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White Pine Stumpage Price Trends In Southern New England

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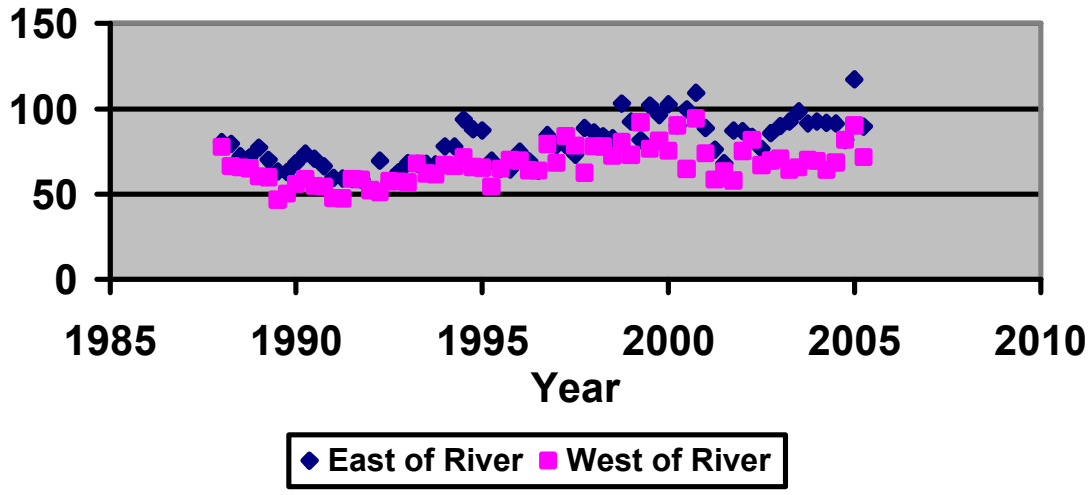
White pine is among the most important timber species in southern New England. Investors in management of white pine expect returns from tree growth and improvement in log quality. In addition, it appears that investors also will benefit from increases in the real price of white pine. This research note reports on an analysis of stumpage price trends for white pine in southern New England from 1988 until midyear 2005. The data come from the price reports published jointly by the University and of Massachusetts and University of Connecticut Forestry Extension units since 1988.

Upward Price Trend

Figure 1: Real White Pine Stumpage Prices, 1988-2005



The upward trend in real stumpage prices is obvious in figure 1. Stumpage prices both east of the Connecticut River and west of the river demonstrate this trend.

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onential trend in white pine stumpage price trends. The estimated rate of real stumpage price increase is 2%. The 95% confidence interval on this estimate ranges from 1.6% to 2.5%. West of the River white pine stumpage sells for 16.4% less than East of the River. The 95% confidence interval is 20% to 12%. Trend over time explains about 50% of the variation in real price.

An Economic Interpretation

Prices rise, according to economic theory because the demand curve is shifting out, the supply curve is shifting backward, or both shifts are occurring. Globally we observe real stumpage price increases for quality wood wood that can be cut into lumber or high-grade plywood. Two forces are shifting demand out increased populations and higher per capita incomes. One force is shifting supply backward the shrinking inventory of timber suitable for lumber and plywood manufacture. This combination has created a steady price increase for many decades for conifers that have high quality (really high value) characteristics straight, round, and more cubic volume per lineal unit of measure.

In the case of southern New England white pine, the market demand is dominated by Canada, especially Quebec. The Quebec sawmills are highly efficient and Canadian lumber flows into global markets, including the US. While southern New England white pine grows rapidly, the standing inventory of sawlog material is shrinking with harvests and land clearing. Consequently, we observe the classic symptom of scarcity rising real prices.

The consistent rise in white pine prices over almost two decades suggests that the trend will continue until some major change occurs in either demand or supply. For the foreseeable future, the Quebec lumber producers and log home manufacturers will dominate the New England market for white pine stumpage. The inventory will continue to shrink, but perhaps more slowly if forestland owners invest in white pine management.

Managerial and Investment Implications

White pine trees grow in diameter and height each year, which creates increase in total volume measured in cubic feet or board feet. Management can increase the rate of diameter growth by thinning and other harvest manipulations that reallocate net photosynthate to fewer stems. In some cases where dominate stems are removed, height growth of co-dominates or younger trees in the understory can be significantly increased as well. Further, tree quality as measure in price per unit volume increases as the ratio of cubic volume to lineal feet of logs increases. If coupled with pruning early in stand development, white pine values per unit of volume can be greatly increased. The results can be measured in terms of rate of value increase on standing trees over a defined period of time, such as a decade interval between harvests.

If harvests leave white pine basal area levels in the 75 to 90 square feet per acre range, volume growth rates can be 5% to 8% per year for a decade. In addition, the trees become more valuable because the cubic/lineal ratio is bigger. In some cases, the log quality also improves, but usually not without pruning investments. Coupled with rising real stumpage prices, white pine investments can earn 7% to 10% per year. Presuming that our interpretation of demand factors is reasonable, these yields have relatively low

and place it in a portfolio model to ascertain how white

This note is the first report from a CFPA research and outreach project on *Estimating Responses to Forest Management Investments on Connecticut Woodlands*. Subsequent reports will amplify what we know about white pine stumpage price trends and conduct similar analyses for other important Connecticut species like red oak, cherry, and sugar maple. A model to estimate tree and stand responses is in preliminary form and it will be improved in the near future. In future reports, the price trend models and tree and stand response models will be integrated to provide a reasonably comprehensive investment return model for use by small private forest owners, forest managers, and investors.

Regression Analysis

A few comments on the methodology will be useful for analysts and investors who use quantitative models.

The data source is the stumpage price reports complied by the University of Massachusetts and University of Connecticut forestry extension units and published on the web pages for each university.[1] Median (not mean) prices are reported for east of the Connecticut River and west of the river. Also reported are low and high prices paid during the quarter.

Real stumpage price is calculated by converting the nominal median prices each quarter using the GDP deflator (Year 2000=100) to correct for inflation. The GDP inflator has an advantage over the PPI (Producers Price Index) because it is not based on fixed market basket of good and services.

The natural log of real price is used for the dependent variable, rather than the real price, because it captures the exponential nature of compound interest if prices are rising over time. In a linear regression model, the estimated parameter or coefficient is the rate of real price change,

Three explanatory variables were used:

Year by quarters (e.g., 2005.00, 2005.25, etc.)
Location (with west of the river represented by a dummy variable=1)
Housing starts (also using the natural logarithm for each quarter -- equivalent annual rate)

The best model tested was:

$$\text{LN Real White Pine Stumpage Price} = ß_0 + ß_1\text{Year} + ß_2\text{Location}.$$

The analytical results are:[2]

R-Square	0.5086

[1] See http://www.canr.uconn.edu/ces/forest/pricesht.htm for University of Connecticut web pages.

[2] Using SAS Learning Edition 2.0

-Sq	0.5014

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-36.31054	4.36506	-8.32	<.0001
Year	1	0.02037	0.00219	9.32	<.0001
Location	1	-0.16377	0.02209	-7.42	<.0001

These results are significant, as the t values indicate. We explain over 50% of the price variation ($R^2 = 0.5014$), and the probability of the hypothesis being wrong for each parameter is less than 1/1000.

Interpretation of Parameter Estimates

The intercept is the estimated price level in year 0, which is meaningless, but it sets the initial price level for the price increases over time. The coefficient or parameter associated with Year is the rate of real price increase over the 1988 to early 2005 period. The estimate is a 2% real rate of increase. Location tells us that west of the river white pine stumpage prices are 16.3% lower than east of the river prices.

Other Information and Interpretations

Housing starts may be an important causal force in shifting demand for white pine (see Figure 2). Over the 1988 to present period, We can construct a model where housing starts explain over a third of the variation in real stumpage price. However, this model has some other statistical limitations and the empirical results do not make economic sense.

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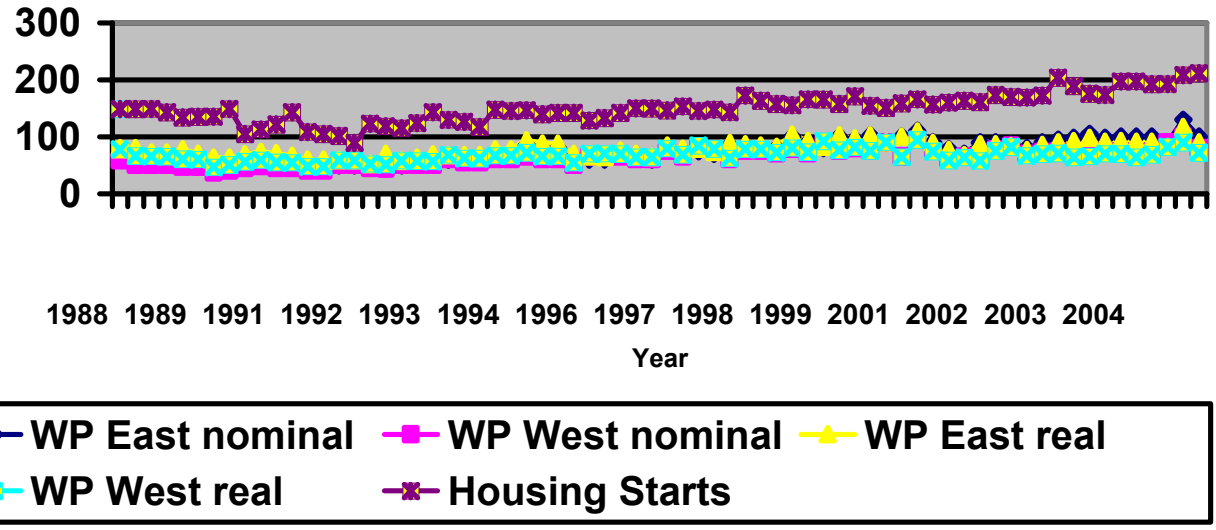
00 units annualy)



A similar model using annual Maine white pine price data for 1959-2003 does not significantly improve when housing starts are added to the regression equation. Further, the sign for housing starts is negative, contrary to theory, which was a common results in various early statistical estimates for Southern New England white pine.

The estimated rate of real white pine price increase for Maine over the 44 year period is 1.7%, with a 95% likelihood of being within +/-0.2%. The adjusted R^2 is 0.84. In future research on southern New England, we will try to use a longer data series composed of the data for Connecticut and Massachusetts,[3] probably coupled with white pine for Maine and other northeastern states.

Related Readings

A more complete summary of the literature cited section will be provided in a later research report. It will summarize all the commercial species in southern New England. The results in this report draws heavily on the following research publications and reports:

Bentley, W. R. 1993. *Economic factors affecting the value of the Long Island transfer to the Klukwan village timber corporation in June 1980.* A report to the Seattle Examination Division, Internal Revenue Service, US Dept. of Treasury, by Winrock International, New Haven CT. 42 p., plus six appendices (in two volumes)

Berck, P. and W.R. Bentley. 1997. Hotelling's Theory, Enhancement, and the Taking of the Redwood National Park. *American Journal of Agricultural Economics* 79 (2): 287-298.

Hibbs, D. E. and W. R. Bentley. 1987. White pine management: volume and volume growth. *North J. Applied Forestry* 4(4):197-201.

[3] The two states combined their price reports beginning the first quarter of 1988.

l S. Broderick. 1990. *Hardwood* stumpage price trends
ed Forestry 7(1):13-16.

annual increase of Northeastern regional stumpage
prices: 1961-2002. *Forest Products Journal* 55(2): 36-45.

Data Numbers used in this analysis.

Year	Real Price - East	Real Price - West	Q. Housing Starts	Year	Real Price - East	Real Price - West	Q. Housing Starts
1988.00	80.44	77.76	1,425	1996.75	87.96	65.97	1,472
1988.25	79.68	66.40	1,491	1997.00	78.90	68.38	1,433
1988.50	72.23	65.67	1,484	1997.25	78.78	84.03	1,476
1988.75	71.70	65.18	1,551	1997.50	73.27	78.51	1,458
1989.00	77.34	60.58	1,489	1997.75	88.68	62.60	1,532
1989.25	70.22	60.01	1,356	1998.00	86.38	78.05	1,559
1989.50	63.39	46.91	1,346	1998.25	84.16	77.92	1,572
1989.75	62.95	50.36	1,337	1998.50	82.82	72.46	1,631
1990.00	68.43	55.99	1,426	1998.75	103.16	80.47	1,722
1990.25	73.79	59.03	1,212	1999.00	92.47	72.95	1,709
1990.50	70.70	54.86	1,132	1999.25	81.91	92.14	1,574
1990.75	66.55	54.45	1,043	1999.50	102.03	76.52	1,651
1991.00	59.79	47.83	895	1999.75	96.51	81.27	1,655
1991.25	59.41	47.53	1,011	2000.00	102.70	75.52	1,659
1991.50	58.99	58.99	1,042	2000.25	90.23	90.23	1,587
1991.75	58.68	58.68	1,087	2000.50	99.74	64.83	1,504
1992.00	52.50	52.50	1,241	2000.75	109.27	94.37	1,544
1992.25	69.61	51.05	1,153	2001.00	88.69	73.91	1,605
1992.50	57.75	57.75	1,184	2001.25	76.28	58.68	1,630
1992.75	63.20	57.45	1,228	2001.50	68.18	63.31	1,600
1993.00	68.41	57.01	1,168	2001.75	87.22	58.14	1,570
1993.25	68.03	68.03	1,266	2002.00	86.90	75.31	1,723
1993.50	67.74	62.10	1,299	2002.25	83.70	81.78	1,691
1993.75	67.39	61.77	1,434	2002.50	76.68	67.10	1,697
1994.00	78.14	66.98	1,391	2002.75	85.79	69.59	1,730
1994.25	77.82	66.70	1,467	2003.00	89.87	70.95	1,736
1994.50	93.89	71.80	1,454	2003.25	92.45	64.15	1,754
1994.75	87.96	65.97	1,472	2003.50	98.59	65.73	1,890
1995.00	87.40	65.55	1,324	2003.75	91.60	70.10	2,036
1995.25	69.67	54.43	1,287	2004.00	92.63	69.47	1,929
1995.50	65.01	65.01	1,415	2004.25	91.75	64.23	1,923
1995.75	64.70	70.09	1,417	2004.50	91.46	68.59	1,974
1996.00	75.00	69.65	1,461	2004.75	81.76	81.76	1,973
1996.25	69.40	64.06	1,496	2005.00	117.22	90.17	2,083
1996.50	63.86	63.86	1,501	2005.25	89.62	71.70	2,012