

MILK



Contract

The Class III Milk futures trades at the Chicago Merchantile Exchange (CME) which is part of the CME Group. The futures' electronic platform ticker is 'DA' for Dairy.

Contract size is 200,000 lbs or approximately 91 metric tons with expiries for every single month.

Price quotation is USD per 100 lbs or one centum weight (cwt). That leverages the futures contract to a factor of 2000 (= 200,000 lbs / 100 lbs).

Maximum daily price movement is USD 0.75 above or below the previous day's settlement price.

The Class III Milk futures is cash-settled only. No delivery of actual fluid milk or any of its products would take place.

Dependencies

The price of milk is influenced by domestic U.S. demand in liquid milk and its products but also by **international demand in milk powder**, in particular out of China. With an exploding milk powder demand out of China (see chart 1) it is clear where prices go. U.S. consumer behavior takes a back seat.

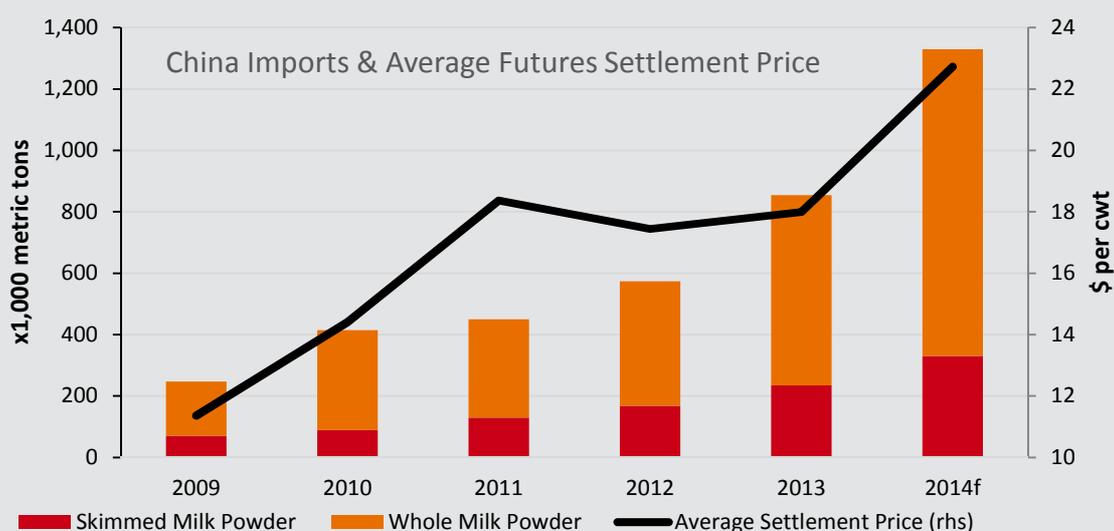


Chart 1: China's Imports of Milk Powder. July 2014 Forecast.
Average Class III Milk Futures Final Settlement Price. Source: USDA

The milk production cost depend on the **cost of feed** for milk cows, which is mainly corn, cowpea and cottonseed meal. Depending on the **nutrition of animal feed** dairy cows give more or less milk.

Absolute milk production and milk productivity, as measured by the average milk production per cow, increases year by year. But production and productivity are highly seasonally (see chart 2).

Higher temperatures or even a drought would negatively affect production and productivity. The largest milk supply is provided therefore before summer during the March to May period. Consequently, futures prices are normally the lowest for April and May expiries.

September and November are known for far less milk supply. Not surprisingly, historically futures prices are the highest for October and November.

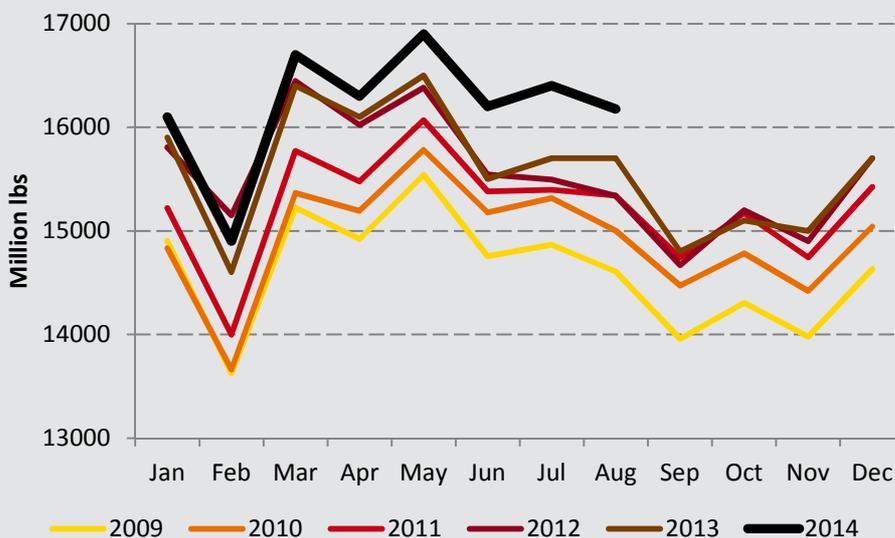


Chart 2: Milk production in 23 selected U.S. states (excluding milk sucked by calves).
Source: USDA

Prolonged heat periods would not only directly affect the cow itself but would typically cause also a shortage of its feed. That amplifies the adverse environment conditions. The milk farmer would save on the more expensive power feed reducing production even more.

Unprofitable milk production caused by either high costs for animal feed or persistent fall of demand leads to increased milk cow slaughters and therefore to (temporarily) lower meat prices due to increased meat supply.

Geographically, U.S. milk cow inventory is concentrated in California (about 21% of heads) and the Northern state of Wisconsin (about 15% of heads). Every third U.S. milk cow is feed therefore in these two states.

Main Exporters

Naturally, the population-rich EU, USA, India and China are the largest fluid milk production countries, in that order.

But when it comes to export milk products, like milk powder, the **EU, USA** and especially **New Zealand** are the world's leading exporters.

The Skimmed Milk Powder (SMP) export market is shared by the USA, EU and New Zealand that combined deliver about 80% of all SMP trades.

In Whole Milk Powder (WMP) New Zealand is nearly in a monopoly situation with an approximate WMP trade share of over 60% (see chart 3).

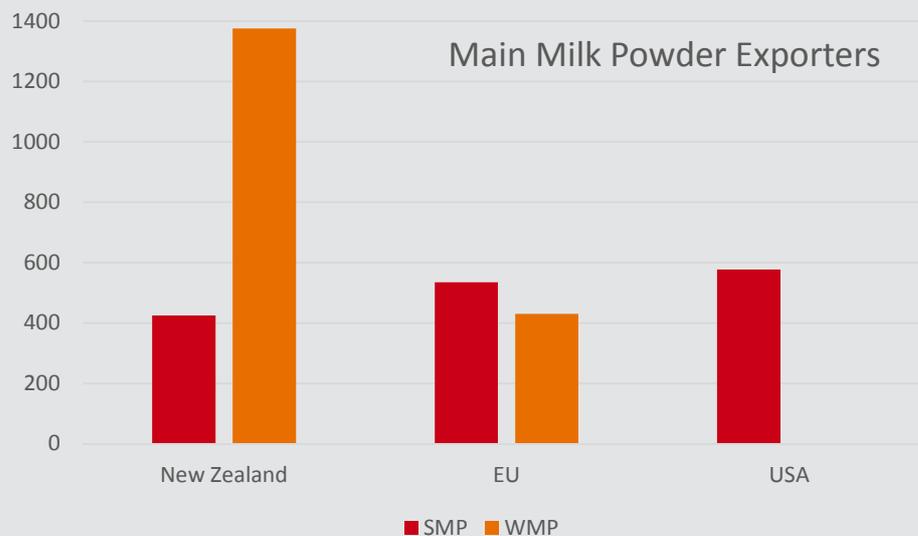


Chart 3: Main milk powder exporter. July 2014 forecast for 2014. Source: USDA

Main Importers

China constitutes the largest market for baby food and as such has the highest demand in milk powder worldwide. Consequently, China is by far the most important milk powder importer.

The Asian giant is forecast to import 330,000 metric tons SMP in 2014 resulting in an about 30% market share. Its expected 1,000,000 metric tons WMP imports would even make about 70% of all WMP international trades in 2014.

Milk Classes

In the US the processing of milk is categorized into 4 classes:

Class I is the fluid milk as such and buttermilk

Class II comprises yoghurt, ice cream and sour cream

Class III is used to manufacture **hard and cream cheese**

Class IV is butter and nonfat dry milk powder

Futures' Final Settlement Price

The final Class III Milk futures settlement price is based on a **United States Department of Agriculture (USDA)** survey of cheese, butter, and dry whey U.S. wholesale prices.

In a weekly **National Dairy Product Sales Reports** the USDA collects wholesale prices and sales volumes for basic dairy commodities including cheese, butter and dry whey. Reporting entities (95 plants) submit price and sales volume data to the USDA by each Tuesday for the preceding week ending Saturday. The National Dairy Product Sales Report is then published on the USDA website **each Wednesday at 3pm EST**. Typically following the release higher trading volume can be observed in the Class III Milk futures. See the latest weekly report on

<http://www.ams.usda.gov/AMSV1.0/DairyProductMandatoryReporting>

under the heading 'National Dairy Product Sales Report'.

No later than the 5th of every month, again on a Wednesday at 3pm EST, the data for the latest 4 or 5 of such reports are then combined to calculate a sales-volume-weighted average price for the past month for cheese, butter and dry whey. Plugged into below formulas these components determine the final Class III Milk futures settlement price for the corresponding futures. Release dates for this monthly report and number of weekly reports used can be found on the aforementioned link under the heading 'Calendars'.

Intermediate Estimate

Already after two of the 4 or 5 weekly National Dairy Product Sales Reports a monthly **Announcement of Advanced Prices and Pricing Factors** is published. Likewise to be found on

<http://www.ams.usda.gov/AMSV1.0/DairyProductMandatoryReporting>

under the heading 'Announcement of Federal Order Prices'.

It calculates the 2-weeks product price averages for cheese, butter and dry whey. In addition, it publishes a Base Class I price based on these averages. The formula for that Base Class I price resembles that of the Class III milk price. So we get a half period estimate of the to come final Class III milk futures final settlement price to be determined 2 or 3 weekly reports later. In that monthly Announcement of Advanced Prices and Pricing Factors report figures are assigned to the coming month.

Component Formulas

Class III milk and intermediate components' prices, like butterfat, protein and other solids, are calculated by the following linear formulas:

$$\text{Class III Price per cwt} = (\text{Class III Skim Milk Price per cwt} * 0.965) + (\text{Butterfat Price per lbs} * 3.5)$$

$$\text{Class III Skim Milk Price per cwt} = (\text{Protein Price per lbs} * 3.1) + (\text{Other Solids Price per lbs} * 5.9)$$

$$\text{Butterfat Price} = (\text{Butter Price} - 0.1715) * 1.211$$

$$\text{Protein Price} = (\text{Cheese Price} - 0.2003) * 1.383 + (((\text{Cheese Price} - 0.2003) * 1.572) - \text{Butterfat Price} * 0.9) * 1.17$$

$$\text{Other Solids Price} = (\text{Dry Whey Price} - 0.1991) * 1.03$$

The **butterfat price** is derived from the wholesale butter price in a simple way: First the constant cost to produce the butter, the so called 'make allowance' is subtracted from the butter price. Notice how low that cost of making of only \$0.1715 is in comparison to a butter price of over \$2.85 as of September 2014.

The pure raw material price is then multiplied by a factor that determines how much butter can be made from a given quantity of butterfat. A factor of 1.211 implies that butter would contain 82.6% (= 1/1.211) butterfat. The rest is mainly water.

Similarly the **other solids** price is calculated off the wholesale dry whey price. The cost of making is fixed at \$0.1991 which compares high to a September 2014 sell price of over \$0.67. Dry whey contains 97.1% (= 1/1.03) of other solids. As it is dried, it contains hardly water.

The **protein** formula is more complex. Again it contains a fixed price of \$0.2003 to make the cheese. Like in the case of butter, an actual wholesale cheese price of over \$2.34 as of September 2014 reveals that the actual manufacturing costs are rather low. The protein price is dominantly determined from cheese prices, implying that cheese contains a certain percentage of protein. However, an increased value of butterfat as used in cheese would in turn decrease the protein portion and price. In other words, a higher fat portion in the cheese goes at the expense of the protein part.

By components, class III milk is dominantly a protein product. Because of the comparably much higher protein price, as defined by above formula, versus butterfat and other solids, it makes over 50% of the milk check. Please note that statement would not imply class III dairy products to contain more than 50% protein, but that it constitutes its most costly component. Nevertheless, in the context of protein source class III milk products can be theoretically compared to livestock and the protein-rich soybean. Although the actual price link between these commodities is typically rather weak.

The Class III Milk futures is really better labeled a **cheese futures**. Its price is most sensitive to the change of wholesale cheese price (factor of 9.6) followed by dry whey (factor of 5.9). The butter price has the least influence with a factor of 0.4 only. In fact, the correlation between cheese price and class III milk price changes (monthly data) is over 99%!

Useful Links

- John Geuss' blog 'MilkPrice': <http://milkprice.blogspot.com/>
- United States Department of Agriculture (USDA)
Milk Marketing Order Stats:
<http://www.ams.usda.gov/AMSV1.0/DairyMarketStatistics>
Milk Production:
<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1103>

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