

# **WHEN SOMEONE CLAIMS TO KNOW WHERE COMMODITY PRICES ARE REALLY HEADING...GRAB YOUR WALLET AND RUN!**

**Daniel A. Sumner and William A. Matthews<sup>1</sup>**

## **ABSTRACT**

Forecasting agricultural commodity prices is fraught with difficulties. These difficulties may be especially acute for milk prices, where volatility has been extreme in recent decades. This paper reviews the record of recent milk price projections from USDA, and also examines futures prices to project the subsequent year's milk prices. Projections and forecasts do fine when little actually changes but seem to have no ability to capture substantial market shifts up or down.

**Key Words: USDA price projections, price forecast, futures market prices**

## **INTRODUCTION**

Forage crop producers, marketers and buyers face substantial economic volatility from many sources. For example, market and trade policies, exchange rates, weather and demand are all subject to unanticipated shocks.

Hay producers naturally turn to forecasts and projections of production, demand conditions and prices such as those available from Seth Hoyt (The Hoyt Report). But forecasts are themselves uncertain and fraught with difficulty. The dairy market is crucial for the hay industry and this paper examines some recent government and futures market forecasts of U.S. dairy markets and highlights the difficulties inherent in forecasting volatile markets.

## **THE PATTERN OF RECENT MILK PRICES**

Dairy farmers have confronted extreme milk price volatility in recent years. Figure 1 shows the monthly milk price from January 1995 through September 2016. Overall prices have ranged from just over \$9 to almost \$23 per hundredweight. During this timeframe, California producers experienced on-farm milk price increases of as much as 20 percent from one month to the next (March to April 2004) and decreases in price greater than 16 percent (December 2008 to January 2009). For the period 1995 through 2006, the average monthly milk price was \$12.10 per hundredweight and the general trend was relatively flat. The average monthly price from January 2007 through September of 2016 was much higher, \$15.80 per hundredweight, but volatility was higher too and milk margins over feed costs were extremely low in parts of 2009 and 2012.

---

<sup>1</sup> Daniel A. Sumner, director University of California Agricultural Issues Center (AIC) and Frank H. Buck, Jr. Professor Department of Agricultural and Resource Economics, UC Davis. [dasumner@ucdavis.edu](mailto:dasumner@ucdavis.edu); William A. Matthews, Project Scientist, AIC. [wamatthews@ucdavis.edu](mailto:wamatthews@ucdavis.edu); In: Proceedings, 2016 California Alfalfa and Forage Symposium, Reno, NV, 29 November - 1 December, 2016. UC Cooperative Extension, Plant Sciences Department, University of California, Davis, CA 95616.

Market shifts present a daunting challenge for price projections. When examined by individual year, the milk price in one month of a particular year tells little about what the price in the same month in following years might be (Figure 2). Prices were extremely high for most of 2014, but collapsed at the end of the year and have been low since then.

### **LONG-TERM PROJECTIONS**

Each year, USDA makes 10-year projections of agricultural supply demand and prices. The commodity projections are also used to project farm program costs and to prepare the President's budget. The projections reflect a number of assumptions that are spelled out in a baseline scenario and cover agricultural commodities, agricultural trade and aggregate indicators of the U.S. farm sector such as farm income. The USDA releases its annual projection in February which reflects estimations conducted in November of the prior year.

Each projection covers the average annual price for the baseline year and the next ten years. In addition, each ten-year projection report provides actual prices from the two prior years for context. Figure 3 examines several recent projections for U.S. annual average all-milk price and compares these projections to actual U.S. annual average all-milk price that occurred for that year. Each line in Figure 3 represents a specific set of baseline projections and the average all-milk price projected out for each year from the projection date.

In some cases, the projected milk price is quite close to the actual price. For example, projected milk price from the 2010 baseline for the calendar year 2010 was \$16.50 per hundredweight and the actual average milk price for 2010 ended up being \$16.26. In other instances, the price projected by the baseline is far from actual prices. For example, the 2012 projected price for 2014 was \$18.53 and the 2014 projected price for 2014 was \$19.75 but the actual average of all milk prices for 2014 turned out to be \$24.20.

Comparing the actual milk price to prices projected by USDA shows the difficulty of the task. Projections tend to follow current trends and find it mostly impossible to forecast rapid shifts up or down in those trends. This is seen in the long-term projections of the 2010, 2012 and 2014 reports compared to those from the 2015 and 2016 reports. The early reports show an increasing trend in average milk price, while the 2015 and 2016 reports, reacting to the volatility of the 2014 milk market, show a downward trend and are projecting much lower prices in milk. The result is an array of projected prices for 2018 that cover a range of more than \$2 per hundredweight.

### **SHORT-TERM PROJECTIONS**

The USDA also produces short-term projections which are reported monthly in The World Agricultural Supply and Demand Estimates (WASDE) report. These reports include projections for U.S. and world supply and demand for various agricultural commodities. Each WASDE reports a full balance sheet for each commodity. Separate estimates are made for components of supply (marketings and imports) and demand (commercial exports, and domestic commercial use).

For U.S. milk estimates, supply and use (Table 1) is presented on both a fat basis and a skim solids basis. On a milk fat basis the United States produced just under 209 billion pounds of milk in 2015. The amount of milk fat imported into the United States was only slight below that exported. On a skim solid basis the U.S. exported 37.3 billion pounds in 2015, substantially more than it imported, making the U.S. a major supplier of skim solid products to the international market. Therefore, in order to project demand for U.S. milk on a skim solids basis, it is crucial to understand the export demand for these products and their influence on projected prices.

The WASDE also reports monthly projections of average farm prices for most items (Table 2). Prices tie together both supply and demand. Market prices ration available supplies among competing uses and stimulate new supply. Table 2 shows the current WASDE report on milk prices. Average annual prices are reported for the previous two years, 2014 and 2015, and are projected for 2016 and 2017. Table 2 shows that milk product prices in 2015 were below the prices in 2014. For nonfat dry milk and dry whey, 2015 prices were only half what they were in 2014 reflecting the collapse in export markets. Moving forward, product prices in 2016 are all set to fall even further, with 2016 whey prices projected at only 44 percent of what they were in 2014. The WASDE projects a slight recovery and increased prices for most products in 2017 with the exception of butter. In addition to milk products, WASDE projects farm prices for milk by U.S. Class III (milk for cheese production), U.S. Class IV (milk for butter and powder) and an all milk price. As with product prices, farm milk prices also fell substantially from 2014 to 2015 with all milk prices down by almost 29 percent. WASDE projected prices to be even lower in 2016 and recover slightly in 2017. But, as we have learned, these projections must be taken with considerable caution.

The process used by the USDA in projecting price and balance sheet items for the WASDE is complex and involves the interaction of expert judgment, commodity models and in-depth research by USDA analysts on key domestic and international issues. The challenges of accurately projecting prices, even given the resources and information available to produce the WASDE, can be seen by comparing previous WASDE reports with what actually occurred in the markets.

In table 3, the milk product prices and the milk prices, which were shown in table 2 with the most recent WASDE estimates, are listed in the rows. The columns show the projected prices for each of these items from the earliest WASDE projections, May of the prior year, available for 2014 and 2015. The actual annual prices for each item for 2014 and 2015 are shown alongside of these projections. Actual prices in 2014 for all milk products and for farm milk were substantially higher than what was projected by WASDE. The largest difference between projected price and actual price was in butter prices with a range of 32 to 45 percent difference between projected and actual price. For farm price, Class III price projections for 2014 were 25 to 30 percent lower than the actual 2014 price. Projections for 2015 prices were also off with most projected prices being higher than actual prices. The average difference between the projected prices and actual prices was around 15 percent. The highest difference between 2015 projected price and actual price was in nonfat dry milk with an actual price 45 percent below the initial WASDE projection.

## FUTURE MARKET PRICE FORECASTS

Commodity futures markets forecast prices up to two years in advance and allow producers, processors and other industry stakeholders to lock in prices for commodities through the purchase of future delivery contracts. From the point that a new contract is made available to the day the contract matures it is possible to follow the price and see the changes that take place over the span of the contract period.

Figure 4 show the changes in future prices for U.S. Class III Milk Price on contracts to deliver on November 1, of 2010 and November 1, 2012. The bottom axis of this figure indicates the number of days remaining until the contract matures. The start of the contract period is 481 days prior to the November 1 delivery date. The November 1, 2010 contract the price starts at \$15.75, stays fairly consistent until about 200 days remaining, when it starts to decline. Two months prior to the close of the contract the price increases and the closing price finishes at \$15.58, a less than one percent difference from where it began. In contrast, the 2012 November 1 contract starts at \$15.47 and closes with the price at \$21.10, a 36 percent difference. Figure 5 shows the same information for futures contracts for delivery of Class III Milk on November 1, 2014 and 2016. The price for the November 1, 2014 contract began at \$15.26 and steadily increased to a price of \$21.25, a 40 percent difference. November 1, 2016 contract was similar to the 2010 contract in Figure 4, with a starting price of \$16.61 and relatively similar closing price of \$16.27.

The uncertainty in the closing day price relative to the opening contract price is evident in the low trade activity seen on contracts early in the trading period. Figure 6 shows that there are few open contracts during the first few hundred days of the contract period for each of the four contracts and a rapid gain in interest in the contract in the final few months of trading as the closing date nears.

Figure 7 plots the difference between the contracted future prices one year in advance of the contracted delivery date with the actual price on the day of delivery for U.S. Class III milk. The scatter plot includes 16 different futures contracts. For each of the years 2012, 2013, 2014 and 2015, four different futures contracts with delivery dates of January 1, April 1, July 1 and October 1 are displayed. The contracts issued in 2013 for 2014 delivery dates differed most from the final settlement price and the futures market underestimates the final price in all cases. By contrast, future contract prices for the four contracts issued in 2012 for 2013 delivery dates were quite close to final values.

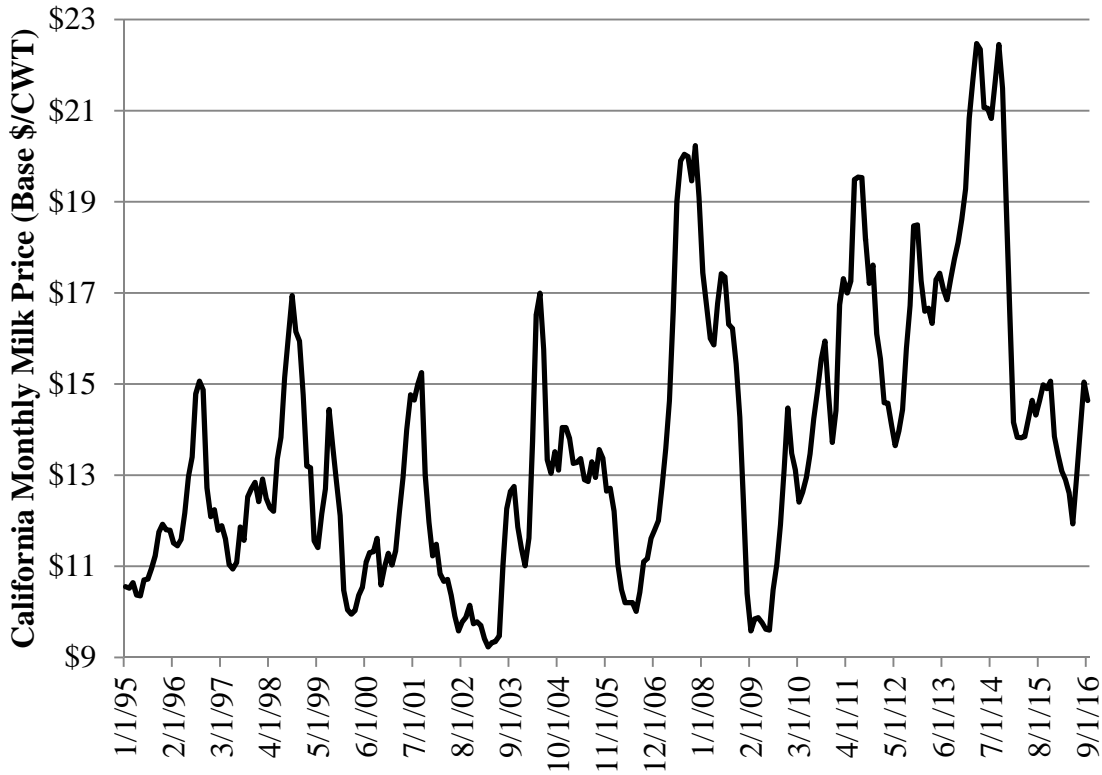
## LESSONS

Agricultural commodity prices are notoriously volatile and those tasked with projecting milk prices face an impossible task. Even futures markets, which aggregate available information and create great incentives for forecasting, are unable to accurately capture movements in milk prices. The lesson is that while awareness of market forces that govern markets can be illuminating, such information cannot be used to confidently predict market prices over a year or several years. Those who know what prices will be in the future will be trading not talking. Those talking about future prices likely do not know what prices will be.

## REFERENCES

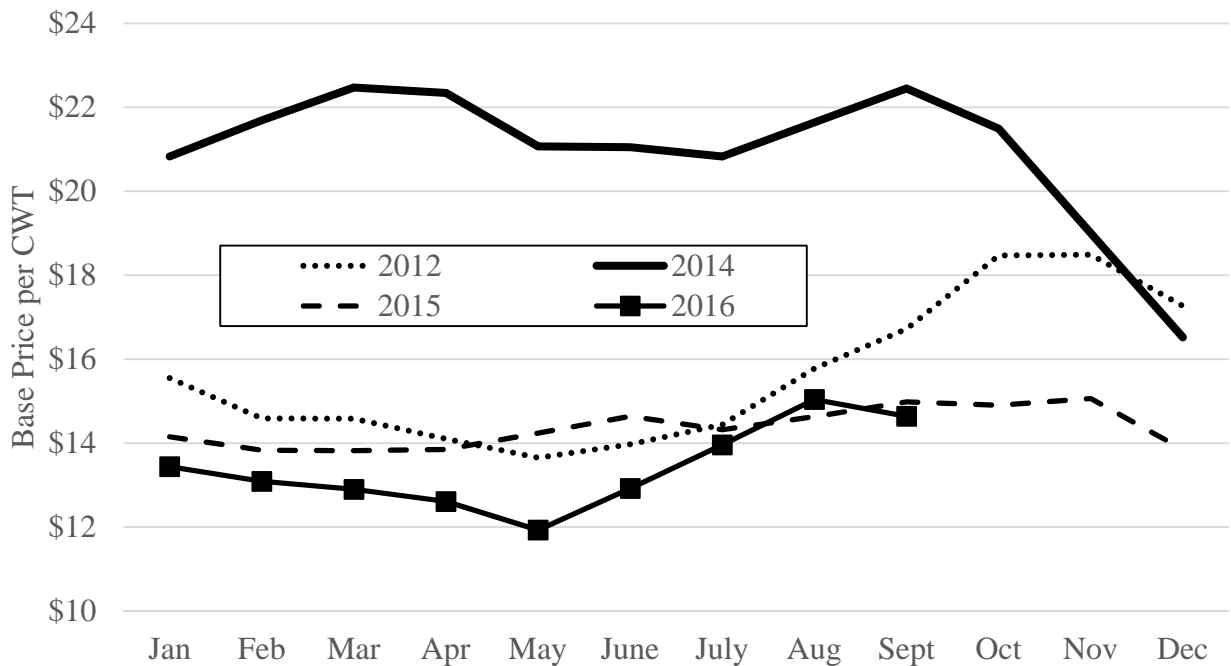
- CDFA Dairy Marketing and Pooling Branch. 2016. Dairy Price Data.  
([https://www.cdfa.ca.gov/dairy/prices\\_main.html](https://www.cdfa.ca.gov/dairy/prices_main.html)). Accessed November 2016.
- Gould, B.W. 2016. Dairy Marketing and Risk Management Program. University of Wisconsin.  
(<http://future.aae.wisc.edu/index.html>). Accessed November 2016.
- USDA-ERS. 2016. USDA Long-Term Projection Tables multiple years.  
(<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1192>).  
Accessed November 2016.
- USDA Office of the Chief Economist. World Agricultural Supply and Demand Estimates.  
Multiple issues. (<http://www.usda.gov/oce/commodity/wasde/index.htm>). Accessed  
November 2016.

Figure 1. California Monthly Milk Price, Nov 1995 to September 2016 (Base hundredweight)



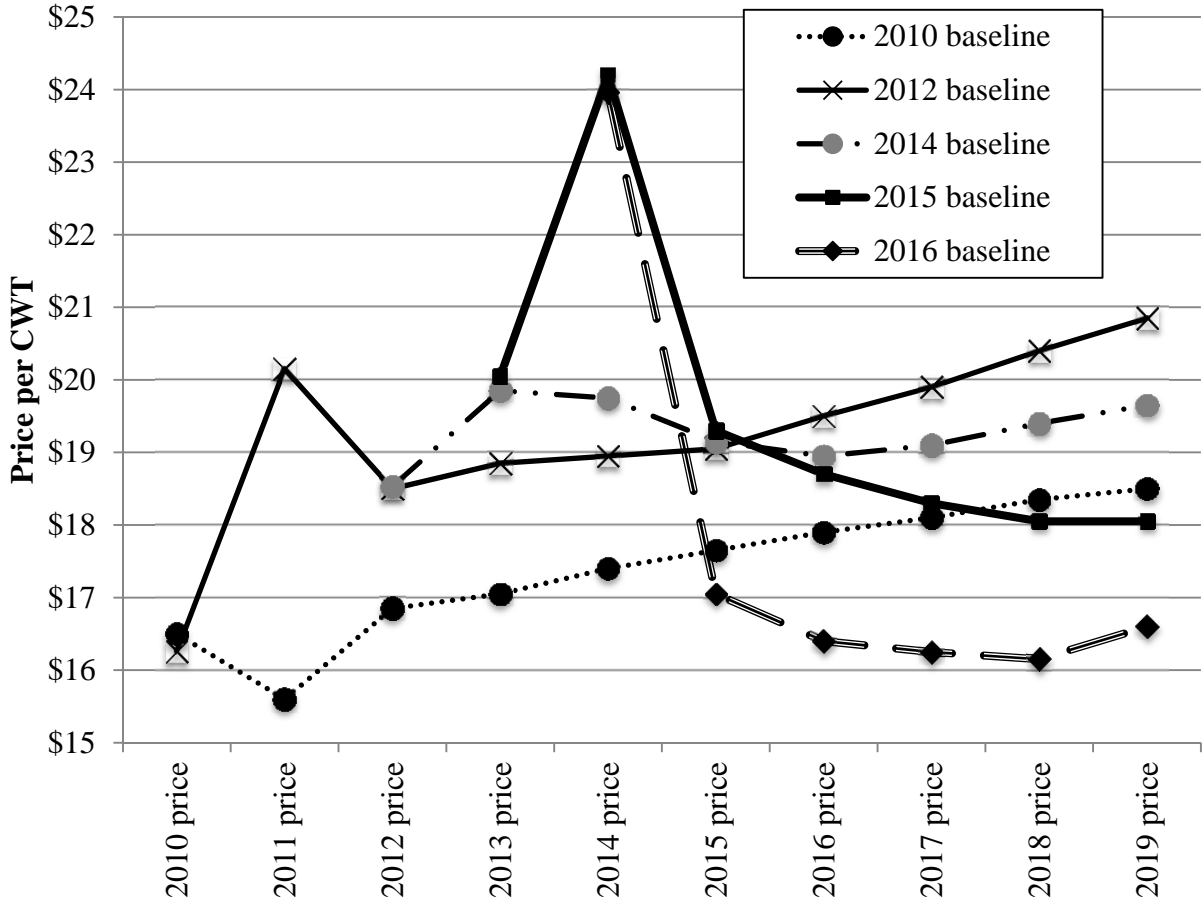
Source: CDFA Dairy Marketing and Milk Pooling Branch

Figure 2. California Monthly Milk Price per Hundredweight for 2012, 2014, 2015 and 2016 through September



Source: CDFA Dairy Marketing and Milk Pooling Branch

Figure 3. USDA Long-Term Agricultural Projections of U.S. All Milk Price by Year, 2010-2016



Source: USDA ERS long-term projection tables, various years

Table 1. U.S. Milk Supply and Use

		Actual 2014	Actual 2015	Projected for Annual 2016	Projected for Annual 2017
Milk		<i>Billion Pounds</i>			
Fat Basis Supply	Production	206.1	208.6	212.5	217
	Marketings	205.1	207.7	211.5	216
	Imports	4.3	5.7	7.2	7.1
Fat Basis Use	Commercial Exports	12.4	8.8	8.7	8.9
	Domestic Commercial Use	196.9	202.5	209.9	214.7
Skim-solid Basis Supply					
	Marketings	205.1	207.7	211.5	216
	Imports	5.6	6	6.6	6.4
Skim-solid Basis Use	Commercial Exports	39	37.3	38.4	39.7
	Domestic Commercial Use	170.3	175.5	180	182.9

Source: USDA World Agricultural Supply and Demand Estimates, November 2016

Table 2. U.S. Dairy Prices<sup>1</sup> and projections

		Actual 2014	Actual 2015	Projected for Annual 2016	Projected for Annual 2017
Product Prices		<i>Dollars per Pound</i>			
	Cheese	2.155	1.645	1.59-1.60	1.61-1.70
	Butter	2.136	2.067	2.035-2.065	1.81-1.93
	Nonfat Dry Milk	1.768	0.902	0.82-0.84	0.93-1.00
	Dry Whey	0.654	0.380	0.28-0.29	0.36-0.39
Milk Prices		<i>Dollars per Hundredweight</i>			
	Class III (milk for cheese)	22.34	15.80	14.70-14.80	15.30-16.20
	Class IV (milk for butter/powder)	22.09	14.35	13.55-13.75	13.50-14.50
	All Milk	23.97	17.12	16.00-16.10	16.30-17.20

Source: USDA World Agricultural Supply and Demand Estimates, November 2016

<sup>1</sup> Prices for products are averages of monthly prices, prices for Class III and Class IV milk are averages of Federal order milk paid by regulated plants and all milk price is average of monthly prices received by farmers.



Table 3. U.S. Dairy Prices<sup>1</sup> Projections and Actuals for 2014 and 2015

	May 2013 Projection of 2014	Actual 2014	May 2014 Projection of 2015	Actual 2015
Product Prices	<i>Dollars per Pound</i>			
Cheese	1.675-1.775	2.155	1.670-1.770	1.645
Butter	1.485-1.615	2.136	1.615-1.745	2.067
Nonfat Dry Milk	1.585-1.655	1.768	1.605-1.675	0.902
Dry Whey	0.565-0.595	0.654	0.550-0.580	0.380
Milk Prices	<i>Dollars per Cwt</i>			
Class III (milk for cheese)	17.00-18.00	22.34	16.90-17.90	15.80
Class IV (milk for butter powder)	17.80-18.90	22.09	18.55-19.65	14.35
All Milk	18.85-19.85	23.97	19.70-20.70	17.12

Source: USDA World Agricultural Supply and Demand Estimates, various editions.

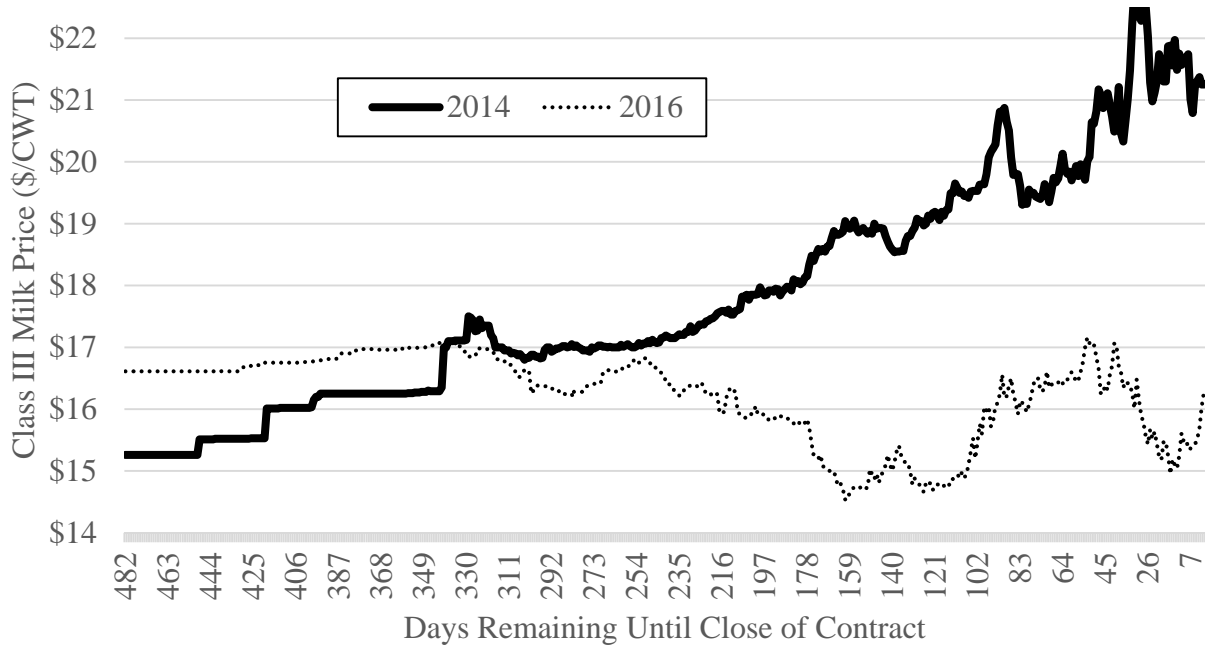
<sup>1</sup> Prices for products are averages of monthly prices, prices for Class III and Class IV milk are averages of Federal order milk paid by regulated plants and all milk price is average of monthly prices received by farmers.

Figure 4. November 1, 2010 and November 1, 2012 Class III Milk Futures Price



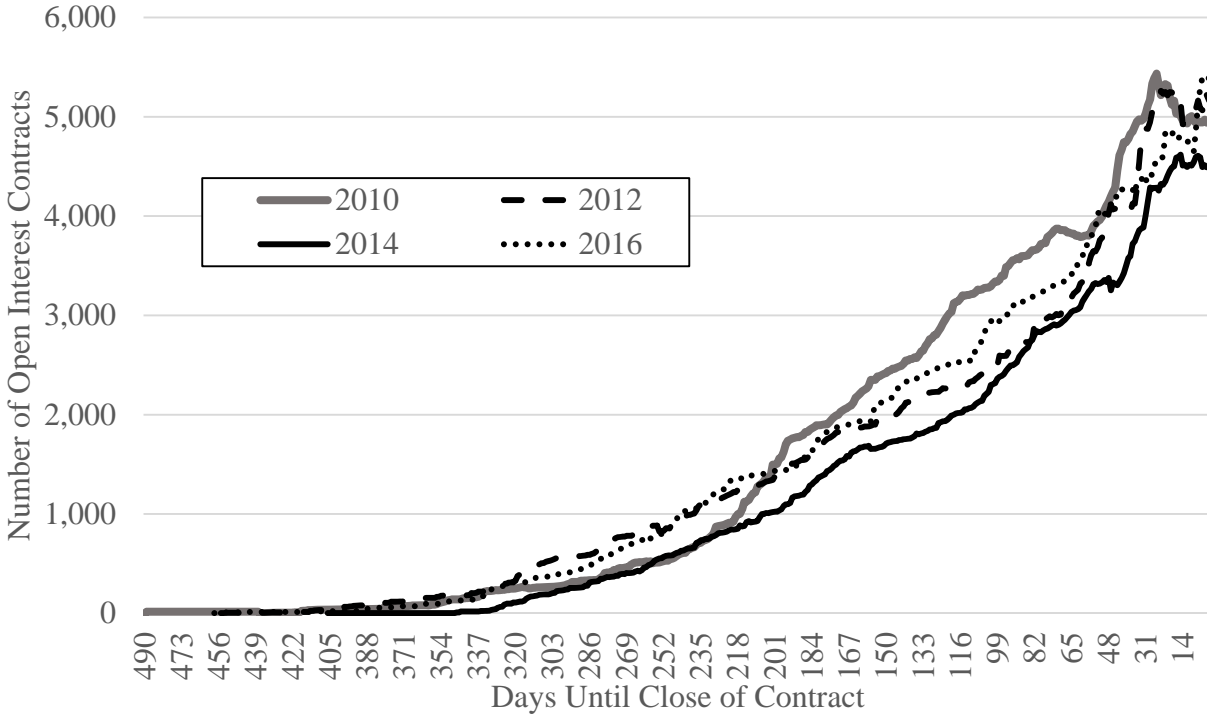
Source: University of Wisconsin Dairy Marketing and Risk Management Program (<http://future.aae.wisc.edu/index.html>)

Figure 5. November 1, 2014 and November 1, 2016 Class III Milk Futures Price



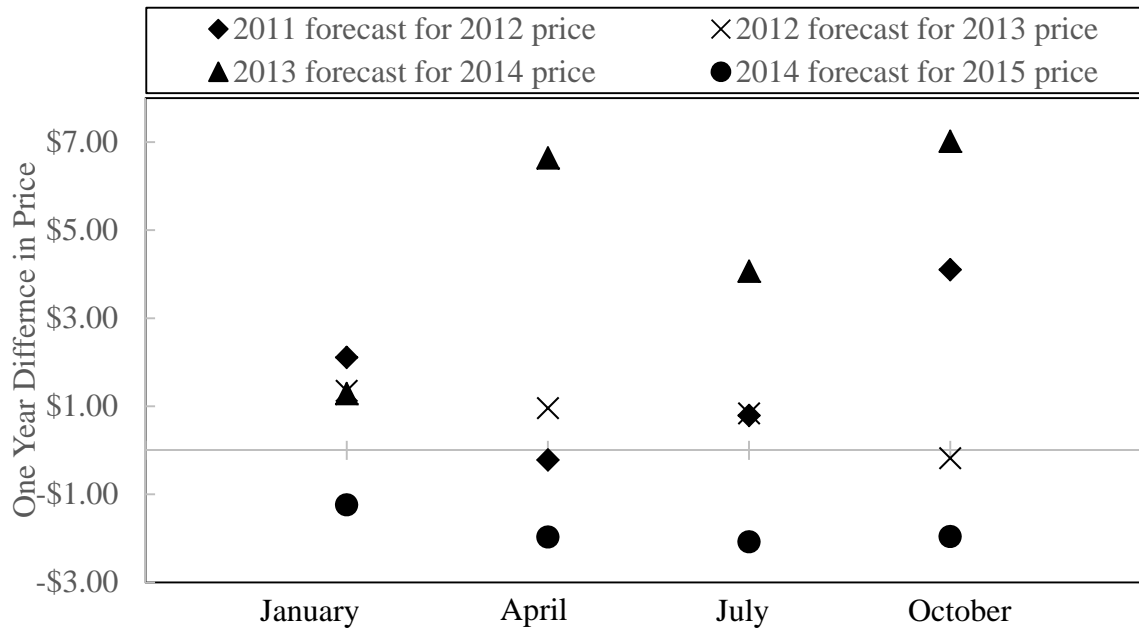
Source: University of Wisconsin Dairy Marketing and Risk Management Program (<http://future.aae.wisc.edu/index.html>)

Figure 6. Open Interest by Days Until Close of Contract for November 1 Class III Milk Futures, 2010, 2012, 2014 and 2016.



Source: University of Wisconsin Dairy Marketing and Risk Management Program (<http://future.aae.wisc.edu/index.html>)

Figure 7. One-year Difference Between Contract Future Price<sup>1</sup> for Delivery Month and Actual Price for Class III Milk in Corresponding Month.



<sup>1</sup> Contract future price data comes from University of Wisconsin Dairy Marketing and Risk Management Program (<http://future.aae.wisc.edu/index.html>)