

Hedging Lumber With Futures and Options

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The volatility of lumber prices over the past few years has wrought havoc in the home building industry, as builders have entered into contracts to deliver homes at fixed prices, and have then had their expected profits evaporate because of unanticipated increases in lumber cost. The increased risk posed by greater lumber price volatility has been exacerbated by a shift toward more preselling of new homes and by a reduced ability and/or willingness of lumber dealers to quote prices for delivery more than a very short period into the future.

One mechanism available to builders to hedge against the risk of lumber price increases is to buy the lumber futures or option contracts traded on the Chicago Mercantile Exchange. Use of these contracts by builders for hedging purposes has been very limited.

Lumber futures contracts represent the purchase of a fixed amount of lumber to be delivered at a specific date in the future at a price set today. Generally, however, the purchaser does not actually take delivery of the lumber, but instead sells back the contract, experiencing a gain or loss on the transaction that reflects the movement in actual lumber prices over the same period. Similarly, the person who sold the contract initially will generally buy back the obligation rather than actually deliver the lumber. Less than 10 percent of lumber futures contracts result in physical delivery, and builders generally should not even consider receiving the lumber from the futures contract.

Each lumber futures contract represents 160,000 board feet of 2x4s, enough to fill up two rail cars. That amount of lumber is roughly the quan-

tity needed to build 10 to 15 houses, although houses aren't built entirely of 2x4s. Each contract allows for delivery of several alternative wood species produced in the western part of the U.S. or Canada, but the futures prices are primarily geared to the spruce-pine-fir (S-P-F) mixture produced in British Columbia. Lumber futures contracts specify delivery in January, March, May, July, September, or November. Contracts are first traded 14 months prior to delivery (i.e., contracts for delivery in November 1995 will be handled on the exchange beginning in September 1994) but most contracts are not created until a few months before the delivery date. Trading continues until the fifteenth day of the delivery month, and if the contract is not sold back, delivery occurs at the end of the month.

The purpose of a hedge transaction is to experience a gain in value from the futures contract to offset any increase in construction cost from higher lumber prices. If lumber prices were to fall over the period, the purchaser would experience a

loss on the futures contract, but that loss would be offset, theoretically, by an unexpected reduction in the cost of the lumber actually used.

Suppose a builder signs contracts for 12 houses in August, for December delivery, with framing to occur in September. The total lumber required for the 12 homes happens to equal 160,000 board feet, and the house prices were set assuming a cost of \$500 per 1,000 board feet for lumber, the price in effect when the contract was signed. If the futures contract were a perfect hedge, then it would work as shown in Table 1, for situations where prices rise or fall.

In the second instance, where there was a drop in lumber price, the builder would have been better off without the futures contract, and that's one of the key points to understanding such contracts—they can help increase certainty but will not, in general, increase profits and will actually wipe out windfall gains from declines in lumber costs.

In these two examples, lumber futures worked as a perfect hedge

Table 1 Futures Contract as a Perfect Hedge

August prices:

Futures contract price of lumber = \$350/MBF

Retail lumber price = \$500/MBF

September prices after increase:

Futures contract price = \$450/MBF

Retail lumber price = \$600/MBF

Gain on futures contract = 160 MBF x \$100 = \$16,000

Increase in building cost = 160 MBF x \$100 = \$16,000

September prices after decline:

Futures contract price = \$250/MBF

Retail lumber price = \$400/MBF

Loss on futures contract = 160 MBF x \$100 = \$16,000

Decrease in building cost = 160 MBF x \$100 = \$16,000

Table 2 Protecting Against Higher Prices Using Futures

	7/9/93	9/10/93
Prices (per MBF):		
Southern Pine 2x4	\$305.00	\$395.00
Southern Pine 2x10	\$348.00	\$355.00
Douglas Fir 2x4	\$405.00	\$395.00
Douglas Fir 2x10	\$425.00	\$520.00
S-P-F 2x4	\$285.00	\$358.00
S-P-F 2x10	\$352.00	\$445.00
July 1993 Futures	\$230.10	—
September 1993 Futures	\$252.00	\$325.80
November 1993 Futures	\$265.20	\$326.80
January 1994 Futures	\$284.80	\$336.20
Increase in Lumber Package:		
Southern Pine		\$762.00
Douglas Fir		\$490.00
S-P-F		\$1,142.00
Gain on September Futures Contract		\$1,033.20

against changes in lumber costs. All changes in the cost of lumber for home building were offset by equally large changes in the opposite direction in the value of the futures contract. In the real world, futures contracts are imperfect hedges, because:

- The wood used in a home is of a different species, dimension, or grade than the wood represented by a futures contract, and their prices will not be perfectly correlated.
- The amount of wood needed by the builder will not exactly match the amount in one or more lumber futures contracts.
- The difference between futures contract price and the price paid by builders for that lumber may fluctuate due to changes in retailers' and wholesalers' margins, transportation costs, taxes, and lags in the price adjustments along the distribution chain.

- The timing of the purchase of lumber for construction doesn't match up with the timing of the futures contract expiration.

These and other factors create "basis risk"—the risk that the hedging vehicle (the futures contract) will be imperfectly correlated with the lumber cost faced by the builder. The existence of basis risk complicates the situation and makes it impossible to completely eliminate uncertainty using futures contracts, but because the correlation between futures prices and lumber cost is still high, the builder's risk can still be substantially reduced.

To see how this process might work, let's look at some of the historical experience, comparing the futures contract price to spot-market prices published by Random Lengths, Inc., a price-reporting service whose price quotations are widely used as benchmarks in the lumber industry. Although the prices quoted by Random Lengths will not match the prices

paid by builders, they offer a reasonable approximation of the basis risk problem faced by builders.

Consider a builder setting prices in mid-July of 1993 for a home to be built using the following package of framing lumber:

8,000 BF	2x4
6,000 BF	2x10

The builder uses kiln-dried southern yellow pine. According to Random Lengths, the average wholesale level of prices for such lumber at a location in the West region (i.e., west of the Mississippi River) during the week of July 9, 1993, were \$305/MBF for 2x4s and \$348/MBF for 2x10s. As of July 9, 1993, the price for the futures contract for delivery at the end of July was \$230.10/MBF, while the price for a contract specifying delivery in September was \$252.80/MBF.

Assume for simplicity that the builder could buy a futures contract for only 14,000 board feet, the quantity needed to build the house. Framing is to occur in September, so the builder buys a futures contract based on September delivery.

On September 10, the builder sells back the futures contract and buys the lumber for construction. The prices at that point are shown in Table 2. The cost of the lumber package had increased by \$762. The value of 14,000 board feet of a September futures contract had increased by \$1,033.20, so the builder, on net, would gain \$271 more on the futures contract than the increase in the cost of lumber. (The situation in September 1993, when the price for 2x10s was less per 1,000 board feet than the price for 2x4s was unusual, but that sometimes happens when inventories of 2x10s are more plentiful.)

The gain on the futures contract in this case was more than the increase in lumber cost. It could have

been less. If prices had fallen over the period, the loss on the futures contract could similarly have been more or less than the savings from a decline in lumber cost.

If the builder used the same mix of 2x4s and 2x10s, but used Douglas fir rather than southern pine, the increase in cost from July to September 1993 would have been only \$490. For S-P-F lumber delivered in Boston, however, the increase in lumber cost from July to September would have been \$1,142—greater than the gain on the futures contract.

As noted, the price of a futures contract on July 9, 1993, for July delivery was only \$230.10/MBF while the price on a contract for September delivery was \$252.00. On that day the price for a contract with November 1993 delivery was \$265.20, and for January 1994 delivery was \$284.80. Typically the futures contract price for delivery in the near term is within a few dollars of the price for delivery a few months later. The substantially higher price for later delivery was a signal that the market expected lumber prices to rise. In this case, the builder perhaps should have set the house price on the assumption that lumber costs would be higher in September than in July. Had this assumption been made, then the gain on the futures contract would have exceeded the increase in lumber cost (compared to the expected price) by even more.¹

Even if futures contracts are not purchased to hedge against future changes in prices, the relationship of the prices for distant delivery dates to the prices for near-term delivery or to spot market prices is a valuable measure of the market's expectation about the direction of prices. If the futures contract prices for delivery six months or a year ahead are above the prices for delivery within two months, the market expects an in-

Table 3 Taking a Futures Loss When Lumber Prices Fall

	12/17/93	4/15/94
Prices (per MBF):		
Southern Pine 2x4	\$505.00	\$395.00
Southern Pine 2x10	\$580.00	\$490.00
Douglas Fir 2x4	\$462.00	\$400.00
Douglas Fir 2x10	\$555.00	\$435.00
S-P-F 2x4	\$500.00	\$390.00
S-P-F 2x10	\$570.00	\$480.00
Jan '94 Futures	\$454.00	—
May '94 Futures	\$441.00	\$344.00
Decrease in Lumber Package:		
Southern Pine		\$1,420.00
Douglas Fir		\$1,216.00
S-P-F		\$1,420.00
Loss on May Futures Contract		\$1,359.00

crease in spot market prices, while if the prices for distant delivery are lower than current prices, the market expects a price decline.

Let's look at how the hedge would have worked in a situation where prices fell. Assuming the same lumber package and again assuming that there is some way to purchase a futures contract on only 14,000 board feet, suppose the home sale and the purchase of the futures contract occurred in December 1993, while the lumber purchase and the sale of the futures contract occurred in April 1994. Because there is no futures contract for April delivery, the futures transaction involves a May 1994 contract.

The relevant price data appear in Table 3. The decline in the cost of the southern pine lumber package is \$1,420, while the loss on the May futures contract is \$1,359, so the net cost of lumber is \$61 less than would have been anticipated if the December 17, 1993 price of lumber had been assumed. If the difference between the January and May futures

contract as of December 17, 1993 had been taken into account in estimating the lumber package, then the assumed price at the time of the home sale in December 1993 would have been \$182 (\$13/MBF) lower, and the "savings" on the southern pine lumber package would have been only \$1,238. This means that the loss on the futures contract for May delivery would have exceeded the savings on the lumber package by \$121. In either case, the loss on the futures contract would be close to the savings on the lumber package.

The decline in the cost of an S-P-F lumber package delivered in Boston would, coincidentally, have been identical to the decline for southern pine west of the Mississippi, based on the prices reported by Random Lengths for the weeks ending December 17, 1993 and April 15, 1994. For the Douglas fir lumber package, the decline in cost, based on the prices reported for that period, was only \$1,216, so the loss on the futures contract would have exceeded the savings on the lumber package.

As these examples show, the use of the futures contract as a hedging device would probably result in lower builder profits on presold homes than would otherwise occur without hedging during a period of falling lumber prices, because builders will experience losses on the futures contract. Moreover, the losses on the futures contract may exceed the savings from lower lumber costs, especially if the volume of lumber covered by the futures contract is equal to or greater than the amount of lumber purchased for construction. On the other hand, these examples also indicate that, despite the existence of basis risk, the use of the futures contract comes very close to locking in the net lumber cost expected at the time a sales contract was signed.

A key unrealistic assumption here has been that a builder can buy a futures contract for the amount of lumber needed for one house. With each contract covering 160,000 board feet, the loss on a single contract (for May 1994 delivery) between December 17, 1993 and April 15, 1994 would have been \$15,520. Unless that was offset by equivalent savings on lumber purchases, it would represent a serious out-of-pocket cost for a small builder. Moreover, it would have to be paid up-front, in response to margin calls each time the price fell.

Another practical problem with the use of the lumber futures market is that there is not always a large number of potential sellers or buyers available, so it may be difficult or even impossible to purchase or sell a lumber futures contract at any given time. This problem is particularly acute for the more distant contracts, since most contracts are not actively traded or even created until a few months before the expiration date. For example, on June 27, 1994, the open interest and

Table 4 Open Interest and Trading Volume 6/27/94

Delivery Month	Open Interest	Trading Volume
July 1994	807	285
September 1994	727	205
November 1994	277	74
January 1995	68	9
March 1995	21	17
May 1995	7	1
July 1995	1	0

Note: Data shown are number of contracts, 160 MBF each.

trading volume for the different expiration dates appear in Table 4.

The exchange establishes limits on the amount by which prices for a futures contract can change in a single day. For lumber that is currently \$10.00/MBF, although if the price rises or falls by that amount on two successive days, the limit is increased to \$15.00 on the third day. If a willing seller or buyer offering a price within the limit is not found, then it is impossible to buy or sell that day. The limits are removed during the two weeks of trading within the delivery month.

The broker's commission for buying and then reselling a futures contract is only about \$75 per contract (or less than 50¢ per MBF). In addition, however, there is a spread between the price bid by buyers and that asked by sellers, and the cost of crossing the bid-asked spread may be greater than the commission.

Options

The futures contract is an appropriate device for hedging against movements—up or down—in lumber prices, thereby locking in lumber cost.

Often, builders want to be able to protect against an increase in lumber prices, but they don't really know how much lumber they will need or when they will need it. For example, they may quote a price to a potential

customer but not know whether the offer will be accepted. Even when a customer has signed a contract for a house, it is not unusual for transactions to fall through.

Builders may also be unwilling to accept a big loss on futures contracts even if that is offset by savings in lumber costs. They may want protection against price increases but still be able to benefit from lumber price cuts.

Another type of contract is traded on the exchange that addresses these needs—a *call option* to purchase a lumber futures contract at a fixed price.² If the value of the futures contract goes up, the holder of an option contract can exercise the option and buy the futures contract at the fixed "strike price," but since the value of the option will rise when the value of the futures contract rises, the option holder need only sell the option to experience a gain. If the price of the futures contract falls below the strike price, the option holder cannot lose more than the price of the option.

This arrangement between the holder and the issuer of the call option sounds like a heads-I-win, tails-you-lose arrangement in favor of the option holder, but the equalizer in their respective positions is the price or "premium" that the option buyer pays, which usually turns out to be more than enough to cover the likely change in the value of the

futures contract. In most cases the value of the option declines as the expiration date approaches.

While all futures contracts expiring in a given month are essentially interchangeable, there will be options at numerous strike prices, so for every delivery month, there will be an array of call options. For any given futures contract, the higher the strike price, the lower the option premium. For example, as on July 8, 1994, the price of lumber futures and options are shown in Table 5.

At that point, to purchase an option on September lumber with a strike price close to the current futures market price would thus cost about \$21 per 1,000 board feet, or about \$336 per house. Note that the cost of an option on lumber for November or January delivery is much higher than for a September lumber option. It will generally be more expensive for a longer term option.

As the option contract approaches expiration, the premium will approach the difference between the market price of the futures contract and the strike price, if the option is "in the money" (strike price below market price). If the option is "out of the money" (strike price above market price), the option premium will fall to zero at expiration.

Call options, when used to hedge against increases in lumber costs, are like insurance policies. For a fee or "premium," an insurance policy pays off when things go wrong. The basis risk that exists with options as well as futures is like the use of "book value" to determine payment on an automobile insurance policy when the car is totaled. Book value may or may not cover the real loss.

Is This for Builders?

Lumber futures and options can effectively reduce risk when they are

Table 5 Prices for Lumber Options on 7/8/94

	September 1994	November 1994	January 1995
Futures Contract	\$346.60	\$342.50	\$349.20
Option contract, by strike price:			
330	29.40	36.10	NA
340	23.90	31.40	42.00
350	19.00	26.80	37.70
360	14.90	NA	NA
370	11.60	NA	29.80
380	8.90	16.50	NA

understood and used properly as tools for hedging. They can lead to disaster if they are used for speculation or if they are used improperly for hedging, out of misunderstanding, or where the purported hedging is actually disguised speculation. In any case, it is important to deal with a broker who really understands futures markets and who can help avoid the pitfalls.

For a builder with predictable future lumber needs who must make commitments to deliver his or her product at a fixed price, lumber futures offer an opportunity to more-or-less lock in lumber costs. The alternative means for locking in costs, such as to buy and store lumber, are often less convenient and more expensive.

A builder may want to only partially hedge against lumber price change. For example, builder planning to use 250,000 board feet may only buy a single futures contract representing 160,000 board feet.

For a builder with less predictable lumber needs who nevertheless faces risks because of volatility in lumber prices, lumber options represent a potentially attractive form of insurance. The price of that insurance may or may not be acceptable in relation to the risk.

For a large builder, the investment in education, the transactions costs, and the volume requirements of the

futures and options market may be justified. Generally, it would be harder for a smaller builder to find use of futures and options worthwhile. Basically, however, operations in the commodities market are not what builders are normally experts in. They should be able instead to get price guarantees from their suppliers. They can't, however, continue to expect to get guaranteed prices if they don't guarantee to buy the lumber or if they don't offer some other compensation to the supplier.

It is the lumber dealers and lumber producers who ought to be active in the futures market, in order to be in a position to make commitments to their customers. While it is reasonable for them to expect reciprocal commitments and compensation for risk-bearing, it is not reasonable for them to expect builders to do their jobs for them.

¹An alternative procedure for developing an assumption about the cost of lumber for use in estimating construction cost would be to essentially ignore the current price for the lumber package, calculate the "normal" difference between the lumber package price and the price for expiring futures contracts, and add that difference to the futures contract price.

²Another type of option, called a *put option* is also traded. That represents a right to sell lumber futures at a fixed price, and it is not an appropriate vehicle for a risk-averse builder. In this article, where the term *option* is used, it is always a call option.