Oregon State University
School of Business

Studies in Management and Accounting for the

FOREST PRODUCTS INDUSTRIES

A Decision Framework for Trading Lumber Futures

by

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PREFACE

Lumber producers, wholesalers, and end users have two markets at their disposal: the cash market, in which lumber and cash actually change hands, and the futures market, in which *promises* for lumber and cash are exchanged. The two markets, when properly used, complement one another and provide a stabilizing influence on profit margins.

It is our purpose in this monograph to help financial and other executives of lumber producing firms understand how the cash and futures markets can be used in tandem to minimize the harmful effects of wide swings in the price of lumber. Basically, the objective is to define relationships that exist between noncontract and contract grade lumber prices and explain how these relationships are related to the price of a futures contract near expiration. Through an evaluation of these relationships, a producer can determine the probability that a futures market gain will offset a cash market loss. In effect, he sets up a decision framework for trading lumber futures that will leave profit margins relatively unscathed in spite of declining prices. Although our discussion is presented from a producer's viewpoint, the principles are generally applicable to wholesalers and end purchasers as well.

When futures trading in plywood and lumber was initiated in 1969, the potential use of this tool was virtually unknown within the industry. The School of Forestry of Oregon State University took an immediate interest in commodity futures because of a solid conviction that futures markets would offer the lumber industry a management tool with a wide range of potential marketing applications. Through its Forestry Extension Program, the university developed a plan of activities designed to introduce futures trading to the lumber industry and to educate companies in its implications for management. As a complement to the Extension Program, the School of Forestry undertook a research project designed to develop guidelines for trading lumber futures. These guidelines provide the basis for this monograph.

We should like to point out that, although many of the principles of futures trading for plywood are analogous to those for lumber, the contract delivery specifications for plywood (including use of a shipping certificate) create different trading opportunities and therefore deserve treatment in a separate publication. Good, general coverage of plywood futures (without statistical analysis of price relationships or convergence experience) can be found in two booklets published by the Chicago Board of Trade: *Trading in Plywood Futures* by Roger W. Gray and *Hedging: Plywood Futures* by Robert W. Radoll.

Those interested in a general introductory explanation of factors affecting lumber and lumber futures prices and of how lumber futures can be used by mills, wholesalers, and retailers to reduce price risk are referred to a booklet published by the Chicago Mercantile Exchange: *Fundamental Factors Affecting Lumber*. Taken together, that booklet and this more specialized monograph present a fairly comprehensive treatment of the complex subject of lumber futures trading.

Special thanks are extended to the Chicago Mercantile Exchange for its encouragement and support of the School of Forestry in its research project from which this monograph stems. The Exchange's award of a Fellowship in futures to the major author is particularly appreciated. A debt of gratitude to J. Michael Connolly of Peavey Company is also acknowledged for his help in developing and refining the ideas presented here.

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A DECISION FRAMEWORK FOR TRADING LUMBER FUTURES

by Hal K. Kingslien* and
Robert O. McMahon

THE CASH LUMBER MARKET

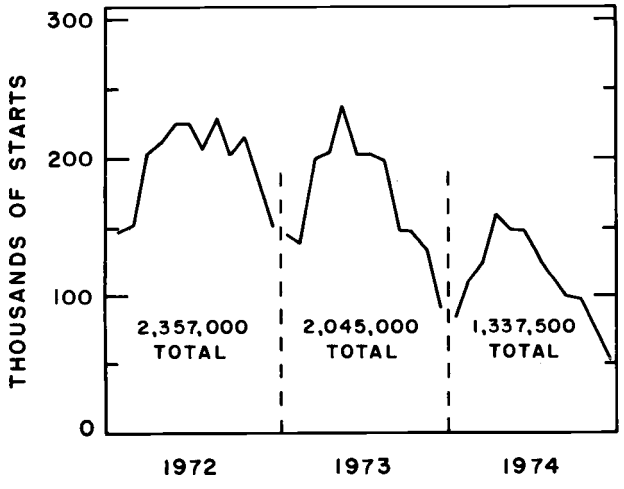
During 1972, housing was enjoying the greatest boom of its history. By 1973, the demand for lumber had driven prices to such high levels that even the most hardbitten, unshakable lumberman was experiencing dizzy spells. The lumber industry adjusted to the new revenue levels by paying higher stumpage prices and labor wages and by building new facilities and increasing existing capacity.

Then the bottom fell out. Between 1972 and 1974 housing starts fell by 50 percent (see Exhibit 1). Prices plummeted and revenues shrank as the flow of product from mills turned to a trickle.

During the boom, stumpage prices rose as producers aggressively tried to secure a timber source for the coming years of presumed prosperity. They committed their cash in the belief that lumber prices would stay high enough to cover the cost of raw material, milling, and selling, in addition to providing a profit. Producers accepted the risk of price decline, and by early 1975, when the risk turned to reality (see Exhibit 2), many companies were in serious financial straits. Lumber prices fell as rapidly as they had risen, but stumpage and milling costs remained at the lofty levels of the boom years. Profit margins were squeezed, and in some instances lumber was sold at a loss to generate cash flow for immediate needs. Shutdowns spread throughout the industry as harsh steps were taken to limit losses.

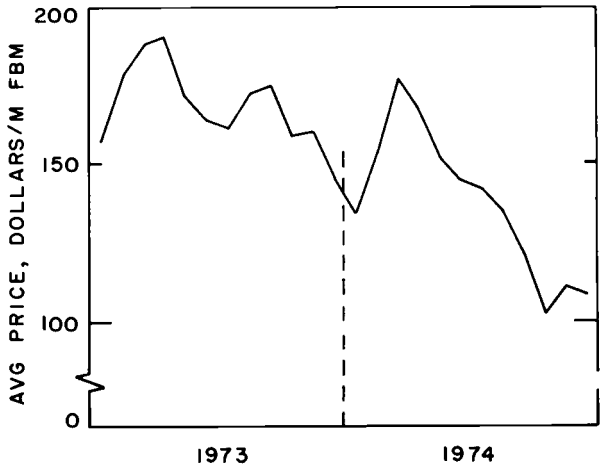
In addition to creating immediate cash flow problems, variations in the cash market can seriously disrupt plans for modernization and expansion—plans that cannot be financed with negative cash flows. If a company waits for an improved market to generate cash and liquidity for capital

Exhibit 1. **PRIVATE HOUSING STARTS***



* From *Random Lengths Yearbook 1974,* a publication of Random Lengths Publishing Company, Eugene, Oregon.

Exhibit 2. **MONTHLY PRICE OF K.D. R/L STD & BTR HEM-FIR (INLAND) 2x4***



* From *Random Lengths Yearbook 1974.*

* Mr. Kingslien, now with Peavey Company, Commodity Services, was a graduate assistant in the Forest Products Department of OSU's School of Forestry while working on the research project on which this monograph is based.

investment, chances are that by the time this is accomplished, the next boom will be half over and the company will have passed up some profitable sales. Company profitability could be vastly improved if alternative sources of cash flow were available when they are most needed—that is, during a slump.

A company that does not protect itself from the vagaries of the cash lumber market is destined to be whipsawed through the booms and busts of economic cycles. These cycles are not likely to stabilize in the future, and, as a result, lumber prices will continue to vary. Money will flow from one segment of the economy to another, depending on the rate each segment is willing to pay. Mortgage credit will surge and ebb as interest rates vary, and residential construction activity will continue to fluctuate.

It is not the actual variation in price that is of such concern to lumber executives, but rather the effects these variations have on profits. Because variations are not subject to company control, a compensating mechanism is needed to cancel any detrimental effects. In other words, for every dollar lost in the cash market, a company needs automatically to gain a compensating dollar in another market. This is known as hedging. Its purpose is to reduce a firm's price-risk level by reducing the risk associated with cash price fluctuations.

FUTURES TRADING IN LUMBER

Hedging

Lumber futures trading is used to offset the consequences of price fluctuations and to improve profitability. But before we get into a discussion of how this works, some basic terminology must be defined:

Lumber futures contract: An agreement between two parties that one will buy and the other will sell, at a specified time and price, 100,000 board feet of kiln or air dried Hem-Fir 2 x 4's of random lengths (8 to 20 feet). (For complete specifications of the lumber contract, the reader is referred to *Futures Trading in Lumber: Rules and Specifications for Lumber Futures,* issued periodically by the Chicago Mercantile Exchange.)

Contract grade: The species, size, and grade as specified in the contract. Commonly referred to as 2 x 4, R/L, Kiln Dried, Hem-Fir lumber of STD & BTR grade.

Noncontract grade item: Lumber that is different in species, size, or grade from that specified in the lumber futures contract.

Cash price: The actual market price of the contract grade of lumber.

Futures price: The market price of a futures contract.

Hedging: Making a commitment in the cash market (buying or selling actual lumber) and an *opposite commitment* in the futures market (selling or buying futures contracts).

The theory of hedging is based on the assumption that the cash price and the futures price fluctuate in a like manner. A price fluctuation that results in a loss in the cash market will be offset by a gain in the futures market. A simple example illustrates this point:

Cash Market	**Futures Market**
In August, a mill commits itself to produce lumber at a cost of $120/M Fbm	In August, the mill sells November futures contracts at a price of $140/M Fbm

The intended profit margin is:

Sold @ $140/M Fbm (Futures Market)
Cost @ $120/M Fbm (Cash Market)

Profit margin $20/M Fbm

If by November, the cash market price has deteriorated to $110 M Fbm, there is the following result:

The mill sells lumber it produced into the cash market at a price of $110/M Fbm		The mill buys back its futures contract at a price of $110/M Fbm	
Cost @ $120/M Fbm		Sold @ $140/M Fbm	
Sold @ $110/M Fbm		Bought @ $110/M Fbm	
Cash Profit	$(–10)/M $(–10)/M Fbm	Futures Gain	$30/M Fbm

Cash market profit + futures market profit = net realized profit
$(–10) + $30 = $20/M Fbm

This is the theory. But in real life, the futures contract price may not decline to a level equal to the cash price. The expected futures gain might

therefore be more or less than $30/M Fbm. As a consequence, the net realized profit margin might be more or less than $20/M Fbm.

Regardless of the reality of a situation, the *contract grade producer* is in an excellent position to deal effectively with the situation because he is actually able to deliver against a futures contract. When he sells a lumber futures contract at $140/M Fbm, he makes a commitment to deliver the contract grade lumber to the buyer for $140/M Fbm. If, in the above example, the futures price declined to only $120/M Fbm and the mill bought back its futures commitment at that price, it would have only a $20/M Fbm futures gain ($140 – $120 = $20). The net realized profit would be only $10/M Fbm (–$10 + $20 = $10). But a contract grade producer, rather than buying back his contract, could choose to deliver the contract grade lumber to fulfill his contract obligation. He would receive $140/M Fbm and thereby obtain the expected $20/M Fbm profit margin.

In other words, the contract grade producer "locks in" his profit. He is the only lumber producer capable of delivering against the contract and the only one who can make *opposing commitments* in the markets and stick to them, regardless of market variation.

But the fact that contract grade producers are the only ones who can "lock in" profit does not in any way preclude noncontract grade producers, wholesalers, or end purchasers from trading lumber futures as a prudent and profitable business practice. Judicious use of the lumber futures market by noncontract grade producers can result in much the same effect as hedging does for contract grade producers—that is, losses in the cash market may be offset by gains in the futures market. With this goal in mind, the futures trading manager must evaluate each trading opportunity and determine the likelihood of a futures market trade offsetting a potential cash market loss.

Price relationships

An accurate evaluation of a trading opportunity requires that the trading manager know something about relationships between cash prices, noncontract grade prices, and futures prices. Statistical analysis of these prices has confirmed the existence of two primary relationships on which a decision framework can be built:

Noncontract grade and contract grade cash prices are positively correlated.

Prices of expiring futures contracts tend to converge with the cash price.

Statistical analysis has further indicated that there is a low correlation between cash and futures prices and that specific seasonal basis patterns are not well defined at this time.

In the cash market, noncontract grades are related to the contract grade. When the price of the contract grade goes up, the noncontract grade price rises with it. Because of idiosyncracies in the market, however, the prices may not rise by equal amounts. When the contract grade changes by $10, the noncontract grade may change by only $8. The correlation between these prices can be determined by statistical methods, so that if the contract grade price is known, reasonable predictions of noncontract grade prices can be made.

The conversion tables presented in the Appendix can be used to evaluate the potential benefits of futures trades. They are derived from the correlation between contract grade and noncontract grade prices, net of cash discounts. Although coast Hem-Fir is now deliverable against the contract, price relationships in the conversion tables are based on inland Hem-Fir as the contract grade. Weekly price data were obtained from *Random Lengths* for the period January 5, 1973, through December 27, 1974.* Prices were limited to this post-price-control era because investigation indicated that the structure of price relationships before and during the price-control period of 1971-73 was substantially different from that which has prevailed since controls ended.

Because price relationships do change over time in response to changes in fundamental conditions, data in the tables must be updated periodically—probably on a yearly schedule—to assure accuracy of predicted results. Investigation shows, however, that such change is relatively slow, at least in the absence of radical changes in price-determining factors, thus giving credence to the belief that results can be expected to be reasonably accurate for a period of up to a year beyond the base period of the tables.

The conversion tables show predicted prices of 31 noncontract items for any given contract

* Companies whose price experience differs markedly from prices reported in *Random Lengths* should construct their own tables (and update them periodically) so as to reflect their individual circumstances.

grade price. The *predicted* price depends upon the *cash* price and is shown for each dollar increment of the cash price from $95 to $221.

For example, to find the predicted price of 2 x 4 R/L Kiln Dried, Std & Btr, Douglas-fir lumber, proceed in the following manner (assume a contract grade price of $135/M Fbm):

- On the first page of the Appendix note the number corresponding to the grade of lumber specified above. It is item number 13.
- The contract grade prices are listed in the far left-hand column of the conversion tables. Find $135 in this column as it pertains to item 13 (see page 16).
- Move across the $135 row to the column representing item 13. The table entry is $143. This means that if the contract grade is selling at $135/M Fbm, item 13 is predicted to be selling at $143/M Fbm.

When the contract grade sells at $135/M Fbm, item 13 often sells at more or less than its predicted value. Therefore, how much confidence can users have that predicted prices are accurate? To help answer this question, we have included an "S" value at the top of each item column—a figure that is a measure of how much and how often the actual price of the item is different from its predicted price. If the user adds the value of "S" to the predicted price, he can be approximately 85-percent confident that the actual price will be less than the resulting sum.* Conversely, if the user subtracts the value of "S" from the predicted price, he can be approximately 85-percent confident that the actual price will be greater than the resulting difference.

To continue our example, then, the cash price of item 13 is $135/M Fbm, the predicted price is $143/M Fbm, and the "S" value is 6.40. Using the "S"-value principle described above, the user can be 85-percent confident that the actual price will be less than $149.40 ($143.00 + $6.40). Likewise, he can be 85-percent confident that the price will be greater than $136.60 ($143.00 – $6.40).

By adding or subtracting more than one unit of "S" from the predicted price, the user can be even more confident with regard to his conclusions. If he adds 1.28 units of "S" (i.e., 1.28 × $6.40 = $8.19) to the predicted price, he can be 90-percent confident that the actual price will be below the resulting total. The units of "S" to be added or subtracted and the corresponding confidence levels that can be assumed are as follows:

Units of "S"	Confidence Level (%)
0.52	70
0.67	75
0.84	80
1.04	85
1.28	90
1.64	95
2.06	98

In the foregoing example, we have described the relationships between the cash price and non-contract grade prices of a particular item. How such relationships are used to evaluate a lumber futures trading opportunity will be explained. But before discussing evaluation techniques it is necessary to understand the relationship of the cash price and the futures price.

When a futures contract nears its expiration date, the contract price and the cash price tend to converge. Convergence occurs because the futures and cash markets become one. In the futures market, promises to buy and sell lumber are made good and actual cash and lumber change hands, as in the cash market. If, near the expiration date of a contract, the futures market price is substantially different from the cash market price, producers will sell into the higher-priced market and users will buy from the lower-priced market. Demand will therefore be concentrated in the lower-priced market and will tend to drive that market's price upward. The higher-priced market, meanwhile, will experience little demand and the fact that there are many willing sellers will tend to drive that market's price downward. As the higher price falls and the lower price rises, equality of price is achieved and convergence occurs.

Occasionally, this natural market mechanism is not completely effective. Failures are rare, however, and the amount by which convergence fails to occur is usually not large. (Exhibit 3 illustrates the strong tendency of prices to converge and the amounts by which complete convergence failed to occur.) Because of this strong tendency of prices to converge, it is assumed in this monograph that the contract grade cash price and the price of the

* For an 85-percent confidence level, 1.04 times the value of "S" would be more exact. However, for illustrative purposes, 1.00 times the value of "S," or simply the value of "S," is used.

Exhibit 3. CONVERGENCE OF FUTURES CONTRACT AND CASH PRICES AS EXPIRATION DATE IS REACHED.*

(.. indicates complete convergence some time during the last two weeks of the contract.)

	Contract Expiration					
	Jan	**Mar**	**May**	**Jul**	**Sep**	**Nov**
1971	..	..	..	..	..	..
1972	..	..	..	..	..	..[1]
1973	..	..	..	**–0.84**[2]	**–5.40**[2]	**–6.80**[2]
1974	..	..	..	..	..	..

[1] There were factors affecting the market during this time that caused a two-tiered market. The futures price followed the market for unallocated production.

[2] The closest these contracts came to convergence in the last two weeks of the contract.

* From *Chicago Mercantile Exchange Yearbooks*, 1969-1974, and *Random Lengths*.

expiring futures contract will converge sometime during the last two weeks the contract is traded.

Before we continue, a word of caution is in order. The relationships described between contract and noncontract grade prices and between contract grade and expiring futures contract prices are based on what has happened in the past. Relationships such as those described above should be reviewed periodically to detect changes as they occur.

Developing a trading strategy

The purpose of trading futures contracts is to increase the likelihood of obtaining a profit margin (per unit return on sales) that may not be obtainable from cash market sales alone. For a company that uses futures markets, the net realized profit margin is the algebraic sum of futures and cash profits (or losses). The selling price of futures will determine the amount of futures profit; the higher the selling price, the more profitable the trade, the better the net profit margin.

Each company has, or should have, determined an acceptable profit margin that will result in an adequate return on investment. This will be referred to as a desired profit margin and should be thought of as the goal of the futures trader. One must remember that the point of futures trading is to minimize the detrimental effects of price variations, but that, in so doing, the windfall gains that occasionally occur when market prices skyrocket may be reduced. Stable profit margins have their cost, but, usually, stability and reduced risk are important to long-run profitability.

The manager of futures trading should forecast market prices for the next six to eight months. If he is nearly positive that cash and futures prices will rise, he may wish to defer the selling of futures until they rise to a more profitable level. This kind of reasoning is valid if it is January and futures and cash prices are below the cost of production. It is not as valid if it is August and futures are selling at a level substantially above the cost of production. In the first instance, there is little to be lost by waiting and much to be gained. The opposite is true in the second instance.

Calculating a desired futures price

The following equation can be used to calculate a desired futures selling price.

Desired profit margin (PM)	+	Cost of production (C)	–	Adjustment factor for item(s) produced (d)	=	Futures price (FP)

The desired profit margin and cost of production on a per-thousand-board-foot basis are determined internally by the company. The adjustment factor—"d"—relates the item or items produced to the contract grade and compensates for price differentials between items. The adjustment factor also determines the confidence users may have that the futures selling price (FP) will adequately offset a cash market loss, should one occur.

To determine the value of "d," use the Appendix to find the production cost of the item and the contract-grade equivalent price. Calculate the difference between the two prices and subtract from this difference the number of units of "S" to obtain the desired level of confidence. In equation form:

$$d = \frac{\text{Cost/M Fbm item produced}}{} - \frac{\text{Contract grade equivalent}}{} - \text{Units of "S"}$$

If the average cost per thousand for item 13 is $135, the cash price equivalent is $127 (see page 16). Therefore, a "d" value that provides an 85-percent confidence level is calculated as follows:

$$d = \$135 - \$127 - \$6.40$$
$$d = \$8 - \$6.40$$
$$d = \$1.60$$

A futures selling price for a company that produces item 13 and has a target profit margin of $15 is:

$$FP = PM + C - d$$
$$FP = \$15 + \$135 - \$1.60$$
$$FP = \$148.40$$

The company can conclude that if it sells futures at $148.40 there is an 85-percent level of confidence that a $15 profit margin will be achieved, even if cash prices fall below the cost of production.* The examples that follow illustrate how and why this would take place.

HYPOTHETICAL CASES

Single-item producer

In June, the XYZ Lumber Company forecasts that the cost of producing item 13 during the next six months (based on delivered log costs, milling costs, etc.) will be $135/M Fbm. The futures trading manager, having calculated the desired futures price to be $148.40, sells November futures at $148.40/M Fbm. At this point, his cash and futures accounts are as follows (figures in $/M Fbm):

Cash	Futures
Committed to produce lumber at $135.00	Sold November futures at $148.40

His desired profit margin is $15 per thousand board feet.

If the cash price drops to $110 in November, the November futures will probably drop to $110 and converge with the expiring November contract. If the cash price is $110, the price of item 13 is predicted to be $118. With an 85-percent confidence level, it will be above $111.60 ($118.00 – $6.40). If this "worst-case" occurs—the $135 lumber is sold at $111.60 and the futures are bought back at $110—the accounts will be as follows:

Cash		Futures	
Produced lumber at	$135.00	Sold November futures at	$148.40
Sold lumber at	$111.60	Bought back at	$110.00
Cash profits (loss)	($ 23.40)	Futures profits (loss)	$ 38.40

Cash Profits (Loss)	$(23.40)
Futures Profits (Loss)	38.40
Net Profit Margin	$ 15.00

Calculating a probable profit margin

The skeptical reader will quickly point out that futures cannot always be sold at the desired level of $148.40. November 1974 futures climbed to $143 in June 1974, but subsequently slipped from that high, making a desired level of $148.40 a virtual impossibility.

Now the problem becomes one of salvaging as much margin as possible. A margin that has decreased from $15 to around $5 is not pleasing, but it is certainly desirable when compared with losses of $20 to $25 or more when cash prices fall through the floor.

In June 1974, a futures trading manager had two alternatives: (1) sell futures and protect a less-than-desired profit margin, or (2) not sell futures and speculate that the cash market would improve. To make a decision, it was necessary to calculate the margin that would probably result if he sold futures. The November futures during the week ending June 14, 1974 sold between $143 and $133. Let's assume that he could have sold at the average price of $138. To calculate the profit margin that could be expected, he would use the rearranged futures selling-price formula.

$$PM = FP - C + d$$
$$PM = \$138.00 - \$135.00 + \$1.60$$
$$PM = \$3.00 + \$1.60$$
$$PM = \$4.60$$

With 85-percent confidence, he could expect to receive a margin of $4.60 if he sold futures at $138. In a like manner, the expected profit margin could be calculated for any futures price.

The calculated margin of $4.60 was not the desired margin; but the painfully obvious conclusion

* This conclusion assumes that the contract grade price and futures price converge at the time the lumber is sold and futures are bought back.

by November 1974 was that futures trading, while certainly not a cure-all, could and did help many companies remain solvent during lean months by providing a meager profit where there might have been a substantial loss.

Multiple-item producer

Through the foregoing discussion and examples we have attempted to show how a producer can develop a strategy or evaluate a trading opportunity in terms of expected effect on profit. Most producers make several grades of lumber, however, and need a framework for evaluating trading opportunities that takes this into account.

For example, assume that a company produces seven items in the following proportions:

Item 1 (10%): Douglas-fir, GR, 2x4, STD & BTR, R/L
Item 3 (10%): Douglas-fir, GR, 2x6, #2 & BTR, R/L
Item 13 (40%): Douglas-fir, KD, 2x4, STD & BTR, R/L
Item 15 (10%): Hem-fir (Coast), KD, 2x6, STD & BTR, R/L
Item 16 (20%): Douglas-fir, KD, 2x6, #2 & BTR, R/L
Item 22 (5%): Hem-fir (Coast), KD, 2x10, #2 & BTR, R/L
Other (5%): Unspecified

A weighted average futures selling price is obtained by calculating the individual prices and weighting them according to their contribution to the total. Assuming an average cost of production of $135/M Fbm and a desired profit margin of $15/M Fbm, the futures selling values (at the 85-percent confidence level) are calculated individually, as was done previously for item 13. The weighted average futures selling price is computed from the individual values as follows:

Item Number	Calculated FP Values	×	Percentage of Production	=	Contribution
1	$145.00		.10		$14.50
3	149.50		.10		14.95
13	148.40		.40		59.36
15	139.40		.10		13.94
16	143.10		.20		28.62
22	132.90		.05		6.65
Misc.	143.10*		.05		7.16
			1.00		$145.20(rounded)
Weighted Average Futures Selling Price (FP)					$145.20(rounded)

* Average of above FP values.

A mill producing the seven items listed above at a cost of $135/M Fbm and selling futures at a price of $145.20/M Fbm can be at least 85-percent sure that it will receive a net profit margin (futures + cash) of at least $15/M Fbm. Again, the example is based on the assumption that convergence occurs as futures contracts are bought back.

As in the single-item example, the expected weighted average profit margin for a given level of futures price can be calculated. For multiple-item situations the profit margins of individual items would be calculated, their respective contributions also calculated, and the contributions totaled to provide the weighted average profit margin.

Two important points regarding the calculations need to be made. One is that cost used in a calculation should include all the costs related to the lumber: not only stumpage, logging, and milling, but selling, inventory degrade, and interest costs. This leads to the second point which applies to wholesalers and retailers. They must be certain to include in their costs the warehouse charges (in and out), storage fees, and interest expense on their inventory.

If costs are calculated accurately, the methods we have presented here should provide a safe and profitable numerical framework for trading lumber futures.

SOME FINAL THOUGHTS

We would like, at this point, to refer to some of the important considerations that must be dealt with by top management when developing and controlling a futures trading program. More extensive coverage of these and other issues can be found in *Futures Trading: Its Uses in Forest Industry.**

Risk assessment

Futures trading is a method of minimizing price risk for the lumber firm. When prices collapse, the realistic value of inventories also collapses. The dollar amount of price risk for a firm is subject to several factors. For example, location of inventory in the production process, amount invested in raw material, and investment in processing all contribute to a determination of the value of inven-

* Edited by Lloyd C. Irland, James P. Olmedo, Jr., and Robert O. McMahon. Yale School of Forestry and Environmental Studies: 1974.

tory. There are different amounts of money invested in each inventory, and, as a result, a different risk value is attached to each. Lumber has more value because of processing, drying, finishing, and storing, and therefore has a higher risk value. Furthermore, future commitments are themselves liabilities and are also subject to risk. The total-dollar amount of futures contracts that should be sold to reduce risk is determined in part by the dollar amount of cash market risk a company has outstanding, including all costs of processing.

Another aspect of risk is the sensitivity of a firm to price variations. This depends on the degree of flexibility a firm has to shift production to specialty items or more profitable products if the dimension market should decline. Sensitivity also depends on the amount of leverage employed in the capital structure of a firm. A heavily leveraged firm is less able to withstand slow markets because it requires cash flow for debt servicing. Therefore, a more fully covered position would be more desirable for the high-leverage firm.

The analysis of risk is, to a great extent, a matter of personal opinion. We would simply like to make the point that an awareness of when and where risk occurs is necessary in developing a trading strategy.

Accounting for futures trading

The paperwork for the futures trading department must be handled in a manner that satisfies three major criteria unique to accounting for futures trading:

- It must provide the user with easily accessible and timely information for controlling the futures trading program.
- It must provide information for evaluating the futures trading manager as his own responsibility center.
- It must provide, where applicable, the matching of futures and cash transactions, so that net positions in both markets are always available.

Naturally, principles that apply to any accounting system generally apply here as well. Readers should recognize, however, that although these criteria may sound relatively simple, the problems involved in meeting them are complex and beyond the scope of this monograph. Separate exploration of these accounting issues is warranted and would meet a critical need in the forest products industry.

Other considerations

One key consideration in developing a successful futures trading department is staffing. One full-time trader is usually sufficient if given the proper secretarial help and news services for support. Of critical importance is the understanding between the trader and top management: Management must not second-guess the trader; the trader must fully understand the goals and objectives of top management.

The choice of broker is also important, and it is the futures trading manager who must make this choice. The broker should be able to provide the necessary information about current news and market activity. But of critical importance to a successful futures trading program is the understanding that exists between trader and broker with respect to goals and objectives.

APPENDIX

CONVERSION TABLES FOR CONVERTING CONTRACT GRADE PRICES TO NONCONTRACT GRADE PRICES*

DESCRIPTION OF ITEMS

Item Number	*Description*
	Green Lumber Items
1	Douglas-fir, GR, 2x4, ST D& BTR, R/L, Portland
2	Fir & Larch, GR, 2x4, STD & BTR, R/L
3	Douglas-fir, GR, 2x6, #2 & BTR, R/L, Portland
4	Fir & Larch, GR, 2x6, #2 & BTR, R/L
5	Spruce-Pine-Fir (Western), GR, 2x6, #2 & BTR, R/L
6	Douglas-fir, GR, 2x10, #2 & BTR, R/L, Portland
7	Fir & Larch, GR, 2x10, #2 & BTR, R/L
8	Spruce-Pine-Fir (Western), GR, 2x10, #2 & BTR, R/L
9	Douglas-fir, GR, 2x4, UTILITY, R/L, Portland
10	Fir & Larch, GR, 2x4, UTILITY, R/L
11	Douglas-fir, GR, 2x4-8′, P.E.T., STUD GRADE, Portland
12	Fir & Larch, GR, 2x4-8′, P.E.T., STUD GRADE
	Kiln Dried Lumber Items
13	Douglas-fir, K.D., 2x4, STD & BTR, R/L
14	Fir & Larch, K.D., 2x4, STD & BTR, R/L
15	Hem-Fir (Coast), K.D., 2x4, STD & BTR, R/L
16	Douglas-fir, K.D., 2x6, #2 & BTR, R/L
17	Fir & Larch, K.D., 2x6, #2 & BTR, R/L
18	Hem-Fir (Coast), K.D., 2x6, #2 & BTR, R/L
19	Hem-Fir (Inlan), K.D., 2x6, #2 & BTR, R/L
20	Douglas-fir, K.D., 2x10, #2 & BTR, R/L
21	Fir & Larch, K.D., 2x10, #2 & BTR, R/L
22	Hem-Fir (Coast), K.D., 2x10, #2 & BTR, R/L
23	Hem-Fir (Inland), K.D., 2x10, #2 & BTR, R/L
24	Douglas-fir, K.D., 2x4, UTILITY, R/L
25	Fir & Larch, K.D., 2x4, UTILITY, R/L
26	Hem-Fir (Coast), K.D., 2x4, UTILITY, R/L
27	Hem-Fir (Inland), K.D., 2x4, UTILITY, R/L
28	Douglas-fir, K.D., 2x4-8′, P.E.T., STUD GRADE
29	Fir & Larch, K.D., 2x4-8′, P.E.T., STUD GRADE
30	Hem-Fir (Inland), K.D., 2x4-8′, P.E.T., STUD GRADE
31	Western Pines, K.D., 2x4-8′, P.E.T., STUD GRADE

* Tables are based on prices reported weekly by *Random Lengths* in 1973 and 1974.

REGRESSION DATA USED TO CALCULATE CONVERSION TABLES

Formulas were determined using ordinary least-squares method of normal-error linear-regression modeling techniques. In all cases, the contract grade was the independent variable while the noncontract grade was the dependent variable.

Data consist of reported weekly prices per thousand board feet, net of cash discounts, between the dates of January 5, 1973 and December 27, 1974, as reported in *Random Lengths* Weekly Lumber Price Guide.

In all cases, the T values of the contract grade coefficients were significantly different from zero at the highest levels (lowest T value was approximately ten).

The regression coefficients were significantly different from 1 at the .975 level, except for the following:

Item	*Level of Significance*
Items 14, 15	.95
Items 9, 13	.90
Item 24	.85
Item 19	.75
Item 17	Less than .50

THE DATA

Item Number	Constant	Coefficient	Standard Deviation of Error Terms	Correlation Coefficient
1	28.0	.8101	8.0	.928
2	1.6	.9293	7.8	.947
3	37.8	.7664	7.5	.929
4	7.5	.8924	8.0	.939
5	50.8	.7672	6.4	.947
6	51.8	.7587	8.6	.908
7	65.0	.6955	8.1	.903
8	112.2	.5749	15.2	.679
9	–63.0	1.0711	12.0	.909
10	–75.4	1.1320	12.9	.907
11	4.5	.7609	11.3	.854
12	– 4.9	.7583	9.9	.883
13	12.7	.9619	6.4	.965
14	– 8.7	1.0628	8.3	.953
15	–10.1	1.0323	4.6	.984
16	27.9	.8804	6.1	.963
17	4.9	.9939	7.4	.957
18	3.2	.9621	4.3	.983
19	2.2	.9932	2.3	.995
20	80.0	.7243	12.4	.819
21	76.4	.7316	12.2	.827
22	46.2	.8180	7.9	.930
23	56.0	.7339	7.7	.919
24	–55.0	1.0606	11.8	.911
25	–75.2	1.1570	12.6	.913
26	–75.8	1.1447	11.7	.922
27	–78.6	1.1903	14.1	.900
28	– 1.4	.8321	9.7	.902
29	– 2.9	.8364	9.9	.900
30	3.4	.8230	9.2	.910
31	– 7.8	.8270	10.3	.891

GREEN LUMBER CONVERSION TABLES

CONTRACT GRADE TO NON-CONTRACT GRADE PRICES

(ALL FIGURES IN DOLLARS)

CONTRACT GRADE 2X4 ,HEM-FIR(I) R.L.K.D. STD.*BTR.	ITEM 1 S= 8.00	ITEM 2 S= 7.80	ITEM 3 S= 7.50	ITEM 4 S= 8.00	ITEM 5 S= 6.40	ITEM 6 S= 8.60	ITEM 7 S= 8.10	ITEM 8 S=15.20	ITEM 9 S=12.00	ITEM 10 S=12.90	ITEM 11 S=11.30	ITEM 12 S= 9.90
95	105	90	111	92	124	124	131	167	39	32	77	67
96	106	91	111	93	124	125	132	167	40	33	78	68
97	107	92	112	94	125	125	132	168	41	34	78	69
98	107	93	113	95	126	126	133	169	42	36	79	69
99	108	94	114	96	127	127	134	169	43	37	80	70
100	109	95	114	97	128	128	135	170	44	38	81	71
101	110	95	115	98	128	128	135	170	45	39	81	72
102	111	96	116	99	129	129	136	171	46	40	82	72
103	111	97	117	99	130	130	137	171	47	41	83	73
104	112	98	117	100	131	131	137	172	48	42	84	74
105	113	99	118	101	131	131	138	173	49	43	84	75
106	114	100	119	102	132	132	139	173	51	45	85	75
107	115	101	120	103	133	133	139	174	52	46	86	76
108	116	102	121	104	134	134	140	174	53	47	87	77
109	116	103	121	105	134	135	141	175	54	48	87	78
110	117	104	122	106	135	135	141	175	55	49	88	78
111	118	105	123	107	136	136	142	176	56	50	89	79
112	119	106	124	107	137	137	143	177	57	51	90	80
113	120	107	124	108	138	138	144	177	58	53	90	81
114	120	108	125	109	138	138	144	178	59	54	91	82
115	121	108	126	110	139	139	145	178	60	55	92	82
116	122	109	127	111	140	140	146	179	61	56	93	83
117	123	110	127	112	141	141	146	179	62	57	93	84
118	124	111	128	113	141	141	147	180	63	58	94	85
119	124	112	129	114	142	142	148	181	64	59	95	85
120	125	113	130	115	143	143	148	181	66	60	96	86
121	126	114	131	115	144	144	149	182	67	62	97	87
122	127	115	131	116	144	144	150	182	68	63	97	88
123	128	116	132	117	145	145	151	183	69	64	98	88
124	128	117	133	118	146	146	151	183	70	65	99	89
125	129	118	134	119	147	147	152	184	71	66	100	90
126	130	119	134	120	147	147	153	185	72	67	100	91
127	131	120	135	121	148	148	153	185	73	68	101	91
128	132	121	136	122	149	149	154	186	74	69	102	92
129	133	121	137	123	150	150	155	186	75	71	103	93
130	133	122	137	124	151	150	155	187	76	72	103	94
131	134	123	138	124	151	151	156	188	77	73	104	94
132	135	124	139	125	152	152	157	188	78	74	105	95
133	136	125	140	126	153	153	157	189	79	75	106	96
134	137	126	140	127	154	153	158	189	81	76	106	97
135	137	127	141	128	154	154	159	190	82	77	107	97
136	138	128	142	129	155	155	160	190	83	79	108	98
137	139	129	143	130	156	156	160	191	84	80	109	99
138	140	130	144	131	157	157	161	192	85	81	109	100
139	141	131	144	132	157	157	162	192	86	82	110	100
140	141	132	145	132	158	158	162	193	87	83	111	101
141	142	133	146	133	159	159	163	193	88	84	112	102
142	143	134	147	134	160	160	164	194	89	85	113	103
143	144	135	147	135	161	160	164	194	90	86	113	103
144	145	135	148	136	161	161	165	195	91	88	114	104
145	145	136	149	137	162	162	166	196	92	89	115	105
146	146	137	150	138	163	163	167	196	93	90	116	106
147	147	138	150	139	164	163	167	197	94	91	116	107
148	148	139	151	140	164	164	168	197	96	92	117	107
149	149	140	152	140	165	165	169	198	97	93	118	108
150	150	141	153	141	166	166	169	198	98	94	119	109
151	150	142	153	142	167	166	170	199	99	96	119	110
152	151	143	154	143	167	167	171	200	100	97	120	110
153	152	144	155	144	168	168	171	200	101	98	121	111
154	153	145	156	145	169	169	172	201	102	99	122	112
155	154	146	157	146	170	169	173	201	103	100	122	113
156	154	147	157	147	171	170	173	202	104	101	123	113
157	155	148	158	148	171	171	174	202	105	102	124	114
158	156	148	159	149	172	172	175	203	106	103	125	115

GREEN LUMBER CONVERSION TABLES

CONTRACT GRADE TO NON-CONTRACT GRADE PRICES

(ALL FIGURES IN DOLLARS)

CONTRACT GRADE 2X4 HEM-FIR(I) R.L.K.D. STD.&BTR.	ITEM 1 S= 8.00	ITEM 2 S= 7.80	ITEM 3 S= 7.50	ITEM 4 S= 8.00	ITEM 5 S= 6.40	ITEM 6 S= 6.60	ITEM 7 S= 6.10	ITEM 8 S=15.20	ITEM 9 S=12.00	ITEM 10 S=12.90	ITEM 11 S=11.30	ITEM 12 S= 9.90
159	157	149	160	149	173	172	176	204	107	105	125	116
160	158	150	160	150	174	173	176	204	108	106	126	116
161	158	151	161	151	174	174	177	205	109	107	127	117
162	159	152	162	152	175	175	178	205	111	108	128	118
163	160	153	163	153	176	175	178	206	112	109	128	119
164	161	154	163	154	177	176	179	206	113	110	129	119
165	162	155	164	155	177	177	180	207	114	111	130	120
166	163	156	165	156	178	178	180	208	115	113	131	121
167	163	157	166	157	179	179	181	208	116	114	132	122
168	164	158	167	157	180	179	182	209	117	115	132	122
169	165	159	167	158	180	180	183	209	118	116	133	123
170	166	160	168	159	181	181	183	210	119	117	134	124
171	167	161	169	160	182	182	184	211	120	118	135	125
172	167	161	170	161	183	182	185	211	121	119	135	125
173	168	162	170	162	184	183	185	212	122	120	136	126
174	169	163	171	163	184	184	186	212	123	122	137	127
175	170	164	172	164	185	185	187	213	124	123	138	128
176	171	165	173	165	186	185	187	213	125	124	138	129
177	171	166	173	165	187	186	188	214	127	125	139	129
178	172	167	174	166	187	187	189	215	128	126	140	130
179	173	168	175	167	188	188	189	215	129	127	141	131
180	174	169	176	168	189	188	190	216	130	128	141	132
181	175	170	176	169	190	189	191	216	131	129	142	132
182	175	171	177	170	190	190	192	217	132	131	143	133
183	176	172	178	171	191	191	192	217	133	132	144	134
184	177	173	179	172	192	191	193	218	134	133	144	135
185	178	174	180	173	193	192	194	219	135	134	145	135
186	179	174	180	173	194	193	194	219	136	135	146	136
187	180	175	181	174	194	194	195	220	137	136	147	137
188	180	176	182	175	195	194	196	220	138	137	148	138
189	181	177	183	176	196	195	196	221	139	139	148	138
190	182	178	183	177	197	196	197	221	140	140	149	139
191	183	179	184	178	197	197	198	222	142	141	150	140
192	184	180	185	179	198	197	199	223	143	142	151	141
193	184	181	186	180	199	198	199	223	144	143	151	141
194	185	182	186	181	200	199	200	224	145	144	152	142
195	186	183	187	182	200	200	201	224	146	145	153	143
196	187	184	188	182	201	201	201	225	147	146	154	144
197	188	185	189	183	202	201	202	225	148	148	154	144
198	188	186	190	184	203	202	203	226	149	149	155	145
199	189	187	190	185	203	203	203	227	150	150	156	146
200	190	187	191	186	204	204	204	227	151	151	157	147
201	191	188	192	187	205	204	205	228	152	152	157	147
202	192	189	193	188	206	205	205	228	153	153	158	148
203	192	190	193	189	207	206	206	229	154	154	159	149
204	193	191	194	190	207	207	207	229	155	155	160	150
205	194	192	195	190	208	207	208	230	157	157	160	151
206	195	193	196	191	209	208	208	231	158	158	161	151
207	196	194	196	192	210	209	209	231	159	159	162	152
208	197	195	197	193	210	210	210	232	160	160	163	153
209	197	196	198	194	211	210	210	232	161	161	163	154
210	198	197	199	195	212	211	211	233	162	162	164	154
211	199	198	199	196	213	212	212	234	163	163	165	155
212	200	199	200	197	213	213	212	234	164	165	166	156
213	201	200	201	198	214	213	213	235	165	166	167	157
214	201	200	202	198	215	214	214	235	166	167	167	157
215	202	201	203	199	216	215	215	236	167	168	168	158
216	203	202	203	200	217	216	215	236	168	169	169	159
217	204	203	204	201	217	216	216	237	169	170	170	160
218	205	204	205	202	218	217	217	238	170	171	170	160
219	205	205	206	203	219	218	217	238	172	173	171	161
220	206	206	206	204	220	219	218	239	173	174	172	162
221	207	207	207	205	220	219	219	239	174	175	173	163

DRIED LUMBER CONVERSION TABLES

CONTRACT GRADE TO NON-CONTRACT GRADE PRICES

(ALL FIGURES IN DOLLARS)

CONTRACT GRADE 2X4,HEM-FIR(I) R.L.K.D. STD.&BTR.	ITEM 13 S= 5.40	ITEM 14 S= 4.30	ITEM 15 S= 4.60	ITEM 16 S= 6.10	ITEM 17 S= 7.40	ITEM 18 S= 4.30	ITEM 19 S= 2.30	ITEM 20 S=12.40	ITEM 21 S=12.20
95	104	92	88	112	99	95	97	149	146
96	105	93	89	112	100	96	98	150	147
97	106	94	90	113	101	97	99	150	147
98	107	95	91	114	102	97	100	151	148
99	108	97	92	115	103	98	101	152	149
100	109	98	93	116	104	99	102	152	150
101	110	99	94	117	105	100	103	153	150
102	111	100	95	118	106	101	103	154	151
103	112	101	96	119	107	102	104	155	152
104	113	102	97	119	108	103	105	155	152
105	114	103	98	120	109	104	106	156	153
106	115	104	99	121	110	105	107	157	154
107	116	105	100	122	111	106	108	158	155
108	117	106	101	123	112	107	109	158	155
109	118	107	102	124	113	108	110	159	156
110	118	108	103	125	114	109	111	160	157
111	119	109	104	126	115	110	112	160	158
112	120	110	106	127	116	111	113	161	158
113	121	111	107	127	117	112	114	162	159
114	122	112	108	128	118	113	115	163	160
115	123	114	109	129	119	114	116	163	161
116	124	115	110	130	120	115	117	164	161
117	125	116	111	131	121	116	118	165	162
118	126	117	112	132	122	117	119	165	163
119	127	118	113	133	123	118	120	166	163
120	128	119	114	134	124	119	121	167	164
121	129	120	115	134	125	120	122	168	165
122	130	121	116	135	126	121	123	168	166
123	131	122	117	136	127	122	124	169	166
124	132	123	118	137	128	122	125	170	167
125	133	124	119	138	129	123	126	171	168
126	134	125	120	139	130	124	127	171	169
127	135	126	121	140	131	125	128	172	169
128	136	127	122	141	132	126	129	173	170
129	137	128	123	141	133	127	130	173	171
130	138	129	124	142	134	128	131	174	171
131	139	131	125	143	135	129	132	175	172
132	140	132	126	144	136	130	133	176	173
133	141	133	127	145	137	131	134	176	174
134	142	134	128	146	138	132	135	177	174
135	143	135	129	147	139	133	136	178	175
136	143	136	130	148	140	134	137	179	176
137	144	137	131	149	141	135	138	179	177
138	145	138	132	149	142	136	139	180	177
139	146	139	133	150	143	137	140	181	178
140	147	140	134	151	144	138	141	181	179
141	148	141	135	152	145	139	142	182	180
142	149	142	136	153	146	140	143	183	180
143	150	143	138	154	147	141	144	184	181
144	151	144	139	155	148	142	145	184	182
145	152	145	140	156	149	143	146	185	182
146	153	146	141	156	150	144	147	186	183
147	154	148	142	157	151	145	148	187	184
148	155	149	143	158	152	146	149	187	185
149	156	150	144	159	153	147	150	188	185
150	157	151	145	160	154	148	151	189	186
151	158	152	146	161	155	148	152	189	187
152	159	153	147	162	156	149	153	190	188
153	160	154	148	163	157	150	154	191	188
154	161	155	149	164	158	151	155	192	189
155	162	156	150	164	159	152	156	192	190
156	163	157	151	165	160	153	157	193	191
157	164	158	152	166	161	154	158	194	191
158	165	159	153	167	162	155	159	194	192

DRIED LUMBER CONVERSION TABLES

CONTRACT GRADE TO NON-CONTRACT GRADE PRICES

(ALL FIGURES IN DOLLARS)

CONTRACT GRADE 2X4,HEM-FIR(I) R.L.K.D. STD.*BTR.	ITEM 13 S= 6.40	ITEM 14 S= 4.30	ITEM 15 S= 4.60	ITEM 16 S= 6.10	ITEM 17 S= 7.40	ITEM 18 S= 4.30	ITEM 19 S= 2.30	ITEM 20 S=12.40	ITEM 21 S=12.20
159	166	160	154	168	163	156	160	195	193
160	167	161	155	169	164	157	161	196	193
161	168	162	156	170	165	158	162	197	194
162	168	164	157	171	166	159	163	197	195
163	169	165	158	171	167	160	164	198	196
164	170	166	159	172	168	161	165	199	196
165	171	167	160	173	169	162	166	200	197
166	172	168	161	174	170	163	167	200	198
167	173	169	162	175	171	164	168	201	199
168	174	170	163	176	172	165	169	202	199
169	175	171	164	177	173	166	170	202	200
170	176	172	165	178	174	167	171	203	201
171	177	173	166	178	175	168	172	204	201
172	178	174	167	179	176	169	173	205	202
173	179	175	168	180	177	170	174	205	203
174	180	176	170	181	178	171	175	206	204
175	181	177	171	182	179	172	176	207	204
176	182	178	172	183	180	173	177	208	205
177	183	179	173	184	181	173	178	208	206
178	184	181	174	185	182	174	179	209	207
179	185	182	175	186	183	175	180	210	207
180	186	183	176	186	184	176	181	210	208
181	187	184	177	187	185	177	182	211	209
182	188	185	178	188	186	178	183	212	210
183	189	186	179	189	187	179	184	213	210
184	190	187	180	190	188	180	185	213	211
185	191	188	181	191	189	181	186	214	212
186	192	189	182	192	190	182	187	215	212
187	193	190	183	193	191	183	188	215	213
188	194	191	184	193	192	184	189	216	214
189	194	192	185	194	193	185	190	217	215
190	195	193	186	195	194	186	191	218	215
191	196	194	187	196	195	187	192	218	216
192	197	195	188	197	196	188	193	219	217
193	198	196	189	198	197	189	194	220	218
194	199	198	190	199	198	190	195	221	218
195	200	199	191	200	199	191	196	221	219
196	201	200	192	200	200	192	197	222	220
197	202	201	193	201	201	193	198	223	220
198	203	202	194	202	202	194	199	223	221
199	204	203	195	203	203	195	200	224	222
200	205	204	196	204	204	196	201	225	223
201	206	205	197	205	205	197	202	226	223
202	207	206	198	206	206	198	203	226	224
203	208	207	199	207	207	199	204	227	225
204	209	208	200	208	208	199	205	228	226
205	210	209	202	208	209	200	206	229	226
206	211	210	203	209	210	201	207	229	227
207	212	211	204	210	211	202	208	230	228
208	213	212	205	211	212	203	209	231	229
209	214	213	206	212	213	204	210	231	229
210	215	215	207	213	214	205	211	232	230
211	216	216	208	214	215	206	212	233	231
212	217	217	209	215	216	207	213	234	231
213	218	218	210	215	217	208	214	234	232
214	219	219	211	216	218	209	215	235	233
215	219	220	212	217	219	210	216	236	234
216	220	221	213	218	220	211	217	236	234
217	221	222	214	219	221	212	218	237	235
218	222	223	215	220	222	213	219	238	236
219	223	224	216	221	223	214	220	239	237
220	224	225	217	222	224	215	221	239	237
221	225	226	218	222	225	216	222	240	238

DRIED LUMBER CONVERSION TABLES

CONTRACT GRADE TO NON-CONTRACT GRADE PRICES

(ALL FIGURES IN DOLLARS)

CONTRACT GRADE 2X4 HEM-FIR(I) R.L.K.D. STD.&BTR.	ITEM 22 S= 7.90	ITEM 23 S= 7.70	ITEM 24 S=11.80	ITEM 25 S=12.60	ITEM 26 S=11.70	ITEM 27 S=14.10	ITEM 28 S= 9.70	ITEM 29 S= 9.90	ITEM 30 S= 9.20	ITEM 31 S=10.30
95	124	126	46	35	33	35	78	77	82	71
96	125	126	47	36	34	36	79	77	82	72
97	126	127	48	37	35	37	79	78	83	72
98	126	128	49	38	36	38	80	79	84	73
99	127	129	50	39	38	39	81	80	85	74
100	128	129	51	40	39	40	82	81	86	75
101	129	130	52	42	40	42	83	82	86	76
102	130	131	53	43	41	43	84	82	87	77
103	130	132	54	44	42	44	84	83	88	77
104	131	132	55	45	43	45	85	84	89	78
105	132	133	56	46	44	46	86	85	90	79
106	133	134	57	47	46	48	87	86	91	80
107	134	134	58	49	47	49	88	87	91	81
108	134	135	60	50	48	50	88	87	92	82
109	135	136	61	51	49	51	89	88	93	82
110	136	137	62	52	50	52	90	89	94	83
111	137	137	63	53	51	54	91	90	95	84
112	138	138	64	54	52	55	92	91	96	85
113	139	139	65	56	54	56	93	92	96	86
114	139	140	66	57	55	57	93	92	97	87
115	140	140	67	58	56	58	94	93	98	87
116	141	141	68	59	57	60	95	94	99	88
117	142	142	69	60	58	61	96	95	100	89
118	143	143	70	61	59	62	97	96	100	90
119	143	143	71	62	60	63	98	97	101	91
120	144	144	72	64	62	64	98	97	102	91
121	145	145	73	65	63	65	99	98	103	92
122	146	146	74	66	64	67	100	99	104	93
123	147	146	75	67	65	68	101	100	105	94
124	148	147	76	68	66	69	102	101	105	95
125	148	148	78	69	67	70	103	102	106	96
126	149	148	79	71	68	71	103	102	107	96
127	150	149	80	72	70	73	104	103	108	97
128	151	150	81	73	71	74	105	104	109	98
129	152	151	82	74	72	75	106	105	110	99
130	152	151	83	75	73	76	107	106	110	100
131	153	152	84	76	74	77	108	107	111	101
132	154	153	85	78	75	79	108	108	112	101
133	155	154	86	79	76	80	109	108	113	102
134	156	154	87	80	78	81	110	109	114	103
135	157	155	88	81	79	82	111	110	114	104
136	157	156	89	82	80	83	112	111	115	105
137	158	157	90	83	81	85	113	112	116	106
138	159	157	91	84	82	86	113	113	117	106
139	160	158	92	86	83	87	114	113	118	107
140	161	159	93	87	84	88	115	114	119	108
141	161	159	95	88	86	89	116	115	119	109
142	162	160	96	89	87	90	117	116	120	110
143	163	161	97	90	88	92	118	117	121	111
144	164	162	98	91	89	93	118	118	122	111
145	165	162	99	93	90	94	119	118	123	112
146	166	163	100	94	91	95	120	119	124	113
147	166	164	101	95	92	96	121	120	124	114
148	167	165	102	96	94	98	122	121	125	115
149	168	165	103	97	95	99	123	122	126	115
150	169	166	104	98	96	100	123	123	127	116
151	170	167	105	100	97	101	124	123	128	117
152	170	168	106	101	98	102	125	124	128	118
153	171	168	107	102	99	104	126	125	129	119
154	172	169	108	103	101	105	127	126	130	120
155	173	170	109	104	102	106	128	127	131	120
156	174	170	110	105	103	107	128	128	132	121
157	175	171	111	106	104	108	129	128	133	122
158	175	172	113	108	105	110	130	129	133	123

DRIED LUMBER CONVERSION TABLES

CONTRACT GRADE TO NON-CONTRACT GRADE PRICES

(ALL FIGURES IN DOLLARS)

CONTRACT GRADE 2X4 ,HEM-FIR(I) R.L.K.D. STD.&BTR.	ITEM 22 S= 7.90	ITEM 23 S= 7.70	ITEM 24 S=11.90	ITEM 25 S=12.60	ITEM 26 S=11.70	ITEM 27 S=14.10	ITEM 28 S= 9.70	ITEM 29 S= 9.90	ITEM 30 S= 9.20	ITEM 31 S=10.30
159	176	173	114	109	106	111	131	130	134	124
160	177	173	115	110	107	112	132	131	135	125
161	178	174	116	111	109	113	133	132	136	125
162	179	175	117	112	110	114	133	133	137	126
163	179	176	118	113	111	115	134	133	137	127
164	180	176	119	115	112	117	135	134	138	128
165	181	177	120	116	113	118	136	135	139	129
166	182	178	121	117	114	119	137	136	140	130
167	183	179	122	118	115	120	138	137	141	130
168	184	179	123	119	117	121	139	138	142	131
169	184	180	124	120	118	123	139	138	142	132
170	185	181	125	121	119	124	140	139	143	133
171	186	181	126	123	120	125	141	140	144	134
172	187	182	127	124	121	126	142	141	145	134
173	188	183	128	125	122	127	143	142	146	135
174	188	184	130	126	123	129	143	143	147	136
175	189	184	131	127	125	130	144	143	147	137
176	190	185	132	128	126	131	145	144	148	138
177	191	186	133	130	127	132	146	145	149	139
178	192	187	134	131	128	133	147	146	150	139
179	193	187	135	132	129	134	148	147	151	140
180	193	188	136	133	130	136	148	148	151	141
181	194	189	137	134	131	137	149	149	152	142
182	195	190	138	135	133	138	150	149	153	143
183	196	190	139	137	134	139	151	150	154	144
184	197	191	140	138	135	140	152	151	155	144
185	197	192	141	139	136	142	153	152	156	145
186	198	192	142	140	137	143	153	153	156	146
187	199	193	143	141	138	144	154	154	157	147
188	200	194	144	142	139	145	155	154	158	148
189	201	195	145	143	141	146	156	155	159	149
190	202	195	146	145	142	148	157	156	160	149
191	202	196	148	146	143	149	158	157	161	150
192	203	197	149	147	144	150	158	158	161	151
193	204	198	150	148	145	151	159	159	162	152
194	205	198	151	149	146	152	160	159	163	153
195	206	199	152	150	147	154	161	160	164	154
196	206	200	153	152	149	155	162	161	165	154
197	207	201	154	153	150	156	163	162	165	155
198	208	201	155	154	151	157	163	163	166	156
199	209	202	156	155	152	158	164	164	167	157
200	210	203	157	156	153	159	165	164	168	158
201	211	203	158	157	154	161	166	165	169	158
202	211	204	159	159	155	162	167	166	170	159
203	212	205	160	160	157	163	168	167	170	160
204	213	206	161	161	158	164	168	168	171	161
205	214	206	162	162	159	165	169	169	172	162
206	215	207	163	163	160	167	170	169	173	163
207	215	208	165	164	161	168	171	170	174	163
208	216	209	166	165	162	169	172	171	175	164
209	217	209	167	167	163	170	173	172	175	165
210	218	210	168	168	165	171	173	173	176	166
211	219	211	169	169	166	173	174	174	177	167
212	220	212	170	170	167	174	175	174	178	168
213	220	212	171	171	168	175	176	175	179	168
214	221	213	172	172	169	176	177	176	179	169
215	222	214	173	174	170	177	178	177	180	170
216	223	214	174	175	171	179	178	178	181	171
217	224	215	175	176	173	180	179	179	182	172
218	224	216	176	177	174	181	180	179	183	173
219	225	217	177	178	175	182	181	180	184	173
220	226	217	178	179	176	183	182	181	184	174
221	227	218	179	180	177	184	183	182	185	175

Studies in Management and Accounting for the Forest Products Industries

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