



AGRICULTURE

# Introduction to VSR

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The exchange specifies the maximum storage charge that an approved futures delivery elevator may charge someone holding one of their delivered shipping certificates. A Variable Storage Rate or “VSR” allows those storage charges to vary when certain conditions are met.

VSR improves cash-futures convergence at futures contract expiration when stocks of the commodity are either small or large relative to available storage capacity. Cash and futures prices almost always come together or “converge” as a futures contract enters delivery, but these prices can remain divergent when storage is in short supply. In the short-run, physical storage space is fixed. In a good production year, the demand for storage space increases relative to the fixed amount of available storage, and the price, or value, of storage increases. If the price to store physical grain exceeds the maximum storage charge allowed by the Exchange to carry shipping certificates, the cash price paid to farmers will remain below the futures price because the value of a commodity entitled to a below market storage rate is higher than that of the farmer delivered commodity because it will face full market storage rates. VSR identifies these types of conditions, and adjusts the Exchange defined maximum storage rate to reflect the true value being discovered in the physical market. The result of this dynamic storage rate is improved cash-futures convergence over a multitude of market conditions.

## VSR Concept

The basic idea behind VSR is to trigger higher storage rates that drive wider calendar spreads when those spreads are near financial full carry and trigger lower storage rates that allow narrower calendar spreads when those spreads are narrow or inverted. When grain stocks are large relative to available storage, calendar spreads become wide; however, when grain stocks are small relative to available storage, calendar spreads narrow. Research conducted by the University of Illinois suggests that the wheat market often exhibits poor cash-futures convergence when stocks are large and calendar spreads are 80 to 100 percent of financial full carry. However, convergence tends to be excellent when stocks are smaller and calendar spreads are less than 80 percent of financial full carry. The VSR mechanism continually expands storage and financial full carry until the calendar spreads fall below 80 percent of financial full carry. Alternatively, the VSR mechanism continually reduces storage and financial full carry until the calendar spreads are above 50 percent of financial full carry. When calendar

spreads are between 50 and 80 percent of financial full carry, no changes in maximum storage rates are triggered.

## How VSR Works

An important component of VSR is the concept of financial full carry, or the cost to take delivery of a wheat shipping certificate, carry that certificate to the next delivery period, and re-deliver that certificate during the next delivery period. The formula for financial full carry is:

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$$\# \text{ Days} * [(\text{Interest}/360 * \text{Futures Price}) + \text{Daily Storage}]$$

Where:

# Days = Number of calendar days from first delivery day in the nearby contract to first delivery day in the contract following the nearby contract

Interest = 3-Month LIBOR rate + 200 basis points

Futures Price = Settlement price for the nearby contract

Daily Storage = Current daily premium charge

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For example, suppose there are 62 days between the first delivery day of the July Wheat futures contract and the first delivery day of the September Wheat futures contract. Assume that the current maximum daily storage rate is 16.5/100s of one cent per bushel per day. Further suppose the 3-Month LIBOR rate is 0.50 percent and full carry is calculated using LIBOR plus 200 basis points or 2.5 percent interest. Finally, suppose the July futures contract is priced at \$5.75 per bushel. Financial full carry would be calculated as:

$62 * [(.025/360 * \$5.75) + .00165] = 12.70$  cents. If the July contract is priced at \$5.75 per bushel and the September contract is priced at \$5.87 per bushel, the July-September spread of 12 cents would represent  $12 \div 12.70 = 94.5$  percent of financial full carry.

Using the VSR mechanism, on each business day from the 19th calendar day of the recently expired delivery month until the nearby contract option expiration date, the nearby calendar spread and financial full carry are calculated just as in the example above. Again, using the July contract as an example, on each business day from May 19 (May is the previous delivery month) until June 25 (June 25 is the July option expiration date) the July – September spread is calculated, financial full carry is calculated and the July – September spread is reported relative to financial full carry. The exchange also calculates the running average of this spread relative to financial full carry each business day on its website at [www.cemgroup.com/vsr](http://www.cemgroup.com/vsr).

Should the average carry during the observations period be 80 percent or greater of financial full carry, the daily maximum storage charge would increase by 10/100's of one cent per bushel (approximately 3 cents per bushel per month) beginning on the 18th calendar day following the delivery period of the nearby contract. For example, continuing with the previous example, if on June 25, the Jul – Sep spread has averaged 80 percent of financial full carry or greater, then beginning on July 18, the daily storage charge for all outstanding wheat shipping certificates will increase by 10/100's of one cent per bushel. Thus, if this was to occur, the daily storage charge would increase from 16.5/100s of one cent per bushel (approximately 5 cents per bushel per month) to 26.5/100s of one cent per bushel (approximately 8 cents per bushel per month).

If the running average carry is between 50 and 80 percent of financial full carry during the observation period, the daily storage charge remains unchanged.

Similarly, should the running average carry be 50 percent or less of financial full carry during the observation period, the daily storage charges would decrease by 10/100's of one cent per bushel beginning on the 18th calendar day following the delivery period of the nearby contract. However, the daily storage charge is not allowed to fall below the floor value of 16.5/100s of one cent per bushel, so even if the Jul – Sep spread used in the example above averaged less than 50 percent of financial full carry, it would not trigger a reduction in the daily storage rate because that rate would already be at its minimum value of 16.5/100s of one cent per bushel.

There is no upper limit on storage charges should spreads continue to trade above 80 percent of financial full carry. If the Jul-Sep spread averages above 80% of financial full carry and the daily storage charge is triggered higher to 26.5/100s on July 18. Then, beginning on July 19, the exchange would begin monitoring the Sep – Dec spread relative to full financial carry, which would now be larger because of the higher storage rate.

For example, assume the 3-month LIBOR rate plus 200 basis points is 2.25 per cent and there are 91 days between September 1 and December 1. Suppose September Wheat futures are trading at \$4.50 per bushel. Then, financial full carry for the Sep to Dec timeframe would be:

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$$[(2.25/360 * \$4.50) + .00265] 26.67 \text{ cents}$$


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The September – December Wheat spread would be measured relative to financial full carry each day from July 19 until August 27, the day the September 2010 Wheat options expire. Suppose during this time the September – December Wheat spread averaged 25.5 cents, then the spread would be  $25.5 / 26.67 = 95.61$  percent of full carry. This would trigger an increase in the daily storage rate from 26.5/100s of one cent per bushel to 36.5/100s of one cent per bushel (approximately 11 cents per bushel per month) beginning on September 18.

Then the process begins again, looking at the Dec – Mar spread relative to financial full carry beginning on September 19. Should the Dec – Mar spread average over 80 percent of full carry, the daily storage rate would again be increased, this time to 46.5/100s of one cent per bushel. Should the Dec – Mar spread average 50 percent of full carry or below, it would trigger the daily storage charge down 10/100s or back to 26.5/100s of one cent per bushel beginning on December 18.

Should the Dec-Mar spread average be greater than 50 percent of full carry but less than 80 percent of full carry, the daily storage charge would remain unchanged at 36.5/100s of one cent per bushel.

## Summary

To improve wheat cash and futures price convergence at futures contract expiration, a variable storage rate or VSR mechanism was implemented in Chicago SRW Wheat futures and is planned in the KC HRW Wheat futures with the March 2018 contract expiration. VSR is based on the concept of allowing Wheat futures contract maximum storage charges to increase when nearby spreads average 80 percent of financial full carry or more over a defined time period and allowing Wheat futures contract maximum storage charges to decrease when nearby spreads average 50 percent of financial full carry or less over a defined time period.

VSR results in improved cash-futures convergence under various underlying market conditions. The portion of price discovery that occurs in the basis gets transferred into the transparent futures spread markets, resulting in greater liquidity.



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