

# HOW NZX MILK PRICE FUTURES AND OPTIONS WORK

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NZX

## Introduction

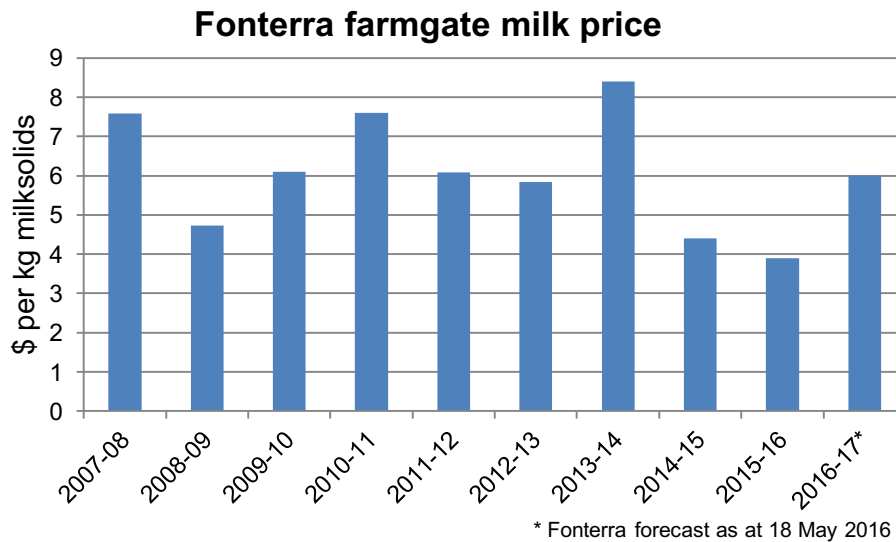
Over the past 50 years the global dairy industry has experienced a transformation, moving from a stable low risk environment to one of unprecedented volatility. The New Zealand dairy farmer is at the forefront of this volatility transformation where 95% of milk is exported and farmers are exposed to the ups and downs of the global market. Both producers and purchasers of milk products are increasingly seeking ways to create certainty around the price they receive or pay for product. Futures and options contracts provide a useful tool for dairy farmers and processors to reduce their risk, and it is now more important than ever to understand how to use these risk management tools.

## Risks for NZ dairy farmers

NZ dairy farmers supplied 1.8b kilograms of milk solids (kgMS) in 2016 and 95% of this milk is exported. Unlike many other dairy producing regions in the world that can depend on domestic demand and government subsidies in tough times, the NZ dairy farmer is significantly more exposed to volatility in the global market. As a result, the milk price can move significantly over the course of the season and from year to year (see chart below), affecting the ability of NZ dairy farmers to manage cash flows. Significant movements in the milk price can also affect the ability of some NZ dairy farmers to service debt. The level of debt carried by NZ dairy farmers is approaching \$40 billion (Reserve Bank Financial Stability Report, Nov 2015) and is unevenly distributed between farmers. Just 20% of farms hold 48% of total farm debt, compared with 20% of the lowest indebted farms accounting for only 3% of the total debt (DairyNZ based on 2013-14 dairy season). The 20% of farms with the highest debt (NZ\$34/kgMS or greater) have an average loan-to value ratio of 68% and require a milk price of \$5.80/kgMS to break even (DairyNZ, Nov 2015).

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## NZ Dairy derivatives market

NZX launched Whole Milk Powder (WMP) Futures in October 2010, followed by Skim Milk Powder (SMP) and Anhydrous Milk Fat (AMF) Futures contracts in February 2011. In November 2011, WMP Options contracts were launched and in December 2014 Butter (BTR) Futures were added to its derivative product offering. In 2016 NZX expanded its dairy offering with the launch of milk price futures and options contracts. Milk price futures and options are currently offered for three seasons. The contract relating to the previous milk production season will expire at the end of September, at which point another contract will be listed, so there will always be at least three contracts available to trade at any time.

## How derivatives work

The value of a derivative contract is derived from a physical (“underlying” or “cash”) market. For example, the value of a NZ milk price futures contract is derived from the market value of raw milk.

### 1. Futures contracts

A futures contract is a contract between a buyer and a seller to make delivery of goods or an asset at an agreed date in the future but at a price agreed today. For example, where the purchaser of a house agrees with the vendor to purchase the property for \$500,000 in 6 months’ time, this agreement is in effect a futures contract. A futures exchange allows parties to trade standardised contracts that are, in most cases, cash settled (i.e. no physical delivery of goods).

### *Futures accounts*

When trading a futures contract you do not pay or receive the full value of the trade when the transaction takes place. Instead, a futures contract is backed by a “margin” account, which - similar to a bond or deposit - helps ensure the agreed transaction takes place. Upon entering into a futures position, the holder is required to pay an ‘Initial Margin’ into this account. Throughout the life of a futures contract the holder may also be required to deposit additional payments where the account balance falls below the “maintenance margin”. These concepts are described in more detail below.

## **2. Options contracts**

Options contracts provide the purchaser with the right, but not the obligation, to buy or sell goods or assets at an agreed date in the future at a specific price. For example, a dairy farmer may want to protect against the milk price falling but retain the benefit of potentially higher prices. To achieve this, the farmer would purchase a “put” option (the right to sell). Were prices to decline, the farmer could exercise the put option. If prices were to rise, the farmer could let the options contract expire worthless. This example also demonstrates how options can be used as a form of insurance to protect against downside risk (with a premium being paid to the seller of the contract). There are five key characteristics of options contracts:

### *Underlying asset*

An options contract must be based on an underlying asset or instrument, e.g. a physical good or in many cases a futures contract.

### *Expiration date*

All options contracts will expire on a specified date. For milk price options contracts this is the day on which the underlying futures contract expires.

### *Type*

Being either a call option or a put option.

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### *Strike or Exercise Price*

This is the agreed price at which the underlying instrument will change hands if the option is exercised.

### *Premium*

The price for the option paid by the buyer to the seller. While the above four characteristics are set by an exchange (NZX), the premium is set by market forces (supply and demand).

To understand why parties choose to trade derivatives, it is useful to learn about two categories of traders: hedgers and speculators.

## **3. Hedging**

Hedgers, such as processors or producers of dairy products, seek to mitigate risk by creating price certainty. They do so by acquiring the opposite position in the futures market to that which they hold in the physical market. Any losses made in the physical market are theoretically offset by gains in the futures market. Hedging strategies consider that the physical market price and the futures market price tend to move in the same direction, at the same time. This correlation is not perfect however it is usually sufficient to significantly reduce the risk of loss.

## **4. Speculating**

Speculators seek to make a profit by predicting market movements. In the futures market, it is just as easy to initiate a trade by selling a futures contract first as it is to buy first. A speculator who thinks prices will rise can buy (go long) dairy futures. Speculators who think prices will fall can sell (short) dairy futures. To close out or offset the initial transaction, they will take the opposite positions (selling contracts they bought, or buying contracts they have sold). Speculation in a derivatives market is vital in bringing liquidity to the market and facilitating trading of those who are wanting to hedge.

## **Common terms and definitions**

### **5. Basis**

The correlation between physical market prices and futures contract prices is known as the 'basis'. The actual Farmgate Milk Price and price of the futures contract may not be identical. It is important for traders of futures contracts to be aware that the slight difference in futures and physical prices could slightly reduce the expected profit (or loss) on an overall transaction.

## **6. Call and put**

The purchaser of a call option has the right but not the obligation to **buy** a futures contract. The seller of a call option must sell the futures contract should the purchaser exercise their right. The purchaser pays a 'premium' for such a right. The opposite is true of put options (i.e. a put option is purchased for the right to sell a futures contract).

## **7. Daily settlement**

A trader's gains and losses with respect to futures contracts are calculated on a daily basis, based on the daily settlement price. This price is determined either by the price of futures traded that day (usually set with reference to last traded price), or a volume weighted calculation involving trading activity late in the day.

## **8. Expiration date / Last trading day**

Rights under options contracts can usually be exercised "on or before" an expiration date. Once that date has passed, the options contract is no longer valid (i.e. has expired and any money spent to purchase the option is unable to be recovered).

## **9. Final settlement (cash vs. physically delivered)**

Rather than literally delivering the physical product (e.g. milk solids) when a contract settles, most futures contracts are now "cash" settled. It is important to be aware that market participants will often refer to a contract as "going to delivery", i.e. the contract is still open at the expiry date, even when it is cash settled. NZ milk price futures settle to the Farmgate Milk Price announced by Fonterra every September.

## **10. 'In the money', 'out of the money', 'at the money'**

A call option (right to buy) is 'in the money' when its strike price is below the market price of the underlying asset, and 'out of the money' when its strike price is above the market price. An option that is 'out of the money' at the expiry date will expire worthless. These terms

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apply in the opposite direction for a put option (right to sell). For example, a put option is ‘in the money’ when its strike price is above the market price of the underlying asset. An ‘at the money’ option’s strike price is identical to the market price of the underlying security.

### **11. Long and short**

To go **long** means to buy. In the physical market if you have not yet bought product (agreed a purchase price) you are by definition short.

To go **short** means to sell. In the physical market if you have not yet sold your product (agreed a sale price) you are by definition long. For example, a dairy farmer will typically be long in the physical market for milk.

These concepts are important in the context of hedging where a hedger acquires an opposite position in the futures market to that which they hold in the physical market.

### **12. Margin (initial vs. maintenance)**

A “margin” account records profits and losses experienced by a futures contract (on a daily basis) as the underlying market fluctuates over the span of the contract.

The initial amount held in a margin account (called “initial margin”) is calculated as a percentage of the futures contract delivery price. A “maintenance margin” represents the lowest amount the account can reach before it must be topped up (back to the initial margin). This is explained in more detail below.

### **13. Physical / cash / underlying market**

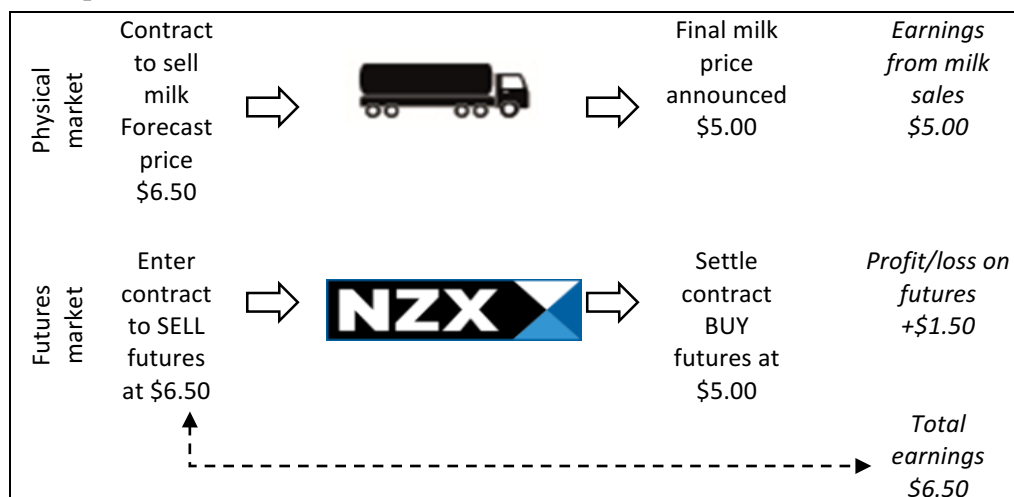
The product or asset from which the futures or options contract is derived, e.g. for milk price futures, the product is kg’s of milk solids.

## **Examples of hedging with futures**

### **14. Short hedge**

Dairy farmers can utilise a short hedge to protect against a falling milk price. This would mean selling futures contracts to offset their long position (holding physical milk solids).

### Example 1



In May 2017, the first forecast Farmgate Milk Price for the 2017/18 season is announced at \$6.50/kgMS. A dairy farmer seeks cash flow certainty by implementing a short hedge.

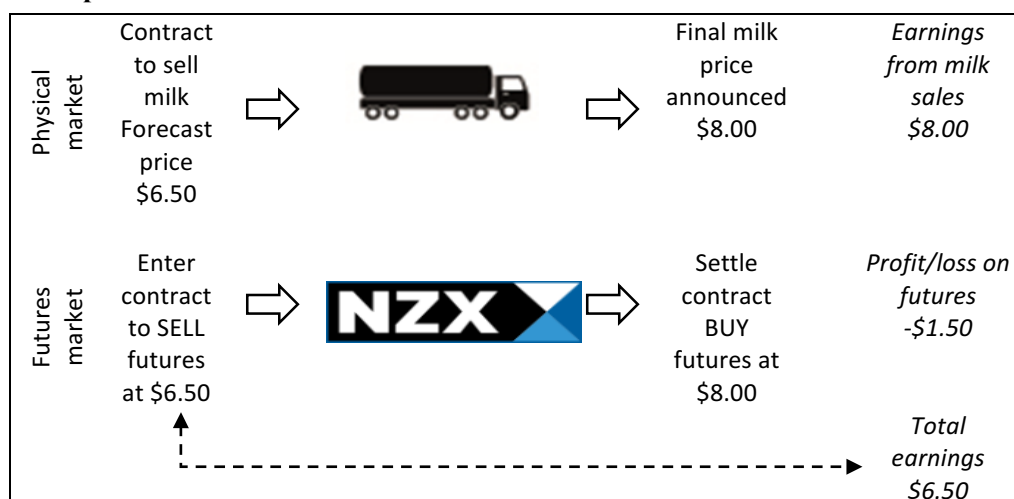
The farmer reviews the NZX milk price futures order book, which shows that participants are willing to buy up to 50 ‘lots’ of milk solids (one ‘lot’ equates to 6,000 kg’s milk solids) at \$6.50/kgMS for the 2017/18 season. The farmer decides to sell 10 lots or the equivalent of 60,000 kgMS at the price offered.

As the season progresses, the milk price falls and the Farmgate Milk Price is announced at \$5/kgMS (also being the final settlement price of the futures contracts).

So what has happened? **The loss in the cash / physical market** (the farmer will receive \$5/kgMS instead of \$6.50/kgMS) has been **offset by the gain in the futures market** (the futures contracts sold in May at \$6.50/kgMS are repurchased (or settled) at the Farmgate Milk Price of \$5/kgMS).

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## Example 2



In May 2017, the first forecast Farmgate Milk Price for the 2017/18 season is announced at \$6.50/kgMS. A dairy farmer seeks cash flow certainty by implementing a short hedge.

The farmer reviews the NZX milk price futures order book, which shows that participants are willing to buy up to 50 ‘lots’ of milk solids (one ‘lot’ equates to 6,000 kg’s milk solids) at \$6.50/kgMS for the 2017/18 season. The farmer decides to sell 10 lots or the equivalent of 60,000 kgMS at the price offered.

As the season progresses, the milk price increases and the Farmgate Milk Price is announced at \$8/kgMS (also being the final settlement price of the futures contracts).

So what has happened? **The gain in the cash / physical market** (the farmer will receive \$8/kgMS instead of \$6.50/kgMS) has been **offset by the loss in the futures market** (the futures contracts sold in May at \$6.50/kgMS are repurchased (or settled) at the Farmgate Milk Price of \$8/kgMS).

	<b>Example 1: Milk price falls</b>	<b>Example 2: Milk price rises</b>
Futures selling price	\$6.50	\$6.50
Final farmgate milk price	\$5.00	\$8.00
Profit/loss on futures contract	+\$1.50	-\$1.50
Effective total income ie milk price + futures gain/loss	\$6.50	\$6.50

## Examples of trading options

An option is the right but not the obligation to buy or sell goods or assets at an agreed date in the future at a specific price. Unlike futures, options can be used to protect against a decline in prices while still allowing the option holder to benefit from a rise in prices – the difference being that the buyer of the option must pay the seller a premium.



In the case of NZ milk price options contracts the underlying asset is an NZ milk price futures contract. One can purchase a “call” (the option to **buy** a futures contract) or purchase a “put” (the option to **sell** a futures contract).

### **15. Buying a put (right to sell)**

A farmer decides to purchase a put option to protect against the possibility of the milk price falling but still benefit from any rise in the milk price.

In July 2017, the Sep 2018 milk price futures contract (for the 2017/18 season) is trading at \$6.50/kgMS. Sep 18 put options are available with a strike price of \$6.50/kgMS, for a \$0.60 premium.

#### *Milk price rises - to \$8/kg*

If the physical milk price for the 2017/18 season rises to \$8/kgMS, a \$6.50/kgMS put option will expire worthless. In this instance, the purchaser of the put option would receive a price for their physical milk of \$8/kgMS and waive the right to sell on the futures market at \$6.50/kgMS. The purchaser will still have to pay the premium however, leading to an effective selling price of \$8/kgMS less \$0.60/kgMS = \$7.40/kgMS.

#### *Milk price falls – to \$5/kg*

If the physical milk price for the 2017/18 season falls below \$6.50/kgMS, the put option is “in the money”– it can either be exercised or sold prior to settlement or will be automatically exercised at expiration.

If exercised, the purchaser of the put option will now have a short futures position at a price of \$6.50/kg. Futures settle to the Farmgate Milk Price of \$5/kg so the farmer will benefit from the gain in the futures contract of \$1.50/kg (less \$0.60/kg premium) creating an effective sales price for milk of \$5.90/kg.

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## Information on margin accounts and trading

### *Initial margin*

Initial margin for NZX Dairy Futures is generally between 5-15% of the value of the traded contract. This margin acts as a good faith bond that will be used if the holder of the account fails to meet any obligations. If all obligations are met, then the initial margin is returned in full once the dairy futures position is closed. To find out more about current initial margin rates, visit this link: [www.nzclearingcorp.com/risk-management](http://www.nzclearingcorp.com/risk-management)

### *Variation margin*

In addition to the initial margin required to open a futures position, the holder of a futures contract may be required to deposit additional payments into the margin account in the event of adverse price movements in the market. The additional payments represent a “variation margin”. A margin call is required if the price moves so much so that the balance of the holder’s margin account falls below a set minimum margin.

### *Example*

A futures contract has an initial margin requirement of \$4,000 and a maintenance margin of \$3,600. If the daily settlement price (based on futures trading for that day) falls by \$420 from Day 1 to Day 2, the account balance has fallen below \$3,600 (i.e.  $\$4,000 - \$420 = \$3,580$ ) and would initiate a margin call. The holder in this case would be obligated to deposit funds into the margin account so as to re-establish the account balance to \$4,000. Failure to meet a margin call will incur fees and potential disciplinary action.

## How to get started

### **1. Develop a hedging strategy**

It is important that you understand your objectives, the different products on offer and in particular the trading fees, charges and margins. You can do so by seeking advice from an NZX Derivatives Participant (broker) or independent advisor.

### **2. Open an account with a broker**

This requires you to provide basic company information, fund the account and impose trading limits.

### **3. Start trading**

This can be done over the phone with your broker.

## Additional information

Brokers and advisers of the NZX milk price contracts (as at May 2017) are as follows:

### 4. Brokers



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To view the latest list of NZX Derivatives Participants (brokers), visit the link below:

<http://www.nzxfutures.com/access>.

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For more information on the NZX Dairy Derivatives market, please call Nick Morris on +64 (9) 3083703 or email: [nzxderivatives@nzx.com](mailto:nzxderivatives@nzx.com). For more information about AgriHQ contact Susan Kilsby +64 272962894 or [susan.kilsby@nzx.com](mailto:susan.kilsby@nzx.com).