thinning and the risk of losing revenue by opening up the crop to windthrow by thinning.

Fire

Ireland has a relatively short fire danger period compared to Mediterranean or Central European countries. Notwithstanding this, fire is a risk, particularly with young coniferous plantations up to thicket stage. The normal forest practices to reduce fire risk include the establishment and maintenance of firebreaks and vigilance during the fire danger period when burning on adjacent land can pose a threat. These costs should be included against the investment. In addition, it is possible to insure the plantation against fire. The premiums are relatively modest and it is prudent to include insurance in the cost schedule.

Frost

Spring and summer frosts can cause serious damage to a young plantation, resulting in the need for substantial filling-in or even replanting. This can in part be avoided by correct choice of species and provenance. However, based on national average replanting by Coillte over a ten year period, replanting due to frost damage will amount to less than 2% of the total area. Thus to account for the risk of frost damage, we need to include in our cost schedule a value for replanting in the region of 2% of total area. It must be stressed that this is a national average value and should be increased or decreased in areas where the risk is perceived to be higher or lower.

Disease

Ireland compared to other European countries is relatively disease free, due not only to its island status, but also to the enforcement of hygiene regulations on the importation of plant reproductive material and wood and wood products. There remains however a constant risk of disease, especially for our major coniferous species. The recent outbreak of the lesser-banded weevil in the north-west is a case in point.

Currently in mainland Europe there are a number of serious outbreaks of *Ips typographus*, *Lymantria monacha* etc., confined mainly though not exclusively to areas where crops are predisposed to disease, due to pollution or the effects of war, where normal sanitary operations have ceased, for example in Bosnia and Herzegovina.

With the establishment of coniferous crops on former agricultural land, there is an increased risk of butt rot (*Heterobasidion annosum*). The current practice of treating freshly cut stumps immediately after felling with a solution of urea will help reduce but will not eliminate the risk of infection completely.

It is impossible to evaluate the risk associated with disease and quantify it in a format suitable for inclusion in any investment valuation. Nonetheless, it should be borne in mind as a long-term risk associated with the investment. As a minimum, the recommended practices for protection against disease should be included in the valuation.

Markets

The following is a synopsis of the assessment carried out by the consultancy companies Deloitte & Touche and Jaakko Poyry in the preparation of the Government's strategic plan for forestry (Anon, 1996).

Global demand for industrial wood (wood for industry as opposed to wood for fuel) is now 1,600 m m^3/annum and is set to grow to over 2,000 m m^3/annum by the year 2015. Softwood will account for 67% of this demand growth, hardwood for 33%. The driving force will be increasing demand for pulp, paper and mechanical wood products (Anon, 1996).

There are two main deficit areas of wood in the world: Western Europe and the newly expanded areas in North-east Asia including Japan and China. The wood resources are situated at a distance from these areas. Possible influences on future wood supply to wood markets include:

North American restrictions on wood cutting and more sustainable forest management which will reduce supplies to world markets;
additional wood from South America which will mainly come from new plantations;
increasing quantities of roundwood and sawnwood from the vast Russian resources;
although Russia could stay as a low-cost country, the industry conditions and transportation would make the delivered cost fairly expensive; and
the cost of wood from Western European resources would be fairly expensive.

Since this market analysis was undertaken, the Russian economy has collapsed and felling in Russia is now less than 50% of 1980 levels (Anon, 1997). Additional OSB, MDF and panel board capacity either has come on stream or is planned in the Baltics and Eastern Europe. The economies in South East Asia are in recession and there is additional pressure on wood producers to adopt and put in place sustainable forest management and certification procedures. This illustrates not only the dynamic nature of wood markets but also that any analysis is outdated the day it is produced

Ireland as an exporter of timber is very dependent upon what happens in the UK, which is its major export market. The timber produced in Ireland competes in the lower

end of the market, where there is strong competition. Most analysts are of the opinion that this competition will increase over time with additional supplies coming on stream from traditional and non-traditional sources.

The impact of markets and price are interrelated. Wood is a globally traded commodity and cannot be looked upon solely in terms of the Irish market. Currently most forest valuations and analyses assume that the market (domestic and export) will be able to absorb/consume all of the wood assortments produced. This is very much dependent upon the development, growth and competitiveness of the sawmilling and small roundwood processing sector at home.

Price

Timber price has a major impact on any investment valuation. Over the years timber prices worldwide have kept pace with inflation and most analysts will agree that this scenario is likely to continue into the future. While prices have kept pace with inflation, they are subject to cyclical variations related to general world economy and growth/development of industry capacity. Ireland does not have a long tradition in forestry and reliable long term information on timber price is relatively scarce and rarely published.

In terms of private investment in forestry, there are a number of factors that will influence price at the local level. These include: (a) tree size, (b) road access (county and internal), (c) harvesting costs (ground conditions, haul distance etc.), (d) stem and wood quality – (species, straightness etc.), (e) distance to market, (f) lot size, and (g) supply and demand situation.

Each of these will impact to a greater or lesser degree on price. The most important are generally considered to be: (a) tree size, (b) access and (c) supply and demand. The most prudent approach in terms of valuation for a specific investment is to adjust general prices in relation to the distinguishing features of the timber coming from the investment.

For valuation of a forestry investment, using current timber prices is inappropriate and can give a very misleading result. This is due to the fact that current prices reflect the market at a single moment in time and do not take on board the cyclical nature of timber prices. Use of a long-term price series is more appropriate and is recommended. Current prices should normally only be used for valuation of mature plantations.

Timber Yields

Information on timber yields is necessary in order to estimate revenues. The traditional approach in Ireland is to use Forestry Commission (FC) yield tables (Anon, 1981) to predict future timber yields. The yield models included in FC Booklet 48 are extensive and cater for a range of yield classes, tree species, initial spacings and thinning treatments. These models are classified as static models and are only accurate if the prescription described is rigidly adhered to throughout the life of the crop.

Recent developments in yield modelling favour the use of dynamic models that can cater for variations in stocking and stand treatment over time. A dynamic model has been developed for Sitka spruce and plans are in place to develop models for Douglas fir, lodgepole pine, and Norway spruce (Broad, 1999). Based on a recent evaluation (Phillips, 1998a) of the model it as yet unsuitable for input to yield valuation.

Other Considerations

Taxation

The current taxation relating to investment in forestry is very favourable. An excellent summary of the taxation situation is provided by O'Hegarty (1997) upon which the following is based.

Income Tax: The occupation of woodlands, managed on a commercial basis and with a view to profits is exempt from income tax. Grant assistance and annual premiums are exempt from income tax.

Capital Gains Tax (CGT): Commercial woodlands occupied by individuals are exempt from CGT on the growing timber. The underlying land is not exempt but chargeable gains are restricted to the surplus over inflation adjusted cost. CGT is not applicable to a disposal on death.

Value Added Tax (VAT): Commercial forestry is regarded as agricultural production and exempt from VAT but the exemption may be waived.

Stamp Duty: Growing timber in commercial woodland is exempt from stamp duty but the underlying land is not exempt.

Capital Acquisitions (Inheritance and Gift) Tax (CAT): Commercial woodlands are subject to CAT on gifts to, or inheritance by individuals. In addition to specified exempt thresholds, relief is available to commercial woodlands as agricultural property.

Grant Schemes

Private forestry investment in Ireland is essentially driven by the generous grant schemes available to both farmer and non-farmer categories. Prior to the introduction of the Western Package scheme in the 1980s, private sector investment was negligible. Since the introduction of more generous incentives, mainly premium payments and increased grant levels, private investment has increased significantly. The downside is that the price of land for forestry has absorbed much of the increase in grant payments. Thus unless the investor owns the land, he/she is not in a position to benefit to the full from the increased grant payments.

Government Forest Strategy

Growing for the Future – A Strategic Plan for the Forestry Sector in Ireland (Anon, 1996) defines the national strategy for forestry. The case for continued and further investment in forestry was made on the basis of (a) a 'critical mass' size for the industry to enable it to compete and enjoy economies of scale, (b) real rate of return on investment, (c) future wood processing capacity and (d) employment. The strategy foresees:

annual planting levels of 25,000 ha to year 2000 and 20,000 ha to year 2030,
Wood output to increase from 2.2 m m^3 to 10 m m^3 by the year 2030,
each afforestation project to include a minimum of two species, and
Sitka spruce to be reduced to 60% of national average afforestation.

The overall forestry strategy provides an assurance to the private investor insofar that there is a strong government commitment to expand the current rate of afforestation and to put in place a range of measures that will benefit the sector and facilitate the private grower.

Cost Implications of Sustainable Forest Management

There can be no doubt but that in the immediate future there will be a requirement placed on owners of forests to manage their crops in accordance with the principles of sustainable forest management (SFM). In addition, there is every likelihood that timber certification will be required if forest products are to remain marketable. This has cost implications. First the cost of compliance with principles of sustainable forest management, second the cost of third party certification that SFM principles are being adhered to and finally the cost associated with the chain of custody.

Currently there are no reliable estimates of these additional costs for Ireland, as the process of SFM and certification is still under development. However, for the private forest owner, the costs are likely to be on average higher due to the level of fixed costs and lack of scale reductions for small forest areas. Some analysts quote a figure of between £2 to £5/ ha/year for compliance under Irish conditions and an additional cost of £2 to £3/m^3 for timber certification. While some costs will be absorbed by the industry, the likelihood is that the majority of costs will have to be borne by the forest owner.

Financial Maturity

Financial Rotation

There are many definitions of financial maturity in relation to forest crops. They can be categorised as being either (a) zero interest models or (b) interest rate models. The former have little application to forestry in Ireland and by their nature ignore the cost of time and capital. Of the models using interest rates there are three main definitions of financial maturity:

rotation of Maximum Net Present Value (MaxNPV)
rotation of Maximum Discounted Revenue (MaxDR)
rotation of Maximum Internal Rate of Return (MaxIRR).

The first two require the choice of discount rate. The third indirectly uses a discount rate, as the IRR is the discount rate at which the discounted revenue (DR) equals the discounted cost (DC) that is the Net Present Value (NPV) equals zero.

In practice MaxDR is easier to calculate and provides similar results to the rotation of maximum NPV (Johnston *et al.*, 1967).

The current practice in Ireland on rotation lengths for coniferous crops can be stated as to grow to rotation of maximum mean annual increment (MMAI) with the exception of Sitka spruce (*Picea sitchensis*) – less 20% MMAI; Norway spruce (*Picea abies*)-less 30% MMAI and coastal lodgepole pine (*Pinus contorta var latifolia*) – less 30% MMAI. The basis for this practice lies in an economic analysis undertaken in 1976 by the Forest and Wildlife Service. However, the analysis had a number of shortcomings in relation to (a) price information and (b) range of growth models available.

Recent economic analysis on rotation lengths (Phillips, 1998b & 1999) indicates that current practice is more or less in line with the theoretical financially optimum rotation for the major tree species. While there are differences, they are not generally so significant to warrant a change in rotation length apart from some minor exceptions. The situation for minor tree species Scots pine *(Pinus sylvestris)* and larch (*Larix spp*) for example, is different, and a reduction in rotation length is indicated. The scale of reduction varies from 5 to 15 years depending on species and yield class.

Technical Considerations

There are some technical considerations, particularly in relation to (a) the average final crop tree size and (b) timber quality from very fast grown crops that need to be taken into consideration. There is little point in having a recommended rotation length that results in a tree size that is not capable of being processed by industry.

Real Rate of Return

Indicative Returns

Economic analysis indicates that the real rate of return is mainly dependent upon (a) owner category – as this determines grant and premium levels and land cost, (b) site productivity and (c) crop management regime, including rotation length. The rate of return is extremely sensitive to the price of land, as this represents the major cost and is borne at the beginning of the investment period. Thus a land owner can in theory expect to achieve a real rate of return in the region of 8% to 12% depending on site productivity and management regime and assuming zero land cost. Where the investor has to purchase the land, then the expectation is for a real rate of return of between 4.5% to 7%, again dependent on site productivity and management regime.

A word of caution must be expressed in relation to these indicated returns. They are only 'best estimates' and are based on certain simplifying, yet prudent, assumptions.

Comparison with Published Returns

There is a lack of published information on the actual or estimated returns from investment in forestry in Ireland. Growing for the Future – A Strategic Plan for the Forestry Sector in Ireland (Anon, 1996) estimated the real rate of return in forestry (Sitka spruce) as 5% including land cost and exclusive of grants and subsidies. This figure[1] was amended to take account of Irish costs and changed to 4.3% which is close to the lower end of the range for non-farmer owner category.

In Britain on better quality land, with zero opportunity cost attributed, rates of return of 7% (Anon, 1986a) and 6.5% (Anon, 1986b) have been demonstrated. The Wood Production Outlook in Britain (Anon, 1977) concluded that rates of return were low and estimated an expected mean of 2.3% for the period 1977-81. Very favourable assumptions about land, labour and timber prices raised this to about 6%.

The Irish Forestry Unit Trust (IFUT) estimates (Lacey, 1998) the return from forestry as being within the range of 5% to 7%.

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[1] A target yield class of 20 was used in the analysis

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