PRICE VOLATILITY: SUPPLY AGREEMENTS V. OPEN MARKET SALES

Studies/Surveys: production/costs   *May 2012*
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INTRODUCTION: Bioenergy companies—many of which originate in, or rely on off-take agreements with, utility companies—will require long-term supply agreements in order to manage their supply risk. Long-term supply agreements are business-as-usual in the energy industry. These companies generally procure energy sources like coal from a single source, and therefore managing the supply risk with long-term supply agreements is a relatively straightforward process. This business model conflicts with the realities of wood procurement, however, where wood products move from many sources to few consumers. In order to ascertain the effects of moving to these types of supply agreements in the wood products supply chain, Forest2Market®, Inc. (F2M), under contract with the Wood Supply Research Institute (WSRI), analyzed data in its Delivered Raw Material Database to understand the relationship between supply agreements and price volatility and offer further insight into the benefits of entering into these types of agreements.

METHODS: As a starting point for the analysis, Forest2Market examined the hypothesis that price volatility is reduced for wood products moving under supply agreement (*Fig. 1*, blue line) versus those traded on the open market (*Fig. 1*, red line).

Fig. 1: Comparison of price volatility: supply agreement v. non-supply agreement.
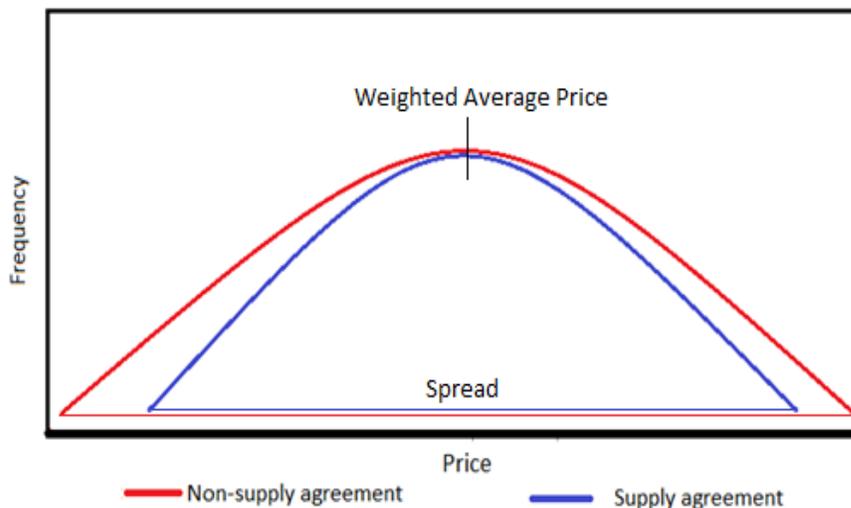
Forest2Market employed its proprietary database of delivered prices for 4 products in 11 states (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Texas and Virginia). The three primary products are pine sawtimber, pine pulpwood, and pine residual chips. Because hardwood pulpwood is a by-product of pine harvests, however, F2M was able to examine the effect of pine supply agreements on hardwood price volatility as well.

Specifically, 16 quarters of data (1Q2007 to 4Q2010)—in total, 29.8 million rows of data (loads), representing approximately 747.1 million tons of wood raw material—were analyzed. For the analysis, data were prepared using the following process:

- Each load's dollar per ton-mile freight rate was adjusted to a haul cost of a standard fifty-mile haul distance.
- Each transaction was tagged as either *known to be sold* under supply agreement or as an *open market* transaction. If two trading partners were known to have a supply agreement, all transactions between the two partners were included.
- Transactions were sorted by state and product.
- Additional subsets of these data were compared, including materials delivered to various facility types, various mill consumption levels, and—in the case of sawtimber—diameter class.
- For each of these subsets, Forest2Market conducted a statistical analysis of the transactions in order to determine whether less volatility was present in those transactions conducted under a supply agreement than in those sold in the open market:
  - The first step of this analysis was to examine the null hypothesis that both data sets were characterized by the same level of price volatility. To do this, F2M calculated the coefficient of variation (CV) for each data set (e.g., pine pulpwood traded under supply agreement in Virginia), paired the CV values of corresponding data sets (e.g., pine pulpwood in Virginia traded under supply agreement and those traded on the open market), and then subjected the list of paired CV values to the Wilcoxon Signed-Rank Text. The result was a p-value expressed as a ratio that indicated the probability that the null hypothesis could be rejected.
  - When the p-value indicated the null hypothesis could be rejected, F2M examined the direction of difference in variation between the paired sets. When that number was positive (i.e., when the CV of the open market data set was higher than the CV of the supply agreement data set), F2M found that price volatility was higher for loads delivered on the open market.

RESULTS: Forest2Market presents the results of these comparisons in colors that indicate the strength of the probability that price spread differences are attributable to the presence of a supply agreement. In effect, the color indicates how big the difference is in the price spread between matched subsets of data.

Color Code						
Probability	< 80 %	80 - < 85 %	85 - < 90 %	90 - < 95 %	95 - < 99%	≥ 99 %
P-Value	> 0.20	≤ 0.20 and > 0.15	≤ 0.15 and > 0.10	≤ 0.10 and > 0.05	≤ 0.05 and > 0.01	≤ 0.01

Key to Table 1: Small difference in spread >>>>> greater difference in spread.

As the difference in spreads increases between paired sets of data, the probability is higher that the existence of a long-term contract lowers price variability compared to similar open market sales. Red means there is a very high probability (≥99%) that supply agreements reduce price volatility. If that probability is less than 80% (blue), F2M finds that no correlation exists between supply agreements and price volatility.

Table 1 shows a sample of the results by state and product combination. The cells coded in red and orange indicate that price volatility was significantly reduced for loads delivered under supply agreement. Those coded in yellow, green and blue show little to no difference in price

volatility. White cells indicate that no known supply agreements met the conditions described in the category or that results, if shown, would violate a confidentiality agreement.

State	Pine Pulpwood (All Mills)	Pine Pulpwood (Mills Consuming 0.75-1.25 million tons)	Pine Sawtimber (All Mills)	Pine Sawtimber (Mills Consuming Logs Between 8-12-inch DBH)	Pine Residuals (All Mills)
Alabama	$P = 0.0039$	$P = 0.0078$	$P = 0.0049$	$P = 0.0010$	$P = 0.0001$
Arkansas	$P = 0.0522$		$P = 0.0001$	$P = 0.0002$	
Florida	$P = 0.0137$		$P = 0.0156$		
Georgia	$P = 0.0020$				$P = 0.0001$
Louisiana	$P = 0.0479$	$P = 0.5417$	$P = 0.0002$	$P = 0.0640$	$P = 0.0001$
Mississippi	$P = 0.3203$	$P = 0.1016$	$P = 0.0830$	$P = 0.0049$	
North Carolina	$P = 0.0007$	$P = 0.0012$	$P = 0.0012$	$P = 0.0327$	
Oklahoma	$P = 0.0078$				
South Carolina	$P = 0.0034$		$P = 0.0010$	$P = 0.0010$	$P = 0.0054$
Texas	$P = 0.0215$	$P = 0.0391$	$P = 0.0245$	$P = 0.6355$	$P = 0.0043$
Virginia	$P = 0.0020$		$P = 0.0039$		$P = 0.0010$

Table 1: *Sample of results.*

FINDINGS:

1) Southwide results show that price volatility was reduced from 2007 through 2010 for wood raw material products sold under supply agreements. For hardwood pulpwood, pine sawtimber and pine residual chips, the results indicate a 99% or higher probability that supply agreements dampened price volatility. For Pine pulpwood, that degree of confidence is between 95-99%.

2) Hardwood pulpwood, due to its nature as a "come-along" product as it is removed in conjunction with pine harvests, showed less volatility in price when it was delivered according to a pine pulpwood supply agreement than when it was traded on the open market.

3) Wood raw materials delivered under supply agreement often garnered a price premium. When a strong difference in price volatility existed (those displayed in red), mean supply agreement prices were often higher than the mean price for the same material sold on the open market. This difference depends on the product and is indicated with the Delta symbol in *Fig. 2*.
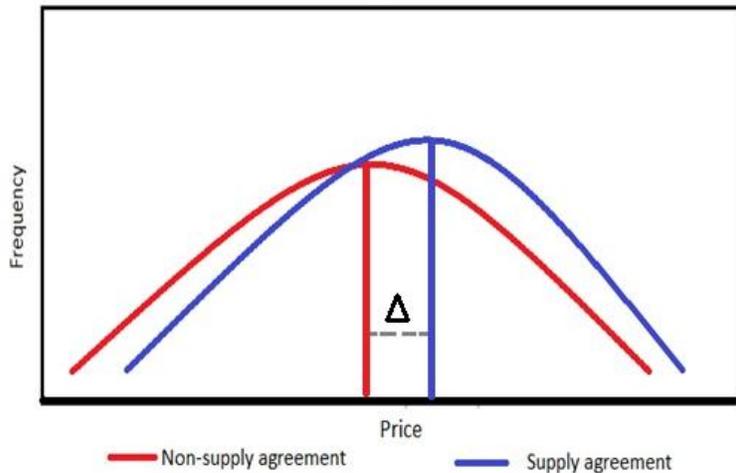

Fig. 2: *Comparison of price volatility: supply agreement v. non-supply agreement.*

CONCLUSIONS: Because higher price volatility equals higher risk for investors in new wood consuming facilities—pellet mills, torrefaction plants, wood biopower facilities and biofuels refineries—these entities have a better chance of securing lower cost capital and operating funds for their facilities when they have signed long-term supply agreements for wood.

In order to support the development of this new market for wood raw materials, the wood supply chain might find it beneficial to adopt new business practices, including the ability to negotiate these long-term agreements.

The results of this study show that members of the supply chain—landowners, loggers and dealers—should be confident entering into these long-term agreements for the following reasons:

1) Suppliers delivering wood raw materials under supply agreement have historically obtained a price that is, on average, slightly higher per ton.
2) These long-term supply agreements have not typically required suppliers to make a commitment to price at their inception. Instead, they generally include indexing mechanisms, or language that ensures that the seller will receive and the buyer will pay market price for material at the time it is sold or purchased. This index is supplied by an independent third party in a timely fashion.
3) Some avoid long-term supply agreements out of a belief that the market can be timed. The results of this study show that the evidence for this belief is anecdotal. In the vast majority of cases, loads delivered under supply agreements have historically brought a higher price.

If suppliers can stay competitive when managing their businesses over the course of a supply agreement, if they can allocate assets, utilize their capital and human resources effectively, they should be confident that these supply agreements will not adversely affect their businesses.

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