INCOME TAX-INDUCED DIFFERENCES BETWEEN BUYERS' AND SELLERS' VALUES OF FORESTS

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ABSTRACT

For loblolly pine and Douglas-fir, this paper shows how an income tax can cause asking and bid prices to diverge for immature timber. If ask and bid prices for timber at mid-rotation are based on discounted cash flow, the ask could be from 28% to 44% above the bid after corporate income taxes, given several sets of reasonable assumptions.

INTRODUCTION

If both seller and buyer have the same view of the future and use the same interest rate, their discounted cash flow values for immature timber after local government taxes should be the same (Klemperer 1976). However, Kovenock and Rothschild (1983) showed that such theoretical ask and bid prices will not be equal after income taxes, since seller and buyer each have a different tax-deductible basis and pay different income taxes. This paper applies Kovenock and Rothschild's (1983) generalized analysis to loblolly pine and Douglas-fir and quantifies the income tax-induced divergence between ask and bid prices based on net present value under selected assumptions.

APPROACH

The analysis considers even-aged timber established by the original owner with the intent to sell land and timber at the economically optimal rotation age. If the original owner decides to sell the forest before rotation age, asking price is assumed to be an amount which assures an after-tax income equal to the after-tax net present value of holding the forest and selling at rotation age. Asking price exceeds this after-tax net present value, since an income tax is due upon sale. The buyer's bid is assumed to be the after-tax net present value of selling land and timber at rotation age.

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Income taxes will be paid on forest sale price minus purchase cost (or basis). The analysis assumes the same interest rate, future prices, harvest date, and income tax rate for both buyer and seller. Competitive conditions are assumed so that timber owners are price takers and taxes are capitalized into lower land values. Rotations will be those which maximize rotation-start net present value ("land expectation value") and latter will be the land value used in calculations.

Equations for computing after-tax ask and bid at any forest age under the above assumptions are given in Klemperer (1989). Results of applying this net present value approach to loblolly pine and Douglas-fir under selected assumptions are given below.

RESULTS

For the empirical examples, federal corporate income taxes were assumed at the current 34% rate plus a 3% effective state tax (total = 37%). Reforestation costs were set at $100 per acre, loblolly pine pulpwood stumpage at $0.25/ft$^3$, Douglas-fir sawtimber stumpage at $120/MBF$, the real after-tax discount rate at 6%, and inflation from 0 to 20%.

Using the foregoing approach and assumptions and a loblolly pine yield function, Figure 1 shows that ask and bid are equal when no income tax is levied. However, Figure 2 shows that ask exceeds bid after the 37% income tax, keeping all other assumptions the same. For loblolly pine, only pulpwood production was considered and optimal rotations remained at 21 years. All figures plot values directly from the simulations.

Considering the tax timing can help explain why ask exceeds bid after income taxes. The original forest owner paid for land and planting, assuming that the income tax would occur at rotation-end. Selling at mid-rotation reduces the advantage of tax-deferral (see Gaffney 1967, Brinner 1973, and Diamond 1975), and the seller keeps the asking price high enough to assure the originally-sought rate of return. However, the buyer, who knows that taxes will be due in less than one rotation length, bids below the asking price. In all cases, the maximum ask/bid ratio occurs at exactly mid-rotation. In Figure 2, this maximum ratio is 1.14, meaning that at mid-rotation, ask is 14% above bid.

Figure 3 parallels Figure 2 except that annual inflation is increased from 0 to 5%. The higher inflation in Figure 3 boosts the maximum mid-rotation ask/bid ratio from 1.14 to 1.28, reflecting the fact that inflation increases the burden of the income tax (see Bullard and Klemperer 1986). Holding everything in Figure 3 equal but boosting

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\text{Yields were 90\% of a yield equation for better sites in Avery and Burkhart (1983, pg. 277).}
Figure 1. Loblolly Pine Ask, Bid, and Liquidation Value: No Tax, No Inflation
Figure 2. Loblolly Pine Ask, Bid, and Liquidation Value: 37% Income Tax, No Inflation
Figure 3. Loblolly Pine Ask, Bid, and Liquidation Value: 37% Income Tax, 5% Inflation
Figure 4. Loblolly Pine Ask, Bid, and Liquidation Value: 37% Income Tax, 20% Inflation
Figure 5. Douglas-fir Ask, Bid, and Liquidation Value: 37% Income Tax, 5% Inflation
projected inflation to 20%. Figure 4 shows much larger differences between ask and bid. The maximum ask/bid ratio in Figure 4 is 1.51. Although sustained inflation at 20% would seem inconceivable in the United States, some countries have seen far greater inflation rates.

Using 5% inflation, Figure 4 shows a Douglas-fir simulation where the optimal rotation was 37 years. In that case, the mid-rotation ask/bid ratio was 1.44. In general, for any given inflation rate and interest rate, longer rotation species show higher maximum ask/bid ratios.

CONCLUSIONS

In all cases, the function of ask/bid ratio over time was perfectly symmetrical, being 1 at the beginning and end of the rotation and reaching a maximum at exactly mid-rotation. Although maximum ask/bid ratios varied with assumptions made, for reasonable ranges of inputs, ask was always significantly above bid (additional sensitivity analyses are given in Klemperer 1989). The ask/bid ratio could be lowered by allowing the tax-deductible basis to be inflation-indexed (Klemperer and O'Neil 1987), thus lowering the ask-bid differential to that found with no inflation (compare Figures 2 and 3).

Actual differences between asking and bid prices for immature timber would be difficult to verify and would no doubt require access to confidential documents. Moreover, many buyers and sellers do not use the explicit discounted cash flow computations modeled here, and when they do, their differing input assumptions would yield widely varying ask/bid ratios for similar stands. Nevertheless, where net present value is used for immature stand appraisals, this study's results suggest a tendency for ask to exceed bid--a "lock-in" effect of the income tax.

LITERATURE CITED


3 The yield equation was estimated from McArdle et al. (1961, pg. 65) for average site qualities.


