Impact of Market Price Fluctuations on the Break-Even Log in Hardwood Sawmills

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Abstract

On the basis of an analysis of operating costs and market prices for hardwood logs and lumber, earlier research determined that in an average eastern hardwood sawmill, a small change of 0.1 percent in any of these factors (operating cost, log cost, lumber prices) will lead to a statistically significant ($\alpha = 0.05$) change in profit. However, operating cost, log cost, or lumber prices typically fluctuate more than 0.1 percent, with changes of several percentage points for all factors not uncommon. The effect of these fluctuations on what constitutes the break-even log is unknown. The break-even log is the combination of a diameter class, length, species, and log grade factors such that when the log is sawn into lumber and residues the total value generated is offset by the total costs (e.g., a zero-dollar profit). In this paper we explored the impact of statistically significant market price changes for operating cost, log cost, and lumber prices on the break-even log. Findings include that, in general, statistically significant market price fluctuations did not lead to immediate changes in characteristics of the break-even log. However, market price (logs, lumber) or operating cost changes of 2.5 percent or more did lead to pronounced differences in what constituted the break-even log for a US hardwood sawmill.

In US hardwood sawmills, the concept of the break-even log is the combination of the diameter class, length, species, and log grade factors such that when the log is sawn into lumber and residue, the total product value equals the sum of the operating and log costs, resulting in a zero-dollar profit (Adams 1970, 1972). Thus, the concept of the break-even log does not point to a single log but to a group of logs where each log results in a zero-dollar profit.

Adams (1970, 1972) and Adams and Dunmire (1977) were the first researchers to examine the methods of determining the characteristics that determined if a hardwood log could be sawn at a profit or not. They used computing power to determine how much a mill could pay for a set of logs and make a profit depending on their operating costs and expected lumber sales. Their work resulted in the development of the SOLVE (Adams 1972) and SOLVE II (Adams and Dunmire 1977) computer programs, which created tables of profitability contrasted with costs for log grades and sizes sawn by a mill. The last revision of the SOLVE program (Palmer et al. 2009) calculated the break-even cost on the basis of a sawmill's log and operating cost data and lumber prices. As such, SOLVE provides the estimated break-even price that could be paid for logs of different grades for a break-even profit point. The user can adjust this break-even point to include a break-even margin based on a user-specified profit margin (Palmer et al. 2009).

Bond (2007) also discussed how to assess hardwood sawmill operating costs and determine the value of the lumber produced, with the goal of being able to make better decisions about when to process a log and when to sell it to another processor (merchandising, Bond 2007). For example, if sawing a specific log required 4 minutes of processing time in a sawmill and resulted in a total profit of \$0.75, then it might be best for the mill to avoid similar logs and concentrate on logs that resulted in a higher profit for the time devoted to it.

Perkins et al. (2008) performed a break-even analysis on the basis of the production data and costs of a hardwood sawmill to determine the feasibility of a potential sawmill expansion project. The analysis examined two levels of production volume combined with two potential recovery volumes and three levels of log costs. The goal of the analysis was to determine which log diameters could be profitably processed in the proposed mill. In this study, the operating costs were obtained from a participating sawmill. However,

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since the proposed sawmill operation was different from the participating sawmill's, the operating costs were adjusted (Perkins et al. 2008). As a result, Perkins et al. (2008) found that the current sawmill and pallet part mill were profitable, but a new sawmill (scragg mill) would likely not be profitable.

The lack of accurate operating costs and hence the use of estimated operating costs is a problem that exists for many hardwood sawmill operators (Buehlmann and Thomas 2025). This directly affects their abilities to accurately determine what constitutes the break-even log for their mill. If operating costs are unknown, the LOg ReCovery Analysis Tool (LORCAT; Thomas et al. 2021, 2024; Thomas and Buehlmann 2024, 2025) can be used to calculate a sawmill's break-even operating cost using a log sample, the processing setup, and current log and lumber market prices (Buehlmann and Thomas 2025). Although this results in an estimate of a hardwood sawmill's operating costs, it is likely to be more reflective of the log sample and processing setup of the hardwood sawmill operation.

Once operating costs are known, LORCAT provides a quick method of determining the break-even log on the basis of a mill's operating and log costs, processing setup, and product market values (Thomas and Buehlmann 2024, 2025; Thomas et al. 2024). Although LORCAT provides a solution to identifying the break-even log as the market prices of logs and lumber and residues, as well as a hardwood sawmill's operating costs, are subject to frequent change. For example, an informal survey by Hardwood Market Report (HMR 2024a) found that the cost of manufacturing in hardwood sawmills had risen by 30 to 40 percent over the past 3 years. Furthermore, HMR (2024a) reports that the increase in operating costs resulted from increases in almost every factor required to operate a sawmill, such as labor, insurance, fuel, energy, logging, equipment, and parts. In addition, log, lumber, and residue prices are far from static. HMR reports industry average lumber prices by species, region, and thickness for green and kiln-dried lumber. HMR (2024b) reported that the current composite price for 4/4, kiln-dried selected species is $1,553 per thousand board feet (MBF) and reported the month and year-ago composite prices as $1,522 and $1,290, respectively, (e.g., a month-over-month increase of 2.4% and year-over-year increase of 20.4%).

Hardwood log prices are also subject to significant change over time. The Kentucky Division of Forestry (2023, 2024) reports delivered log prices to sawmills by state region and quality: high, medium, or low (S. A. Rogers, Kentucky Division of Forestry, personal communication, July 3, 2024). These standards are approximately equivalent to the US Forest Service (USFS) forest log grades Factory 1, Factory 2, and Factory 3 (Rast et al. 1973), respectively (S. A. Rogers, Kentucky Division of Forestry, personal communication, July 3, 2024). Figure 1 lists the prices for red oak logs by grade for the first and second halves of 2023 and the first half of 2024. Comparing first halves of 2023 and 2024 shows that the prices for Factory 1, Factory 2, and Factory 3 log grades have decreased by 11.4, 5.4, and 35.7 percent, respectively (Figure 1).

Buehlmann and Thomas (2025) analyzed the cost and price factors of 4, 8, and 12 MMBF (million board feet) annual production hardwood sawmills and found that a change in operating cost, log cost, or lumber prices by plus or minus 0.1 percent caused a statistically significant

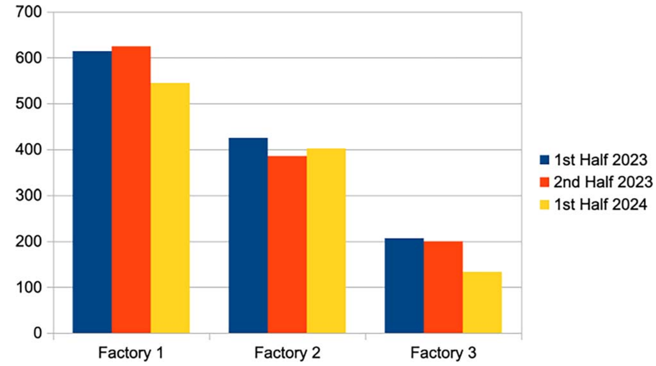

Figure 1.—Hardwood log prices by US Forest Service log grade for 2023 and 2024.

($\alpha = 0.05$) change in profit. Given the volatility of costs and market prices in hardwood sawmills and the sensitivity of profit to slight changes in these factors, an obvious question arises: How do the characteristics of the break-even log, such as diameter class, length, species, and log grade, change when a statistically significant change in profit occurs?

Methods

LORCAT's profit/loss analysis allows users to identify the group of logs that results in a loss or an unacceptably low profit when sawn (Thomas and Buehlmann 2024, 2025). LORCAT begins the analysis by creating a sample of logs that includes 10 logs for every small-end diameter (SED) 1-inch class in 0.1-inch increments. The SED log diameters for each grade range from the minimum diameter allowed by the log grade rules: 13, 10, and 8 inches for USFS Factory log grades 1, 2, and 3 (Rast et al. 1973), respectively, to maximum SED log diameters of 25, 24, or 20 inches for Factory log grades 1, 2, and 3, respectively. The large-end diameter (LED) is determined by using the hardwood log taper distribution data (Wood et al. 2020) that were collected to create the hardwood log recovery yield tables (Hanks et al. 1980). The entire log sample created for this simulation contains 430 logs with a total Doyle scale volume of 79,359 board feet.

Once LORCAT (Thomas and Buehlmann 2024, 2025) completes creating the log data sample, it then processes the log sample using the user's processing setup: opening face size, cant specifications, target board thickness, kerf thickness, sawing variation, hourly volume sawn, market prices for logs, lumber, and residues. For each log sawn LORCAT reports the value produced from the lumber, cant, and residues, as well as log and operation cost, and, most important, the profit or loss associated with every log in the sample. In the LORCAT simulations performed for this example, we specified an average production volume of 5,333 board feet per hour. Given an average of 2,250 operating hours per year (D. Spessert, National Hardwood Lumber Association, personal communication, January 2023), the example analysis presented here represents a mill with an approximate annual production volume of 12 MMBF.

For this analysis of the break-even log, sawing practices of typical Appalachian hardwood sawmills were used (Thomas et al. 2024). All lumber was sawn to 1-inch (4/4) thickness with a green allowance of 0.125 inch. A minimum opening face width, e.g., the width of the board produced by the first cut on the face of a log, was specified at 5.5 inches with a minimum board length of 8 feet. All logs were sawn to a 6-inch-high random-width cant that was then sawn into lumber using a gang resaw. The kerf thicknesses and total sawing variation at the headrig and gang resaw were set to 0.125 and 0.035 inches respectively. Given the green allowance and total sawing variation specifications and 1-inch lumber thickness, using Brown's equation (Brown 2000), a target thickness of 1.194 inches was specified. The grade sawing method used by LORCAT (Thomas and Buehlmann 2024, 2025) simulates typical hardwood sawing practices where the log is rotated and boards are sawn from the highest-grade face until a user-specified cant thickness is achieved. In addition, LORCAT simulated split-taper sawing where the taper of the log is split between opposite faces and the log is sawn parallel to its central axis (Hallock et al. 1978).

Log and lumber market prices

To perform an accurate analysis of break-even log costs and prices that reflect current market conditions, accurate current log and lumber prices are required. Average red oak log prices for the first half of 2024 were obtained from the Kentucky Division of Forestry (2024). We used the pricing data for Region 4, eastern Kentucky, as it has the most complete data. The prices for red oak logs per thousand board feet Doyle scale are presented in Figure 1. Market prices for green, red oak 4/4 lumber in the Appalachian region are shown in Figure 2 (HMR 2024b). Note that HMR does not report prices for F1F or Selects. These prices are estimated on the basis of the price for firsts-and-seconds (FAS) lumber. F1F and Selects are approximately 0.98 and 0.95 percent of the FAS price, respectively (J. Johnson, personal communication, September 2022).

Residue prices

Average market residue prices for hardwood residue products were obtained from an anonymous source at a pulp and paper mill (Anonymous, personal communication, January 2024). For January 2024 it was reported that the average prices for hardwood chips, bark, and sawdust were $25, $17, and $17 per ton, respectively, delivered to the mill. As these prices do not include any transportation costs, we contacted a local trucking company for a price quote to deliver the residue products to the pulp mill from a hypothetical sawmill 50 miles away. K. Weiss (Weiss Trucking, personal communication, February 15, 2024) stated that it depended on the number of trailers required to park at the mill and collect the residues and the number of loads per day delivered to the mill. On the basis of the volume of residue estimated to be produced by a 12-MMBF sawmill, the distance to the mill, and the number of trailers needed to be kept at the mill to collect the residue, K. Weiss (Weiss Trucking, personal communication, February 15, 2024) quoted a price of $17 per ton to transport the residue products.

For our hypothetical mill, the cost to transport sawdust and bark is the same as the value of the product, $17 per ton. Thus, these residues are a break-even proposition at best. It is important to note that if there was not a market available for sawdust and bark, they would still need to be disposed of. In a worst-case scenario, the sawdust and bark are disposed of at a landfill. The average national tipping fee is approximately $57 per ton (EREF 2024), plus the transportation and trailer costs, resulting in a potential disposal cost of $74 per ton. Although there are likely cheaper alternatives to disposing of sawdust and bark, we present the option of landfill disposal as the worst case.

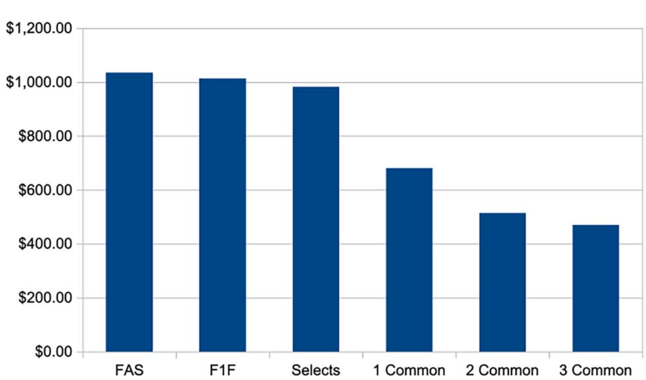

Figure 2.—Green red oak 4/4 lumber prices per 1,000 board feet as reported by Hardwood Market Report (HMR) for June 30, 2024 (J. Johnson, personal communication, September 2022, HMR 2024b).

Study design

Using a typical processing setup for an Appalachian sawmill and current market prices for logs, lumber, and residue as specified above, we determined that the break-even operating cost for our hypothetical sawmill was $2,234.07 per hour (Buehlmann and Thomas 2025). That is, with this operating cost, the average hourly profit for the sawmill will be zero dollars. Since the objective of a sawmill is to make a profit, we performed the analysis such that a profit of 10 percent, or $9052.19, was realized on the basis of a total product value of $90,521.85 that was produced from sawing the 430-log sample. LORCAT estimated that a 12-MMBF sawmill sawing an average of 2,250 board feet per hour would require 23.7 hours to saw the sample used in this study. Thus, we calculated that to achieve a 10 percent profit with log costs and lumber prices unchanged, the operating cost would need to be $1,852.47, resulting in an hourly profit of $381.60.

For each diameter class within each log grade, we examined the impact of what happens to log profitability when there was plus or minus change of 20, 15, 10, 5, 2.5, 0.5, or 0.1 percent to any of the major cost/price factors: operating cost, log cost, or lumber prices. However, we did not change the price for residues as they make up a very small part of a hardwood sawmill's profitability. All changes are compared with the baseline cost and price factors explained above (10% profit). As operating costs and log costs increase, and lumber prices decrease, the profit level will necessarily decrease. Similarly, a reduction in operating costs or log costs or an increase in lumber prices will increase profitability.

Results

LORCAT's simulated sawing of the 430-log sample produced a total of 103,983.2 board feet of lumber. The 430-log sample with USFS Factory log grades 1, 2, and 3 and all SED and LED diameters produced a total profit at the standard settings of no changes to any cost and value factors of $9,052.14 (10%). We use this processing information from the 430-log sample to establish a level of reasonable profit

Table 1.—Overall sample profit for different percent changes in operating cost, log cost, and lumber prices.

Percent change	Operating cost			Log cost			Lumber prices			Profit percent change		
	Overall profit	Baseline difference	Percent difference	Overall profit	Baseline difference	Percent difference	Overall profit	Baseline difference	Percent difference	Operating cost	Log cost	Lumber prices
−5.0%	11,249.52	2,197.40	24.27%	10,928.52	1,876.40	20.73%	4,571.98	−4,480.14	−49.49%	24.27%	20.73%	−49.49%
−2.5%	10,150.83	1,098.71	12.14%	9,990.35	938.23	10.36%	6,811.97	−2,240.15	−24.75%	12.14%	10.36%	−24.75%
−1.0%	9,491.64	439.52	4.86%	9,427.60	375.48	4.15%	8,156.21	−895.91	−9.90%	4.86%	4.15%	−9.90%
−0.5%	9,271.84	219.72	2.43%	9,239.90	187.78	2.07%	8,604.09	−448.03	−4.95%	2.43%	2.07%	−4.95%
−0.1%	9,096.36	44.24	0.49%	9,089.74	37.62	0.42%	8,962.68	−89.44	−0.99%	0.49%	0.42%	−0.99%
0.0%	9,052.12	0.00	0.00%	9,052.12	0.00	0.00%	9,052.12	0.00	0.00%	0.00%	0.00%	0.00%
0.1%	9,008.26	−43.86	−0.48%	9,014.72	−37.40	−0.41%	9,141.84	89.72	0.99%	−0.48%	−0.41%	0.99%
0.5%	8,832.58	−219.54	−2.43%	8,864.57	−187.55	−2.07%	9,500.25	448.13	4.95%	−2.43%	−2.07%	4.95%
1.0%	8,612.76	−439.36	−4.85%	8,676.98	−375.14	−4.14%	9,948.26	896.14	9.90%	−4.85%	−4.14%	9.90%
2.5%	7,953.63	−1,098.49	−12.14%	8,114.10	−938.02	−10.36%	11,292.39	2,240.27	24.75%	−12.14%	−10.36%	24.75%
5.0%	6,855.18	−2,196.94	−24.27%	7,175.87	−1,876.25	−20.73%	13,532.53	4,480.41	49.50%	−24.27%	−20.73%	49.50%

such that the profitability of each log diameter class within each Forest Service log grade is observable. Buehlmann and Thomas (2025) found that a 0.1 percent change in any of the cost/revenue factors (logs, operating cost, lumber) resulted in a statistically significant impact on profit. Although 0.1 percent differences were statistically significant, the potential impact of a 0.1 percent difference in any of these factors on day-to-day operations may be minimal (Buehlmann and Thomas 2025). However, little knowledge exists about how such a small percent change in cost (operating and log costs) and prices (lumber), independently or combined, may change the characteristics of the break-even log composition. Below we address the percent change in costs and prices for each factor (operating and log cost, lumber prices) independently (e.g., each factor without changing the other factors) to determine the potential impact they would have on the break-even log.

Operating cost

For the 430-log sample a 0.1 percent decrease/increase in operating cost resulted in a plus/minus profit difference of \$44 or approximately 0.48 percent, as can be seen in Table 1. Figure 3 shows the change in profit with respect to the percent change in operating cost, log cost, and lumber prices. Table 1 also shows that a 1.0 percent decrease in operating cost will improve overall profit to \$9,491.64 over the initial profit of \$9052.12, an increase of 4.86 percent. Thus, the 0.1 percent change in operating cost that was found to be significant in Buehlmann and Thomas (2025) is magnified by a factor of 4.86 with respect to profit for our hypothetical sawmill. Therefore, a 5 percent decrease in operating costs is echoed by a 24.27 percent profit increase, from \$9,052.14 to \$11,294.52. Similarly, a 5 percent increase in operating cost results in a 24.27 percent profit decrease, from \$9,052.14 to \$6,855.18.

Table 2 lists log profitability in US dollars by USFS Factory log grade, SED, and by percent change in operating cost. For example, a USFS Factory 1 25-inch SED log returns a profit of \$42.02 with the base operating cost of \$1,852.47 per hour. Further, increasing operating costs by 5.0 percent will reduce profit on that log to \$34.73. In Table 2, log grade, SED, and percent change combinations that result in a log being sawn at a loss are highlighted in orange. For USFS Factory Grade 1 logs, sawing 13- and 14-inch SED logs will result in a loss when operating cost is increased by 5.0 percent. When operating costs increased by 20 percent, all USFS Factory 1 logs with SEDs ≤21 inches became unprofitable to saw into lumber.

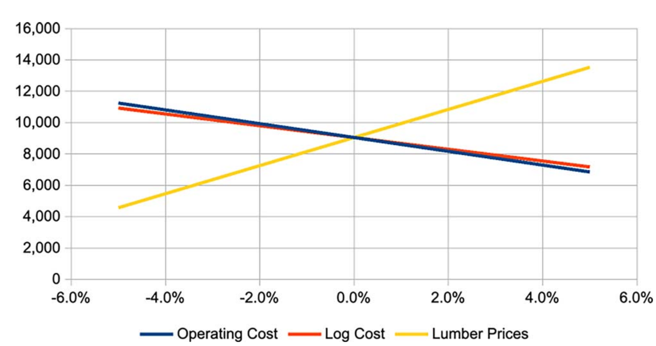

Figure 3.—Profit by percent change in operating cost, log cost, and lumber prices.

Table 2.—Log profit in dollars, by log grade, small-end diameter (SED), and percent change of operating cost. Orange shading indicates where sawing resulted in a loss.

		Operating cost percent change														
Log grade	SED	−20.0%	−15.0%	−10.0%	−5.0%	−2.5%	−0.5%	−0.1%	0.0%	0.1%	0.5%	2.5%	5.0%	10.0%	15.0%	20.0%
Factory-1	13	12.31	9.78	7.24	4.71	3.45	2.44	2.23	2.18	2.13	1.93	0.91	−0.35	−2.88	−5.41	−7.95
	14	14.41	11.48	8.55	5.62	4.16	2.99	2.76	2.70	2.64	2.41	1.23	−0.23	−3.16	−6.09	−9.02
	15	21.62	18.29	14.97	11.64	9.98	8.65	8.39	8.32	8.25	7.99	6.66	4.99	1.67	−1.66	−4.98
	16	27.78	24.06	20.34	16.62	14.76	13.27	12.97	12.90	12.82	12.53	11.04	9.18	5.46	1.73	−1.99
	17	29.64	25.52	21.41	17.29	15.23	13.58	13.25	13.17	13.09	12.76	11.11	9.05	4.93	0.81	−3.31
	18	30.81	26.30	21.78	17.27	15.01	13.20	12.84	12.75	12.66	12.30	10.49	8.24	3.72	−0.79	−5.31
	19	34.10	29.19	24.28	19.36	16.91	14.94	14.55	14.45	14.35	13.96	12.00	9.54	4.63	−0.29	−5.20
	20	38.54	33.23	27.93	22.62	19.97	17.84	17.42	17.31	17.20	16.78	14.66	12.00	6.69	1.39	−3.92
	21	42.90	37.19	31.49	25.78	22.93	20.65	20.19	20.08	19.96	19.51	17.23	14.37	8.67	2.96	−2.74
	22	57.58	51.48	45.38	39.27	36.22	33.78	33.30	33.17	33.05	32.56	30.12	27.07	20.97	14.87	8.77
	23	63.70	57.21	50.71	44.21	40.96	38.36	37.84	37.71	37.58	37.06	34.46	31.21	24.71	18.21	11.72
	24	67.09	60.19	53.30	46.41	42.96	40.20	39.65	39.51	39.37	38.82	36.06	32.62	25.72	18.83	11.93
	25	71.19	63.89	56.60	49.31	45.67	42.75	42.17	42.02	41.88	41.29	38.37	34.73	27.44	20.15	12.86
Factory-2	10	5.81	4.16	2.51	0.86	0.04	−0.62	−0.75	−0.79	−0.82	−0.95	−1.61	−2.43	−4.08	−5.73	−7.38
	11	4.58	2.54	0.49	−1.56	−2.58	−3.40	−3.56	−3.60	−3.64	−3.81	−4.63	−5.65	−7.69	−9.74	−11.78
	12	3.41	0.97	−1.48	−3.92	−5.14	−6.11	−6.31	−6.36	−6.41	−6.60	−7.58	−8.80	−11.24	−13.68	−16.13
	13	3.88	1.04	−1.79	−4.63	−6.05	−7.19	−7.42	−7.47	−7.53	−7.75	−8.89	−10.31	−13.15	−15.99	−18.83
	14	5.54	2.30	−0.94	−4.17	−5.79	−7.09	−7.34	−7.41	−7.47	−7.73	−9.03	−10.64	−13.88	−17.11	−20.35
	15	11.49	7.86	4.23	0.60	−1.22	−2.67	−2.96	−3.04	−3.11	−3.40	−4.85	−6.67	−10.30	−13.93	−17.57
	16	19.47	15.44	11.42	7.39	5.37	3.76	3.44	3.36	3.28	2.96	1.34	−0.67	−4.70	−8.73	−12.76
	17	21.33	16.91	12.48	8.06	5.84	4.07	3.72	3.63	3.54	3.19	1.42	−0.79	−5.22	−9.65	−14.07
	18	26.06	21.24	16.42	11.60	9.18	7.26	6.87	6.77	6.68	6.29	4.36	1.95	−2.87	−7.69	−12.52
	19	29.28	24.07	18.85	13.63	11.02	8.93	8.51	8.41	8.30	7.89	5.80	3.19	−2.03	−7.25	−12.47
	20	36.41	30.80	25.18	19.56	16.76	14.51	14.06	13.95	13.84	13.39	11.14	8.33	2.72	−2.90	−8.51
	21	43.77	37.76	31.75	25.74	22.73	20.33	19.85	19.73	19.61	19.13	16.72	13.71	7.70	1.69	−4.32
	22	60.08	53.67	47.26	40.86	37.65	35.09	34.57	34.45	34.32	33.80	31.24	28.04	21.63	15.22	8.81
	23	69.14	62.33	55.53	48.72	45.32	42.60	42.05	41.92	41.78	41.23	38.51	35.11	28.30	21.50	14.69
	24	76.76	69.55	62.35	55.15	51.55	48.67	48.09	47.95	47.80	47.23	44.35	40.75	33.54	26.34	19.14
Factory-3	8	0.48	−0.69	−1.85	−3.01	−3.59	−4.06	−4.15	−4.17	−4.20	−4.29	−4.76	−5.34	−6.50	−7.66	−8.82
	9	1.39	−0.17	−1.73	−3.29	−4.07	−4.70	−4.82	−4.85	−4.88	−5.00	−5.63	−6.41	−7.97	−9.53	−11.09
	10	5.01	3.05	1.10	−0.86	−1.84	−2.62	−2.78	−2.82	−2.86	−3.02	−3.80	−4.77	−6.73	−8.69	−10.64
	11	5.15	2.79	0.44	−1.91	−3.09	−4.03	−4.22	−4.27	−4.31	−4.50	−5.44	−6.62	−8.97	−11.32	−13.68
	12	7.01	4.26	1.51	−1.24	−2.62	−3.72	−3.93	−3.99	−4.05	−4.27	−5.37	−6.74	−9.49	−12.24	−14.99
	13	10.33	7.18	4.04	0.89	−0.68	−1.94	−2.19	−2.25	−2.32	−2.57	−3.83	−5.40	−8.55	−11.69	−14.84
	14	14.74	11.20	7.66	4.12	2.35	0.93	0.64	0.57	0.50	0.22	−1.20	−2.97	−6.51	−10.06	−13.60
	15	24.10	20.16	16.22	12.28	10.31	8.74	8.42	8.35	8.27	7.95	6.38	4.41	0.47	−3.47	−7.41
	16	33.31	28.98	24.64	20.30	18.14	16.40	16.05	15.97	15.88	15.53	13.80	11.63	7.30	2.96	−1.38
	17	39.71	34.98	30.24	25.51	23.15	21.25	20.87	20.78	20.68	20.31	18.41	16.05	11.31	6.58	1.85
	18	46.79	41.66	36.53	31.40	28.83	26.78	26.37	26.27	26.17	25.76	23.71	21.14	16.01	10.88	5.75
	19	54.34	48.82	43.29	37.76	35.00	32.79	32.35	32.24	32.13	31.68	29.47	26.71	21.18	15.66	10.13
	20	64.29	58.37	52.45	46.52	43.56	41.19	40.72	40.60	40.48	40.01	37.64	34.68	28.76	22.83	16.91

A surprising observation is that with a 15 percent increase in operating cost, 18- and 19-inch SED Factory 1 logs became unprofitable to saw, whereas 16- and 17-inch logs were profitable. There are two factors that interact and lead to this condition. First, the larger-diameter logs are more expensive. Second, across the range of sawlog diameters, there are diameters such that when sawn there is less waste and a greater proportion of the log converted into lumber. Conversely, some log diameters have a greater degree of waste where a lesser proportion of the log is sawn into lumber. Thus, when the increased diameter results in a greater log cost and it is not possible to saw the log into lumber with the same degree of efficiency, the larger-diameter log can result in a loss when sawn.

For USFS Factory Grade 2 logs, all logs with SEDs ≤15 inches were unprofitable to process with the base operating cost (0.0% column, Table 2). Fifteen-inch SED USFS Factory 2 logs became profitable to saw only when operating costs decreased by 5 percent, with an estimated profit of only $0.60 (Table 2). When operating costs increase by 10 percent, sawing logs with SEDs ≤19 inches is unprofitable. A 20 percent increase results in ≥22-inch SED logs to be the only profitable USFS Factory 2 logs (Table 2). Sixteen- and 17-inch SED USFS Factory 2 logs become unprofitable to saw when operating costs increase by ≥5.0 percent. For the conditions in our analysis, ≥20-inch SED USFS Factory 2 logs were more profitable to saw at the base operating cost than USFS Factory 1 logs (Table 2). This is due to the 27 percent higher market price of the USFS Factory 1 logs. However, the higher operating costs had a greater impact on the profitability of USFS Factory 2 logs. Thus, when operating costs increased, USFS Factory 1 logs became more profitable to process than USFS Factory 2 logs.

All USFS Factory Grade 3 logs with SEDs ≤13 inches could not be profitably sawn at the base operating cost (0.0% column, Table 2). USFS Factory 3 13-inch SED logs became profitable to saw only when operating costs decreased by

5 percent (Table 2). Further, the profit for 14-inch logs is negative when operating costs increase by ≥2.5 percent and is just $0.57 at the base operating cost. On the whole, our analysis estimates that sawing larger-diameter (e.g., USFS Factory 3 SED logs >16 in.) may be more profitable than sawing USFS Factory 2 logs of the same size. However, the log population data collected from 42 hardwood sawmills and compiled by Wood et al. (2020) found that only 16 percent of USFS Factory 3 logs had SEDs ≥16 inches and only 8 percent of USFS Factory 3 logs had SEDs ≥18 inches.

Log cost

When examining the effect of log cost changes, the base operating cost of $1,852.47 per hour and unmodified lumber prices as reported in Figure 2 were used. We found that a 0.1 percent decrease/increase in log cost resulted in a plus/minus overall profit difference of approximately 0.41 percent, or $37 (Table 1). As with operating cost, the effect of a change in log cost is magnified with respect to profit. For example, a 1.0 percent change in log cost effects a 4.14 percent difference in profit. Thus, as with operating costs, small changes can lead to statistically significant profitability impacts (Buehlmann and Thomas 2025).

Table 3 lists log profitability by USFS Factory log grade and SED by percent change in log cost. All USFS Factory Grade 1 logs were profitably sawn using the base log costs (column 0.0%, Table 3). When log prices increased by 5.0 percent, 13- and 14-inch SED logs became unprofitable to saw (Table 3). Further increases in log costs had greater impacts on profitability. For example, 15 and 20 percent log cost increases caused ≤21-inch SED logs and all SED logs, respectively, to be unprofitable to saw.

For USFS Factory Grade 2 logs, all logs with SEDs ≤15 inches were unprofitable to process with the base operating cost (0.0% column, Table 3). As with the examination of operating costs, the log cost analyses results indicate that

Table 3.—Log profit in dollars, by log grade, small-end diameter (SED), and percent change of log cost. Orange shading indicates where sawing resulted in a loss.

		Log cost percent change														
Log grade	SED	−20.0%	−15.0%	−10.0%	−5.0%	−2.5%	−0.5%	−0.1%	0.0%	0.1%	0.5%	2.5%	5.0%	10.0%	15.0%	20.0%
Factory-1	13	10.99	8.79	6.59	4.38	3.28	2.40	2.22	2.18	2.14	1.96	1.08	−0.02	−2.23	−4.43	−6.63
	14	13.58	10.855	8.14	5.42	4.06	2.97	2.75	2.70	2.64	2.42	1.34	−0.03	−2.75	−5.47	−8.19
	15	21.48	18.193	14.90	11.61	9.96	8.65	8.39	8.32	8.25	7.99	6.67	5.03	1.74	−1.55	−4.85
	16	28.57	24.647	20.73	16.82	14.86	13.29	12.98	12.90	12.82	12.51	10.94	8.98	5.06	1.15	−2.77
	17	31.56	26.958	22.36	17.77	15.47	13.63	13.26	13.17	13.08	12.71	10.87	8.57	3.98	−0.62	−5.22
	18	34.08	28.746	23.41	18.08	15.42	13.28	12.86	12.75	12.65	12.22	10.09	7.42	2.09	−3.24	−8.57
	19	38.93	32.81	26.69	20.57	17.51	15.06	14.58	14.45	14.33	13.84	11.39	8.33	2.21	−3.91	−10.03
	20	45.16	38.199	31.24	24.27	20.79	18.01	17.45	17.31	17.17	16.62	13.83	10.35	3.38	−3.58	−10.54
	21	51.52	43.659	35.80	27.94	24.01	20.86	20.24	20.08	19.92	19.29	16.15	12.22	4.36	−3.51	−11.37
	22	68.43	59.614	50.80	41.99	37.58	34.06	33.35	33.17	33.00	32.29	28.77	24.36	15.55	6.74	−2.08
	23	76.99	67.167	57.35	47.53	42.62	38.69	37.91	37.71	37.51	36.73	32.80	27.89	18.07	8.25	−1.57
	24	83.03	72.15	61.27	50.39	44.95	40.60	39.73	39.51	39.29	38.42	34.07	28.63	17.75	6.87	−4.01
	25	90.00	78.007	66.01	54.02	48.02	43.22	42.26	42.02	41.78	40.82	36.02	30.03	18.03	6.03	−5.96
Factory-2	10	2.11	1.385	0.66	−0.06	−0.42	−0.71	−0.77	−0.79	−0.80	−0.86	−1.15	−1.51	−2.23	−2.96	−3.68
	11	0.34	−0.65	−1.63	−2.62	−3.11	−3.50	−3.58	−3.60	−3.62	−3.70	−4.10	−4.59	−5.57	−6.56	−7.54
	12	−1.21	−2.50	−3.79	−5.07	−5.72	−6.23	−6.33	−6.36	−6.38	−6.49	−7.00	−7.65	−8.93	−10.22	−11.50
	13	−0.96	−2.59	−4.22	−5.84	−6.66	−7.31	−7.44	−7.47	−7.51	−7.64	−8.29	−9.10	−10.73	−12.36	−13.99
	14	0.63	−1.38	−3.39	−5.40	−6.40	−7.21	−7.37	−7.41	−7.45	−7.61	−8.41	−9.42	−11.43	−13.44	−15.45
	15	6.69	4.262	1.83	−0.61	−1.82	−2.79	−2.99	−3.04	−3.09	−3.28	−4.25	−5.47	−7.90	−10.33	−12.77
	16	14.94	12.041	9.15	6.25	4.81	3.65	3.42	3.36	3.30	3.07	1.91	0.46	−2.43	−5.33	−8.22
	17	17.22	13.822	10.43	7.03	5.33	3.97	3.70	3.63	3.56	3.29	1.93	0.23	−3.16	−6.56	−9.96
	18	22.53	18.592	14.65	10.71	8.74	7.17	6.85	6.77	6.69	6.38	4.80	2.83	−1.11	−5.05	−8.99
	19	26.50	21.975	17.45	12.93	10.67	8.86	8.50	8.41	8.32	7.96	6.15	3.89	−0.64	−5.16	−9.68
	20	34.53	29.386	24.24	19.10	16.52	14.46	14.05	13.95	13.85	13.44	11.38	8.80	3.66	−1.49	−6.63
	21	42.96	37.153	31.34	25.54	22.63	20.31	19.84	19.73	19.61	19.15	16.82	13.92	8.11	2.30	−3.51
	22	60.50	53.98	47.47	40.96	37.70	35.10	34.58	34.45	34.32	33.80	31.19	27.93	21.42	14.91	8.40
	23	70.94	63.683	56.43	49.17	45.54	42.64	42.06	41.92	41.77	41.19	38.29	34.66	27.40	20.15	12.89
	24	80.11	72.068	64.03	55.99	51.97	48.75	48.11	47.95	47.79	47.14	43.93	39.91	31.87	23.83	15.79
Factory-3	8	−3.75	−3.86	−3.96	−4.07	−4.12	−4.16	−4.17	−4.17	−4.18	−4.18	−4.23	−4.28	−4.39	−4.49	−4.60
	9	−4.18	−4.35	−4.52	−4.68	−4.77	−4.83	−4.85	−4.85	−4.85	−4.87	−4.93	−5.02	−5.18	−5.35	−5.51
	10	−1.89	−2.12	−2.35	−2.59	−2.70	−2.79	−2.81	−2.82	−2.82	−2.84	−2.93	−3.05	−3.28	−3.51	−3.74
	11	−2.96	−3.29	−3.62	−3.94	−4.10	−4.23	−4.26	−4.27	−4.27	−4.30	−4.43	−4.59	−4.92	−5.24	−5.57
	12	−2.29	−2.71	−3.14	−3.56	−3.78	−3.95	−3.98	−3.99	−4.00	−4.03	−4.20	−4.42	−4.84	−5.27	−5.69
	13	−0.10	−0.64	−1.18	−1.72	−1.98	−2.20	−2.24	−2.25	−2.26	−2.31	−2.52	−2.79	−3.33	−3.87	−4.41
	14	3.23	2.567	1.90	1.24	0.91	0.64	0.59	0.57	0.56	0.51	0.24	−0.09	−0.76	−1.42	−2.09
	15	11.56	10.758	9.95	9.15	8.75	8.43	8.36	8.35	8.33	8.27	7.94	7.54	6.74	5.93	5.13
	16	19.80	18.842	17.88	16.93	16.45	16.06	15.99	15.97	15.95	15.87	15.49	15.01	14.05	13.10	12.14
	17	25.27	24.149	23.03	21.90	21.34	20.89	20.80	20.78	20.76	20.67	20.22	19.65	18.53	17.41	16.28
	18	31.48	30.18	28.88	27.57	26.92	26.40	26.30	26.27	26.24	26.14	25.62	24.97	23.66	22.36	21.06
	19	38.22	36.724	35.23	33.73	32.98	32.39	32.27	32.24	32.21	32.09	31.49	30.74	29.24	27.75	26.25
	20	47.41	45.71	44.01	42.30	41.45	40.77	40.63	40.60	40.57	40.43	39.75	38.90	37.20	35.49	33.79

USFS Factory 2 SED logs ≥22 inches are more profitable to saw than USFS Factory 1 logs of the same diameter (Table 3). As explained previously, this is largely due to the higher market price of Factory 1 logs.

All USFS Factory Grade 3 logs with SEDs ≤13 inches could not be profitably sawn at the base log cost (0.0% column) or when log costs decreased as much as 20 percent (Table 3). Further, the profit for 14-inch logs is negative when log costs increase by 5.0 percent or more. Additionally, even when log prices decreased as much as 5.0 percent, the estimated profit from a USFS Factory 3 14-inch SED log was only $1.24 (Table 3). Logs ≥15 inches SED were sawn profitably even when log costs increased by as much as 20 percent.

Lumber prices

We used the base operating cost of $1,852.47 per hour and unmodified log costs when examining the effect of lumber value changes. We found that a 0.1 percent decrease/increase in lumber prices resulted in a plus/minus profit difference of approximately $89 or 0.99 percent (Table 1). As with operating and log costs, the effect of a change in lumber prices is magnified with respect to profit. For example, a 1.0 percent change in lumber prices effects a 9.90 percent difference in profit. As with operating and log costs, small changes in lumber prices are likely to have statistically significant impacts on profitability (Buehlmann and Thomas 2025).

For USFS Factory 1 logs all SEDs could be profitably sawn with the base lumber prices (0.0% Column, Table 4). Only when lumber prices decreased ≥2.5 percent did the 13- and 14-inch SEDs become unprofitable to saw (Table 4). Lumber price decreases of ≥15 percent caused all USFS Factory 1 logs to be sawn unprofitably.

When lumber prices increased by 5.0 percent, USFS Factory 2 15-inch SED logs and larger SEDs were profitable (Table 4). Decreases of 5 percent in lumber prices resulted in all SED logs up to 19 inches being unprofitable. Further,

Table 4.—Log profit in dollars, by log grade, small-end diameter (SED), and percent change of lumber prices. Orange shading indicates where sawing resulted in a loss.

		Lumber price percent change														
Log grade	SED	−20.0%	−15.0%	−10.0%	−5.0%	−2.5%	−0.5%	−0.1%	0.0%	0.1%	0.5%	2.5%	5.0%	10.0%	15.0%	20.0%
Factory-1	13	−16.91	−12.14	−7.37	−2.59	−0.21	1.70	2.09	2.18	2.28	2.66	4.57	6.95	11.73	16.50	21.28
	14	−20.13	−14.42	−8.72	−3.01	−0.16	2.12	2.58	2.70	2.81	3.27	5.55	8.40	14.11	19.82	25.52
	15	−19.50	−12.54	−5.59	1.37	4.84	7.62	8.18	8.32	8.46	9.02	11.80	15.27	22.23	29.18	36.14
	16	−19.91	−11.71	−3.51	4.70	8.80	12.08	12.74	12.90	13.06	13.72	17.00	21.10	29.30	37.51	45.71
	17	−23.97	−14.68	−5.40	3.88	8.53	12.24	12.98	13.17	13.36	14.10	17.81	22.45	31.74	41.02	50.30
	18	−28.79	−18.40	−8.02	2.37	7.56	11.71	12.54	12.75	12.96	13.79	17.95	23.14	33.52	43.91	54.29
	19	−31.95	−20.44	−8.93	2.58	8.34	12.94	13.86	14.45	14.32	15.62	19.85	25.61	37.12	48.63	60.14
	20	−34.77	−21.75	−8.73	4.29	10.80	16.01	17.05	17.31	17.57	18.61	23.82	30.33	43.35	56.37	69.39
	21	−37.71	−23.27	−8.82	5.63	12.85	18.63	19.79	20.08	20.37	21.52	27.30	34.53	48.97	63.42	77.87
	22	−32.64	−16.19	0.27	16.72	24.95	31.53	32.84	33.17	33.50	34.82	41.40	49.63	66.08	82.53	98.99
	23	−34.58	−16.51	1.56	19.64	28.67	35.90	37.35	37.71	38.07	39.52	46.75	55.78	73.86	91.93	110.00
	24	−38.93	−19.32	0.29	19.90	29.70	37.55	39.12	39.51	39.90	41.47	49.32	59.12	78.73	98.34	117.95
	25	−42.24	−21.15	−0.06	21.04	31.58	40.02	41.70	42.02	42.55	44.15	52.67	63.22	84.31	105.40	126.50
Factory-2	10	−9.93	−7.64	−5.35	−3.07	−1.93	−1.01	−0.83	−0.79	−0.74	−0.56	0.36	1.50	3.79	6.07	8.36
	11	−14.78	−11.99	−9.19	−6.40	−5.00	−3.88	−3.66	−3.60	−3.55	−3.32	−2.20	−0.81	1.99	4.78	7.58
	12	−19.75	−16.40	−13.05	−9.70	−8.03	−6.69	−6.43	−6.36	−6.29	−6.02	−4.68	−3.01	0.34	3.69	7.03
	13	−23.56	−19.54	−15.52	−11.49	−9.48	−7.87	−7.55	−7.47	−7.39	−7.07	−5.46	−3.45	0.57	4.60	8.62
	14	−26.60	−21.81	−17.00	−12.21	−9.81	−7.89	−7.50	−7.41	−7.31	−6.93	−5.01	−2.61	2.19	6.99	11.79
	15	−26.38	−20.54	−14.71	−8.87	−5.95	−3.62	−3.15	−3.04	−2.92	−2.45	−0.12	2.80	8.63	14.47	20.30
	16	−24.69	−17.68	−10.67	−3.66	−0.15	2.66	3.22	3.36	3.50	4.06	6.86	10.37	17.38	24.39	31.40
	17	−28.03	−20.11	−12.20	−4.28	−0.33	2.84	3.48	3.63	3.79	4.42	7.59	11.55	19.46	27.38	35.29
	18	−29.24	−20.24	−11.23	−2.23	2.27	5.87	6.59	6.77	6.96	7.68	11.28	15.78	24.78	33.78	42.79
	19	−31.81	−21.76	−11.70	−1.65	3.38	7.40	8.21	8.41	8.61	9.41	13.44	18.46	28.52	38.57	48.63
	20	−31.42	−20.08	−8.74	2.61	8.28	12.82	13.72	13.95	14.18	15.08	19.62	25.29	36.64	47.98	59.32
	21	−31.01	−18.33	−5.64	7.04	13.38	18.46	19.47	19.73	19.98	21.00	26.07	32.41	45.09	57.78	70.46
	22	−23.64	−9.12	5.40	19.92	27.18	32.99	34.15	34.45	34.73	35.90	41.70	48.97	63.49	78.01	92.53
	23	−22.20	−6.17	9.86	25.89	33.90	40.31	41.59	41.92	42.24	43.52	49.93	57.94	73.97	90.00	106.03
	24	−22.05	−4.55	12.95	30.45	39.20	46.20	47.60	47.95	48.29	49.70	56.70	65.45	82.94	100.44	117.95
Factory-3	8	−8.24	−7.23	−6.21	−5.19	−4.68	−4.27	−4.19	−4.17	−4.15	−4.07	−3.66	−3.16	−2.14	−1.12	−0.10
	9	−10.60	−9.16	−7.72	−6.29	−5.57	−4.99	−4.88	−4.85	−4.82	−4.71	−4.13	−3.41	−1.98	−0.54	0.90
	10	−10.82	−8.82	−6.82	−4.82	−3.82	−3.02	−2.86	−2.82	−2.78	−2.62	−1.82	−0.82	1.18	3.18	5.18
	11	−13.90	−11.50	−9.09	−6.68	−5.47	−4.51	−4.31	−4.27	−4.22	−4.02	−3.06	−1.86	0.55	2.96	5.37
	12	−15.64	−12.73	−9.82	−6.90	−5.45	−4.28	−4.05	−3.99	−3.93	−3.70	−2.54	−1.08	1.83	4.75	7.66
	13	−16.26	−12.76	−9.26	−5.76	−4.00	−2.60	−2.32	−2.25	−2.18	−1.90	−0.50	1.25	4.75	8.25	11.75
	14	−16.07	−11.91	−7.75	−3.59	−1.51	0.16	0.49	0.57	0.66	0.99	2.65	4.73	8.89	13.05	17.21
	15	−11.99	−6.91	−1.82	3.26	5.80	7.84	8.24	8.35	8.45	8.85	10.89	13.43	18.51	23.60	28.68
	16	−8.08	−2.07	3.94	9.96	12.96	15.37	15.85	15.97	16.09	16.57	18.97	21.98	27.99	34.00	40.02
	17	−6.45	0.36	7.16	13.97	17.37	20.10	20.64	20.78	20.92	21.46	24.18	27.58	34.39	41.20	48.01
	18	−4.32	3.33	10.97	18.62	22.45	25.51	26.12	26.27	26.42	27.04	30.10	33.92	41.56	49.21	56.86
	19	−1.87	6.66	15.19	23.71	27.97	31.38	32.07	32.24	32.41	33.09	36.50	40.76	49.29	57.81	66.34
	20	2.43	11.98	21.52	31.06	35.83	39.65	40.41	40.60	40.79	41.56	45.37	50.14	59.68	69.23	78.77

lumber price decreases of ≥15 percent resulted in all USFS Factory 2 logs becoming unprofitable to saw.

All SED USFS Factory 3 logs ≤13 inches resulted in a loss when sawn at base lumber prices (Table 4). When lumber prices decreased by ≥2.5 percent, 14-inch SED logs became unprofitable to saw. Lumber price decreases of 20 percent resulted in only the 20-inch SED USFS Factory 3 log being profitable to saw. Lumber price increases of 20 percent resulted in only the 8-inch SED USFS Factory 3 log being unprofitable to saw.

Discussion

Table 5 reports the number of times any log grade and SED combination went from being profitable to saw at the base cost/price factors to unprofitable given a change to a single factor. The analysis presented here examined a total of 123 log grade and SED combinations. A 2.5 percent change in cost/price factors resulted in a total of six log grade and SED combinations moving to a loss situation. Additionally, 5 and 10 percent changes in the factors resulted in 9 and 17 log grade and SED combinations, respectively, changing to a loss (Table 5). Overall, cost/price factor changes of ≤5 percent resulted in a total of 15 (12.2%) of all log grade SED combinations moving to a loss (Table 5). Changes in the cost/price factors of 10, 15, and 20 percent resulted in 17, 20, and 14, respectively, log grade and SED combinations being at a loss when sawn (Table 5). Overall, either increased operating costs, log costs, or decreased lumber prices resulted in 65 of the 123 log grade and SED combinations being at a loss when sawn.

Thus, although a change to a cost/price factor may be statistically significant, it does not result in large changes to what a hardwood sawmill regards as a break-even log. However, cost factor changes like those seen by sawmills recently with respect to logs (Fig. 1, Kentucky Division of Forestry 2023, 2024), operating costs (HMR 2024a), and lumber prices (HMR 2024b) are likely to change the break-even log definitions of most hardwood sawmills.

As operating and log costs decrease or lumber prices increase, mill profitability will necessarily improve and change the definition of the break-even log. Table 6 reports the number of times any log grade and SED combination went from resulting in a loss at the base cost/price factors to being sawn at profit due to changes in the factors. At the base operating cost, which was set to yield a 10 percent profit given current market prices for logs and lumber, there were 12 combinations that resulted in a loss when sawn (Tables 2 through 4). When operating costs decreased by as much as 10 percent, 7 of the 12 combinations became profitable (Tables 2 and 6). When operating costs had decreased by 20 percent, all logs were profitable. Decreased log cost had the least effect, with only two combinations becoming profitable with a 10 percent decrease, and two more with a 20 percent decrease. Increased lumber prices had the greatest effect, with all 12 log combinations becoming profitable with a 10 percent increase (Tables 3 and 6).

Table 5.—Number of times a profitable log changed to a loss log by cost factor, log grade, and percent change.

Cost factor	Log grade	Number of changes to loss by cost factor percent change				
		2.5%	5.0%	10.0%	15.0%	20.0%
Operating cost	Factory 1		2		3	4
	Factory 2		2	2	1	1
	Factory 3	1			1	1
Log cost	Factory 1		2		7	4
	Factory 2			4	1	1
	Factory 3		1			
Lumber price	Factory 1	2		8	3	
	Factory 2	2	2	2	3	
	Factory 3	1		1	1	3
	Total	6	9	17	20	14

Table 6.—Number of times a loss log changed to a profitable log by cost factor, log grade, and percent change.

Cost factor	Log grade	Number of changes to profit by cost factor percent change				
		2.5%	5.0%	10.0%	15.0%	20.0%
Operating cost	Factory 1					
	Factory 2	1	1	1	3	
	Factory 3		1	3		2
Log cost	Factory 1					
	Factory 2			2		2
	Factory 3					
Lumber price	Factory 1					
	Factory 2		4	4		
	Factory 3		1	3		1
	Total	1	7	13	3	5

Conclusions

The break-even log analysis presented in this study represents the costs, market prices, and processing setup of a hypothetical mill modeled after actual processing configurations. Further, current market prices for lumber, logs, and residue were used in this analysis. Thus, the setup of the mill, the market costs, and processing volumes reflect a specific instance of a processing environment. It is unlikely that a sawmill will have the exact costs and processing setup as our hypothetical sawmill. In addition, it is extremely unlikely that any two hardwood sawmills would have nearly identical economic and processing conditions. However, this does not prevent an operation from using LORCAT in combination with their mill specifications, costs, and lumber process to identify which logs are profitable and those that will likely result in a loss.

While performing the analysis presented here we also examined different levels of profit, including no profit in combination with 8 MMBF and 4 MMBF of annual production and different processing setups. In this series of analyses the same trends emerged, in essence if a log can be profitably sawn at the base operating cost, log cost, or lumber price, then cost factor changes as much as 5 percent are unlikely to alter the profitability of any log. However, as reported by Buehlmann and Thomas (2025), such changes will have a significant impact on overall mill profitability.

Earlier hardwood break-even studies (Adams, 1970, 1972; Adams and Dunmire 1977) were concerned with identifying how much could be paid for a hardwood log on the basis of the expected resulting product value and processing cost. Bond (2007) discussed a similar approach using mill studies and detailed operating cost analyses. This study took a different approach and examined which log diameters and grades were profitable or unprofitable to process on the basis of changes to costs or lumber market values. As such, the results of this study can be used to determine when the characteristics of the break-even log need to be re-evaluated to ensure a continued profitable operation.

In this paper we limited our analysis to examining the impact of cost and price factors individually. The interactions between these factors can either multiply or nullify any differences with respect to profitability and the break-even log. These interactions and their impact deserve additional study.

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