



VelesWater

WATER FUTURES MADE EASY

Water futures present a unique, cost-effective means to manage water price risk. One can use futures to hedge against price changes in the water market, which may otherwise have significant financial impact to a water user's bottom line. This article will lay out the fundamental concepts involved in trading the contracts and lay the groundwork for successful risk hedging.

The returns or losses can be greater than in illustrated examples. Futures are marked-to-market on a daily basis. Individuals are responsible for initial and maintenance margin. Investment in futures can result in losses that exceed initial investment.

Setting the Stage

Water is a unique asset in that it not only sustains human life, but it serves as an essential input to a wide variety of economic activity. Simply put, water is vital to both lives and livelihoods. In the state of California, the use of water is regulated by a system of entitlements to manage use of this limited resource. In recent decades, the growing demand for water across the state has spurred the development of markets for trading water entitlements. For those holding water entitlements in California (hereafter “water users”), these markets provide a means of reallocating water to address year-to-year variability in supply. Today, California’s water markets involve many participants trading billions of dollars’ worth of water.

California water resources are characterized by their extremely variable supply. The price of water can increase sharply during drought conditions, as demand substantially outpaces supply. The inverse holds true when the state experiences sustained wet hydrologic conditions. Over the last century, California has experienced several prolonged and severe drought cycles, punctuated by brief periods of extremely wet hydrologic conditions. Whether one is a buyer or seller, the impact of water price volatility can be profound for the California water user.

In addition to hydrologically driven challenges, the information available to water market participants is often limited and opaque. Buyers and sellers may only be aware of trades in their local market, and even then, the pricing of those trades is rarely disclosed publicly. In partnership with WestWater Research and Nasdaq, Veles has sought a solution to this problem through the creation of the Nasdaq Veles California Water Index (NQH2O). The index represents the current valuation of water as determined by entitlement transactions from California’s surface water market and select adjudicated groundwater basins. The index is published weekly, delivering a timely and transparent informational tool for water users to benchmark the value of their water entitlements.

California water markets are highly susceptible to price volatility based on prevailing hydrology. Water market participants are exposed to the risk that prices will be higher or lower in the future. Until recently, buyers and sellers have had limited tools to manage the adverse effects of price risk. This changed on December 7, 2020, when the CME Group listed the Nasdaq Veles California Water Index futures. The introduction of this product offers California water users a robust, cost-effective tool to manage the financial impacts of water price volatility.

Connecting the Physical and the Futures Markets

A large portion of water entitlements in California are traded in what is known as a “spot” market. In a spot market, price discovery occurs spontaneously as buyers and sellers come together to determine fair value for the asset at that moment in time. In a “futures” market, by contrast, buyers and sellers agree to buy or sell a specific quantity of a standardized asset on a specific date in the future. The same terms apply to all participants, regardless of who is involved in the trade. In the case of NQH2O futures, the transaction is purely financial, meaning the good exchanged between buyer and seller is cash. Trading in NQH2O futures does not involve the delivery of physical water or the transfer of a water entitlement, from seller to buyer. A water user seeking to buy or sell a water entitlement will need to do so via a separate transaction. However, were a water user to enter into both a spot market trade and a futures trade, an exciting new opportunity emerges.

Consider a water user who needs to acquire 1,000 acre-feet (AF) of water for delivery in September 2021. In March 2021, the water user may not have an immediate need or available storage for this quantity of water; however, this individual knows that he or she will need to execute this purchase via the spot market in September 2021. The water user will be required to pay the prevailing market price in September, regardless of whether the price has increased or decreased since March. As such, the water user is exposed to the risk that the prevailing market price in September will be higher than spot market price today in March. Rather than bear the full brunt of that financial risk in September, the water use can take action in March to address this uncertainty by purchasing September 2021 NQH2O futures contracts. The idea here - what is termed a “hedge” in financial markets - is to offset a loss incurred if prices rise in the spot market, with a corresponding gain from the futures contract.

The price of the September futures contract represents the market’s expectation of where the NQH2O Index value will be on September 15th, 2021. The price of the September futures contract will change between March and September as buyers and sellers of that contract refine their expectations. This process of refinement will culminate with the contract expiration on September 15th, 2021. On that date, the contract settles to the NQH2O Index. By definition, the value of the futures contract equals the price of NQH2O at that time of expiration.

In the course of this settlement process, buyers and sellers of the September futures contract will realize a final profit or loss. The exact profit or loss is dependent upon the difference between the original transaction price of the September futures contract and the value of NQH2O at the time the contract expires. For the California water user seeking to hedge the cost of water in the spot market, it is critical that this profit or loss be viewed in the context of that spot market transaction. If a hedge is successful, a profit in the futures market will be offset by higher prices in the spot market, and vice versa. The aim is to secure a particular financial outcome associated with the spot market transaction, regardless of whether spot market prices are higher or lower in September.

Stylized Example of Hedging

Before diving into the example, it is important to note two key assumptions in the following analysis. First, we assume that spot market price available to the water user is equivalent to the NQH2O Index. In practice, the two values will track with one-another, but will rarely be perfectly in-line. Second, we ignore the cost of maintaining margin between the water user initiating the futures position and the expiration of the contract. For more information on these subjects, see the disclaimer at the end of this document.

A water user expects they will need to acquire 1,000 AF of water on the spot market in September 2021. One NQH2O futures contract represents 10 AF worth of financial exposure. In order to cover the full financial exposure of the 1,000 AF the water user plans to purchase in September 2021, the water user will buy 100 September 2021 futures contracts in March 2021. If the September futures contract is trading at \$500/AF in March 2021, the futures market is predicting that 1,000 AF of water will cost the water user \$500,000 in September. As we see in the tables below, by purchasing 100 September 2021 futures contracts, the water user can “lock in” a price of \$500/AF regardless of where the spot market ends up in September. If the price of spot market water rises above \$500/AF in September, profits from the futures will offset the cost purchasing more expensive spot market water. If the spot price of water falls below \$500/AF in September, the loss in the futures will be offset by the purchase of less expensive spot market water. It is important to note that the same logic applies to the reciprocal scenario with a water user that is selling water in the spot market. Holding the same assumptions as above, a seller of water can “lock in” a price for a September spot market transaction by selling the corresponding September futures contract.

Below are four examples to demonstrate potential outcomes of hedging the future price of water in the spot market, as both a buyer and a seller. Someone anticipating a need to purchase water in the spot market at a future date and wanting to hedge against the price risk associated with that purchase will enter into a long position in the futures market. A water user that anticipates the need to market unused water supply at a future date and would like to hedge against the price risk associated with the sale will enter into a short position in the futures market.

Hedging as a Buyer

September 2021 Water Price Increases By \$300/AF

Date	Action	September 2021 Futures Price	NQH2O	Futures Position	Water Position	Gross Price of Water	Net Price of Water	Cash On Hand	Notes
15/03/2021	--	\$500	\$400	--	--	--	--	\$1,000,000	The Spot Market value of 1,000 AF of water is \$400,000 in March 2021 The Futures Market expects the Spot Market value of 1,000 AF of water will be \$500,000 in September 2021
15/03/2021	Buy Futures Contracts	\$500	\$400	100 Contracts (Long)	--	--	--	\$875,000	The initial margin required to buy the futures contracts is \$125,000
15/09/2021	Futures Contracts Expire	\$800	\$800	0 Contracts	--	--	--	\$1,300,000	Return of \$125,000 margin Profit of \$300,000 on the futures contracts
15/09/2021	Buy Water	\$800	\$800	0 Contracts	1,000 Acre Feet	\$800,000	\$500,000	\$500,000	The Spot Market cost of 1,000 AF of water is \$800,000 The net price, when accounting for the \$300,000 profit on the futures, is \$500,000

In this example, the water user's net purchase price for spot market water in September 2021 is \$500/AF. The futures generated a profit of \$300/AF, which when subtracted from the spot market price (\$800/AF), results in a net price of \$500/AF.

September 2021 Water Price Decreases By \$300/AF

Date	Action	September 2021 Futures Price	NQH2O	Futures Position	Water Position	Gross Price of Water	Net Price of Water	Cash On Hand	Notes
15/03/2021	--	\$500	\$400	--	--	--	--	\$1,000,000	The Spot Market value of 1,000 AF of water is \$400,000 in March 2021 The Futures Market expects the Spot Market value of 1,000 AF of water will be \$500,000 in September 2021
15/03/2021	Buy Futures Contracts	\$500	\$400	100 Contracts (Long)	--	--	--	\$875,000	The initial margin required to buy the futures contracts is \$125,000
15/09/2021	Futures Contracts Expire	\$200	\$200	0 Contracts	--	--	--	\$700,000	Loss of \$300,000 on the futures contracts \$125,000 margin is used to pay for part of that loss
15/09/2021	Buy Water	\$200	\$200	0 Contracts	1,000 Acre Feet	\$200,000	\$500,000	\$500,000	The Spot Market cost of 1,000 AF of water is \$200,000 The net price, when accounting for the \$300,000 loss on the futures, is \$500,000

In this example, the water user's net purchase price for spot market water in September 2021 is \$500/AF. The futures generated a loss of \$300/AF, which when added to the spot market price for water (\$200/AF), results in a net price of \$500/AF. It is important to note that during the life of this trade, the buyer would be obligated to post maintenance margin of up to \$300,000. For more information on maintenance margin, please see disclaimers at the end of this document.

Hedging As A Seller

September 2021 Water Price Increases By \$300/AF

Date	Action	September 2021 Futures Price	NQH2O	Futures Position	Water Position	Gross Price of Water	Net Price of Water	Cash On Hand	Notes
15/03/2021	--	\$500	\$400	--	1,000 Acre Feet	--	--	\$500,000	The Spot Market value of 1,000 AF of water is \$400,000 in March 2021 The Futures Market expects the Spot Market value of 1,000 AF of water will be \$500,000 in September 2021
15/03/2021	Sell Futures Contracts	\$500	\$400	100 Contracts (Short)	1,000 Acre Feet	--	--	\$375,000	The initial margin required to sell the futures contracts is \$125,000
15/09/2021	Futures Contracts Expire	\$800	\$800	0 Contracts	1,000 Acre Feet	--	--	\$200,000	Loss of \$300,000 on the futures contracts \$125,000 margin is used to pay for part of that loss
15/09/2021	Sell Water	\$800	\$800	0 Contracts	--	\$800,000	\$500,000	\$1,000,000	The Spot Market cost of 1,000 AF of water is \$800,000 The net price, when accounting for the \$300,000 loss on the futures, is \$500,000

In this example, the water user's net sale price for spot market water in September 2021 is \$500/AF. The futures generated a loss of \$300/AF, which when subtracted from the spot market price for water (\$800/AF), results in a net price of \$500/AF. It is important to note that during the life of this trade, the seller would be obligated to post maintenance margin of up to \$300,000. For more information on maintenance margin, please see disclaimers at the end of this document.

September 2021 Water Price Decreases By \$300/AF

Date	Action	September 2021 Futures Price	NQH2O	Futures Position	Water Position	Gross Price of Water	Net Price of Water	Cash On Hand	Notes
15/03/2021	--	\$500	\$400	--	1,000 Acre Feet	--	--	\$500,000	The Spot Market value of 1,000 AF of water is \$400,000 in March 2021 The Futures Market expects the Spot Market value of 1,000 AF of water will be \$500,000 in September 2021
15/03/2021	Sell Futures Contract	\$500	\$400	100 Contracts (Short)	1,000 Acre Feet	--	--	\$375,000	The initial margin required to sell the futures contracts is \$125,000
15/09/2021	Futures Contracts Expire	\$200	\$200	0 Contracts	1,000 Acre Feet	--	--	\$800,000	Return of \$125,000 margin Profit of \$300,000 on the futures contracts
15/09/2021	Sell Water	\$200	\$200	0 Contracts	--	\$200,000	\$500,000	\$1,000,000	The Spot Market cost of 1,000 AF of water is \$200,000 The net price, when accounting for the \$300,000 profit on the futures, is \$500,000

In this example, the water user's net sale price for spot market water in September 2021 is \$500/AF. The futures generated a profit of \$300/AF, which when added to the spot market price for water (\$800/AF), results in a net price of \$500/AF.

Important Notes Regarding Risks

This document is designed to create an understanding of the basic mechanics of futures trading. The analysis makes certain assumptions and omits certain considerations for the sake of simplicity.

Margin – Like all other exchange-traded futures contracts, H2O futures are marked-to-market on a daily basis. In order to initiate a position in a futures contract, one must deposit initial margin. Initial margin is the amount of money that one must deposit and keep on hand with a broker in order to maintain a futures position. In addition to initial margin, one may be required to post Maintenance Margin prior to exiting a futures position. Margin Maintenance is the amount of money necessary when a loss on a futures position requires an investor to allocate more funds to return the margin to the initial or original margin level.

Basis - This analysis assumes that spot market prices are equal to the NQH2O Index. In practice, the spot market price may not be perfectly correlated to NQH2O, and there is there is potential for both excess gains and excess losses when hedging spot market price risk via NQH2O futures.

Fees – Trading futures may involve brokerage and other fees (including exchange fees) have been ignored in this analysis.

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