

Milk and Money Case Study

Chaman Preet Kaur and Chris Atterbury

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Executive Summary

This section is to be written last and contains a short (approx 250 words) summary of the case study as a whole.

Background

The financial success of dairy farms depends on the price of their milk. The case study helps in understanding how milk prices are decided by the federal and state agencies, how payments are made and focuses on different options that farm owners can explore to hedge the price risk against market fluctuations. The simplest approach is to purchase an option or a futures contract from the Chicago Mercantile Exchange on commodity futures that can ensure minimum floor value for their produce. An option on a futures contract is the right, but not the obligation, to buy or sell a futures contract at a specific price on or before an expiration date.

The price a farm receives for its milk depends on various factors. What the dairy producers actually receive per hundredweight was called the mailbox price. The farmer (Gerard in this case study) needs to determine which of the options available for trade offer the best hedge for his own milk price or his own mailbox price. The federal order groups milk into four classes: Class I (defined as California Class 1), Class II (California Class 2 and Class 3), Class III (California Class 4b), and Class IV (California Class 4a). Options contracts allow hedgers to establish a price floor without giving up the opportunity to benefit from favorable price changes in the future. Buyers pay a price for the option called the premium up front. There are two different types of options:

- Put Options. A put option is the right to sell a futures contract at a certain price.
- Call Options. A call option is the right to buy a futures contract at a certain price.

The price at which the buyer has the right to buy or sell a futures contract is known as the strike price or exercise price of the option. Payoff options are described in the following ways:

- At the money when the price of the underlying security (roughly) equals the strike price.
- In the money; when the strike price is more than the market price of the underlying security, and a call option is in the money when the strike price is less than the market price of the underlying security.
- Out of the money when holders do not gain a profit if the option is exercised, so they allow the option to expire unused. The only loss is that of the initial premium and the trading costs of the initial transaction.

Methods

Initial Considerations

To help Gerard with his put option deliberations, we must analyze the data that he has collected. We have feature columns *Month*, *Mailbox*, *Class.Iv*, *Class.III*, *Butter*, *NFDM*. Please refer to **Codeblock 1** in the *Appendix* to see the first six rows of this data set to get a feel for it. We will not use the *Month* column since we are not doing time series analysis, but simply viewing the data as a collection of measurements of the

other feature columns. Also, we must remove the dollar signs from each of the other columns so that we can treat them as numeric columns. Please see **Codeblock 2** in the *Appendix* for details on this approach, including the code itself.

Details how we arrived at the models that we use. This is all about the process. Our thought processes should be detailed so that there is no question how we got to our models.

Results

Details the actual model and how it worked. This needs to do all of the leg work so that the Conclusions section can roll through the answers to the questions.

Conclusions

Integrate the answers to the questions as seamlessly as possible. The goal is that everything is built up to this point so that little justification is needed and other general conclusions can be included.

Appendix

Codeblock 1

```
milk <- read.csv("41330727.csv", header = TRUE, stringsAsFactors = FALSE)
head(milk)
```

##	Month	Mailbox	Class.IV	Class.III	Butter	NFDM
## 1	January-04	\$11.64	\$10.97	\$11.61	\$1.4320	\$0.8366
## 2	February-04	\$12.25	\$12.21	\$11.89	\$1.7132	\$0.8413
## 3	March-04	\$14.31	\$14.10	\$14.49	\$2.1350	\$0.8518
## 4	April-04	\$17.04	\$14.57	\$19.66	\$2.2204	\$0.8808
## 5	May-04	\$17.29	\$14.50	\$20.58	\$2.0363	\$0.9050
## 6	June-04	\$16.14	\$13.72	\$17.68	\$1.9300	\$0.9188

Codeblock 2

In *Codeblock 1* we anticipated the need to convert the numeric feature columns. When being read into the data.frame *milk*, those columns are interpreted as factors because of the dollar signs. By reading them in as strings, we can use a regular expression to remove all of the dollar signs, then convert the columns from character to numeric types. See below for the code doing this.

```
for (i in 2:length(milk)) {
  milk[[i]] <- gsub("\\$", "", milk[[i]])
  milk[[i]] <- as.numeric(milk[[i]])
}
```

All of the R code and figures referenced throughout the above sections are included here. This is the section that we use to prove that we have done all of the work.