University of Wisconsin-Madison
Department of Agricultural Economics
Marketing and Policy Briefing Paper Series

Department of Agricultural Economics, College of Agricultural and Life Sciences, University of Wisconsin-Madison Cooperative Extension Service, University of Wisconsin-Extension

Paper No. 42 (Revised)
May 1993

Futures Trading in Cheese: How Will it Work?

by

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FUTURES TRADING IN CHEESE: HOW WILL IT WORK?

Robert A. Cropp and Edward V. Jesse[1]

The Coffee, Sugar and Cocoa Exchange, Inc. (CSCE) has formally requested approval from the Commodity Futures Trading Commission (CFTC) to trade futures contracts and futures options for cheddar cheese and nonfat dry milk. Approval by the CFTC is anticipated, with actual trading commencing early summer 1993.

Organized futures markets have been in existence for nearly 130 years, beginning with grain futures contracts in 1865. However, futures trading is a new concept for dairy.[2] Consequently, many questions are being raised with respect to how futures and options may be used and their potential benefits to and other impacts on dairy manufacturers, dairy food ingredient users and dairy farmers.

In this paper, we address some basic questions concerning futures markets and the mechanics of futures trading. We then provide several illustrations showing how manufacturing milk plants, buyers of dairy products, and dairy farmers might use futures trading to hedge price risk. Finally, we reflect on how futures might benefit the dairy industry. Two appendices provide additional hedging examples and illustrate the calculation of basis for some representative hedges. The paper centers on cheese futures, but trading nonfat dry milk futures would be similar. The use of options will be discussed in another paper.

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[2] The Chicago Mercantile Exchange traded butter futures contracts for a short period during the mid-1950's to early 1960's. Trading in this contract was very limited because butter prices were being supported by the federal dairy price support program during most of this period.

What is a futures market?

A futures market can be contrasted with a cash or spot market. A cash or spot market provides for immediate delivery of and payment for the commodity traded. The purpose is to fulfill the immediate needs of buyers and sellers. Cheese plants typically sell their cheese to cheese buyers through private negotiations. This kind of transaction is an informal cash market. The National Cheese Exchange at Green Bay, Wisconsin is an organized wholesale cash market for block and barrel cheddar cheese.

A futures market is a place where futures contracts are traded. A futures contract involves a *commitment* to either accept or make delivery of a specified quantity and quality of a commodity at a specified time, and often at a specified place of delivery. No actual commodity changes hands unless and until the contract comes due or matures.

How and why did futures markets develop?

The origin and development of futures markets dates to the mid-19th century with the expansion of market areas, particularly for grain. There was increased market price risk due to the long time period between grain production, storage and final sale. There was a need to protect against a loss in grain inventory value due to price declines between harvest and sale. Initial attempts to avoid this price risk involved establishing a price for grain before it had arrived at its destination through what were termed, "to arrive" contracts. This procedure passed price risk onto the buyer, but many grain dealers and processors were unwilling to absorb all the price risk. The development of futures markets alleviated the problem of sharing the risk of unfavorable price movements and thereby increased the flow of risk capital into the market place.

The first organized futures market was the Chicago Board of Trade (CBOT) The CBOT was founded in 1848 as a cash grain market, but it did not start futures trading in grain until 1865. Today, there are twelve futures markets in the United States. These futures markets are operated by one of twelve futures organizations, called futures exchanges. Futures markets also exist in Canada, Argentina, Japan, India, Australia and several European countries.

More than one hundred different commodities are traded on U.S. futures markets. Early in their history, futures markets traded only agricultural commodities. Raw farm commodities like corn, wheat, soybeans, cotton, cattle, hogs, sugar, cocoa, and coffee still make up a large portion of futures market trading. But non-farm commodities such as gold, silver, heating oil and plywood are also actively traded, and recently, financial instruments like Treasury Bills, interest rates, and foreign currencies, have come to make up a majority share of futures trading.

A major reason for the existence of futures markets is to provide a means for shifting the risk of price change on the cash market for the commodities involved. This is accomplished through a process called hedging which is explained later. For hedgers, futures markets are not places to buy and sell commodities; they are used to protect price and profit objectives in the cash market.

What is the Coffee, Sugar and Cocoa Exchange, Inc.?

The Coffee, Sugar and Cocoa Exchange, Inc., located in New York City, is one of the twelve U.S. futures exchanges. Originally known as the Coffee Exchange of the City of New York, it was founded in 1882 by a group of coffee merchants who wished to avoid the risk of a cash market collapse by organizing a market for trading in coffee futures. In 1914, the exchange expanded to include futures in sugar, and, in 1916, it became the New York Coffee and Sugar Exchange. On September 28, 1979, the New York Cocoa Exchange, which had been in existence since 1925, merged with the Coffee and Sugar Exchange, and the name Coffee, Sugar and Cocoa Exchange, Inc. was adopted.

The Coffee, Sugar and Cocoa Exchange, Inc., as well as the other eleven futures exchanges are not-for-profit membership associations, incorporated in the states in which they are located. Membership in each exchange is limited to a specific number of specific individuals. Every membership is owned by an individual; however, companies, corporations, partnerships, and cooperatives may be registered for certain membership privileges.

What are the commitments of buyers and sellers of futures contracts?

If the initial trade on the futures market is the *purchase* of a contract, the buyer is said to be *long* in the market. The buyer has purchased a commitment to receive delivery of a commodity at a specific future date and at a specific price. If the initial trade is the *sale* of a contract, the seller is said to be *short* in the market. The seller has sold a commitment to make delivery of a commodity at a specific date and at a specific price.

In most all instances the buyers and sellers of the contracts will not hold the contracts until they mature. Instead they will *cover* themselves by offsetting a position previously taken on the futures market with an opposite transaction of the contract before maturity. Thus a seller of a futures contract (short) covers him/herself by purchasing a futures contract prior to maturity of the contract. A purchaser of a futures contract (long) would cover through the sale of a futures contract.

Normally, few futures contracts are settled by actual delivery of a commodity, but instead are covered. This is because the individuals are either using the futures contracts to protect their profit objective on the cash market (hedging) or attempting to make a profit on futures contract price changes (speculating).

Futures contract commitments are legally enforced by requiring actual delivery and acceptance of delivery of the underlying physical commodity if a contract is allowed to mature. When contracts are covered, there is no delivery or acceptance of a commodity, but there is a cash settlement. For example, if the initial transaction is the sale of a cheese futures contract for $1.30 per pound and the contract is later covered by the purchase of a cheese futures contract for $1.25 per pound, a profit of $.05 per pound will be received from the futures market. On the other hand if this same contract had been covered by the purchase of a cheese futures contract for $1.35 per pound, there would be a loss of $.05 per pound, which would require a payment to the futures market.

Who are the key players in a futures market?

Hedgers, speculators and brokers comprise the key players in the futures market. A *hedger* uses the futures market to protect a cash market price and profit objective by shifting the risk of price change. The hedger deals in both the cash and futures market--expecting that any loss in one market will be offset by a gain in the other market. These transactions are known as hedging. Hedging involves making simultaneous and opposite transactions in the cash and futures markets.

Speculators assume the price risk that hedgers try to avoid. The motive of speculators is to make a profit in the futures market by buying and selling futures contracts. While profit is the motive, speculators provide the futures market with an essential element, liquidity, which enables hedgers to buy or sell contracts when they want to set or lift their hedges. Although speculators usually have no commercial interest in commodities, the potential for profit motivates them to gather market information regarding supply and demand and to anticipate its effect on prices. By buying and selling futures contracts, speculators also help provide information about the impact of current events on expected prices. In essence, speculators make the market more fluid, bridging the gap between the prices bid and offered by other commodity traders.

In order to trade on the futures market, orders must go through a *broker*. A broker is an agent for the customer (hedger, or speculator) who executes a futures contract order. The broker charges a commission for executing the trade. Commissions are "round-trip", entitling the trader to buy and sell their contract.

What is the procedure for trading futures contracts?

In order to trade on the futures market an individual or firm will need to contact a broker to open an account and sign a customer agreement. The customer agreement will specify whether the interest is in speculating or hedging. The broker will carry out the trades for the customer by contacting a Futures Commission Merchant (FCM). The broker contacted may actually be an employee with a FCM. The FCM is a firm that transacts trades on the

futures exchange on behalf of financial and commercial institutions as well as the general public. FCM become registered member firms of futures exchange in order to trade or handle accounts. The basic function of the FCM is to represent the interest of those in the market who do not hold a membership (seat) on the futures exchange.

A *floor broker* is a broker on the exchange trading floor who does the actual trading. The FCM places the customer's order with the floor broker. Floor brokers may also take outside orders from commercial interests, processors, exporters and even speculators. Floor brokers should be distinguished from *locals*. Locals are also on the exchange floor but trade for their own account and speculate on futures price movements.

Futures exchange participants, both buyers and sellers, are required to post performance bond margins. Performance bond margins are financial guarantees to ensure that buyers and sellers will fulfill their obligations of the futures contract rather than walk away. Performance bond margin provides for contract integrity. Margin requirements for futures contracts usually range between 5 and 15 percent of a contract's face value and are set by the futures exchange where contracts are traded. The size of the margin depends upon the probability of a price change. A higher margin is required in a volatile (or risky) market than in a less volatile market.

Brokerage firms may require a larger margin than the futures market minimum but they cannot require less. Margin levels also vary for hedging and speculating accounts. Generally lower margins are required for hedging accounts because they carry less risk than speculating accounts. Margin may be in the form of cash or government securities.[3]

The performance bond margin posted by traders at the time they place an order to buy or sell a futures contract is called initial margin. The initial margin is intended to offset any loses that might be incurred if the contract were liquidated. If prices move in favor of the trader (e.g., rising price for a long position or falling price for a short position), then no additional margin is required. But if prices move unfavorably, and erode the initial margin less the loss that would occur if the contact were liquidated below a specified level, then the trader will be obligated to post additional margin. The request for additional margin is referred to as a *margin call*.

Margin calls provide some assurance against trader defaults. For example, if the price of a commodity increases, a seller of a futures contract could possibly gain by defaulting on the contract and forfeiting the initial margin. Sufficient additional margin will be required to

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[3] The advantage of using government securities as margin is that they earn interest for the customer at the same time that they serve as a performance bond for the futures market position. Brokers seldom pay interest on cash margins. The disadvantage of using government securities as margin is that the denominations are large and "lumpy," meaning that the performance bond may be much larger than required. Different rules pertaining to margin calls and profit payouts apply to margin deposits in cash and securities.

more than offset the seller's gain from defaulting. Should a customer refuse to come up with additional margin, his/her position will be closed out by the broker and the resulting loss will be deducted from the margin. If the remaining margin is not sufficient to cover the loss, the customer may be sued or subject to other penalties.

Just as every buyer or seller of a futures contract must maintain adequate funds in his/her margin account with the brokerage firm, so must each brokerage firm maintain adequate funds in its margin account with the futures exchange clearing house to cover the positions of its customers.

Margins are returned to the seller and buyer when the contract is offset (covered) by an opposite transaction or when the contract matures. When futures price movements favor the trader, the margin plus futures gain (profit) are returned. If a trader experiences a loss on the futures contract trade, then the loss is deducted from the margin.

Who accounts for futures contract transactions and margin requirements?

Essential to each futures exchange is a clearinghouse. Clearinghouses are responsible for day-to-day settlements of thousands of accounts and transactions, collecting and maintaining margin monies, regulating delivery, and reporting trading data. Their operations insure the financial integrity of the marketplace.

Both buyers and sellers of futures contracts are responsible to the clearinghouse through FCMs or brokerage firms who are members of the clearinghouse. Clearinghouses act as third parties to all futures contracts -- acting as a buyer to every clearing member seller and a seller to every clearing member buyer. Buyers and sellers of futures contracts do not create financial obligations to one another, but, rather, to the clearinghouse through their clearing member firms. As a third party to every trade, the clearinghouse assumes the responsibility of guarantor of every trade.

Clearing houses settle all accounts to a net gain or loss each trading day, and balance their own books to a *net zero position*, since gains must fully offset losses. Gains are credited to accounts of member firms or, in some cases, paid out to customers. Losses that erode margin deposits below required levels require prompt posting of additional funds.

How are futures markets regulated?

U.S. futures exchanges are required by state and federal laws to regulate the conduct of members, member firms, and their employees. The rules and regulations of futures exchanges are extensive and are designed to support competitive, efficient, liquid markets. Exchange rules and regulations cover many areas of futures trading -- from contract specification to trading practices to arbitration procedures. For example, the exchange sets daily

trading limits on the maximum price range allowed each trading day for a contract. Position limits are set on the maximum number of futures contracts that may be held by a market participant. FCMs are liable for losses that occur due to error or mishandling a customer's order. Members who default on futures contracts may be suspended until the contract is performed or the debt is satisfied.

The obligation of the exchanges to enforce their own rules and regulations were enhanced in the 1900's with passage of several federal acts. Of most relevance today is the Commodity Futures Trading Commission Act of 1974, and the Futures Trading Acts of 1978, 1982, 1986, and 1990. Prior to the 1974 act, federal regulation of exchanges was through the Commodity Exchange Authority which was housed in the U.S. Department of Agriculture and reported to the Secretary of Agriculture. The 1974 act created an independent federal regulatory agency, the Commodity Futures Trading Commission (CFTC). The subsequent Futures Trading Acts re-authorized the continuation of the CFTC and clarified its jurisdiction.

The CFTC has five full-time commissioners appointed by the President with Senate confirmation. The CFTC's regulatory powers extend to exchange actions and to the review and approval of futures contracts proposed by an exchange. The CFTC has regulatory powers over floor brokers, FCMs, and other market participants. Exchanges and their clearinghouses are required by the CFTC to maintain daily trading records. The CFTC is authorized to take emergency steps in the markets under certain conditions, such as actual or threatened market manipulation, or some other event that prevents the market from reflecting true supply/demand factors.

In addition to regulation by exchanges themselves and federal regulation there is industry regulation. The Commodity Futures Trading Act of 1974 authorized the futures industry to create registered futures associations with the CFTC. One such organization is the National Futures Association (NFA). NFA is an industry wide, industry-supported, self-regulatory organization for the futures industry. NFA enforces ethical standards and customer protection rules, screens futures professionals for membership, credits and monitors futures professionals for financial and general compliance rules and related activities.

FCMs and brokerage firms provide further regulation. Since they are responsible to the exchange and clearinghouse for their customer's transactions, they do a complete investigation of the financial integrity of the customer prior to opening a trading account.

What criteria does the CFTC use to approve new futures contracts?

An exchange that wishes to trade a new futures contract must request approval from the CFTC. Prior to this request the exchange has studied the feasibility of the proposed

contract and received approval by its board of directors. The CFTC must determine that a futures contract is in the public interest. In making this assessment, the CFTC examines how the proposed contract would be used commercially for pricing and hedging to ensure that it will serve an economic purpose.

The CFTC is concerned about the number of market participants, both buyers and sellers, interested in hedging. Even more critical is the adequacy of speculator interest. As mentioned earlier, hedging will not work without sufficient speculator activity. Sufficient speculator activity is required to provide for market liquidity so a hedger may set or lift his/her hedging position in a timely fashion.

What does the cheese futures contract look like?

Futures contracts are standard contracts. That is, there are no negotiations over contract specifications. The only negotiation on the futures exchange is price. This is no different than the standard cheese contract traded on the National Cheese Exchange. Most of the specifications for the cheese futures contract are identical to the contract on the National Cheese Exchange. Some important specifications for the cheese futures contract specifications are:

Trading Unit:	One contract will be 40,000 pounds of 40-pound cheddar blocks.
Price Basis:	The price basis will be cents per pound FOB delivered anywhere in the U.S. The cheese futures contract does not have a specified delivery point.
Delivery Months:	Futures contracts are traded every business day. But the contract months, referred to as delivery months, are for February, May, July, September and November. A trader interested in hedging would choose the contract month that best fits his/her cash market transaction.
Trading Hours:	Trading hours will be from 2:15p.m. to 3:15p.m. New York time.
Minimum Price Change:	The smallest price change is 5/100 cents per pound or $20 per 40,000 pound contract. That is, bids or offers would be 5/100 cents per pound or more from the existing price on the exchange.
Standards:	Standards are the product specifications. The 40 pound cheddar blocks must be manufactured from pasteurized

milk only and shall meet the requirements of USDA Grade A or better. Blocks shall be colored and have a standard moisture basis (37.8-39.0%). Delivered cheese shall be 7 to 60 days old.

Last Trading Day: The last trading day is the final day when trading may occur for a given cheese futures contract month. The last trading day is the first Friday of the delivery month. For example, the last trading day for a September cheese futures contract would be the first Friday in September. Futures contracts outstanding, that is not covered or offset, must be settled by delivery of cheese no later than the last business day of the delivery month.

Notice Day: If a trader intends to make actual delivery of cheese rather than covering, he/she must give notice of intent to deliver in fulfillment of a given month's futures contract. The clearinghouse will match this intent with the oldest open long position (buyer) in the same delivery month. For cheese futures contracts the notice day will be the first business day following the last trading day.

Position Limits: These restrict the maximum number of contracts speculators may hold in total and for any delivery month. squeezes. No speculator may hold more than 1,000 contracts on the same side of the market in all months combined. The same limit applies to any delivery month except the limit drops to 250 contracts within two weeks of the last trading day.

What does it cost to trade futures contracts?

There are two primary costs to trade futures contracts; commission charged by the broker and margin money. The broker commission is negotiable, and will vary among brokers. Commissions vary with the extent of broker services provided the client, the size of the trade, and the frequency of trading. It is usually beneficial to contact two or more brokers to compare commission charges. The commission for a futures market transaction is for a "round trip." That is, the cost for the initial trade of a contract and to cover or offset that contract.

The cost associated with margin money is the interest charge if margin money is borrowed, interest lost if a trader's own funds are used, or the difference in interest rates between government securities and private investment opportunities if securities are posted as margin. Depending upon the contract cheese price, required initial margin could range from $3,000 to $4,000 per contract.

Why is there interest in a cheese futures contract?

For the first 38 years of its existence (1950-1988), the federal dairy price support program protected the dairy industry from price volatility. Under the federal dairy price support program the support level for manufacturing milk is set based on legislative rules. The announced support price is maintained by government purchases through the Commodity Credit Corporation (CCC) of cheddar cheese (40# blocks, and 500# barrels), nonfat dry milk and butter at specified prices.

Until the late 1970's the federal dairy price support program worked much like a buffer stock program. When milk production increased seasonally during the spring, CCC purchases would prevent cheese, nonfat dry milk and butter prices and, in turn, manufacturing milk prices, from falling far from support levels. Then, during late summer and fall, when milk production was normally at its seasonal low and demand was relatively strong, the CCC would sell cheese, nonfat dry milk and butter back to the commercial market at prices 110 percent of CCC purchase prices.[4] The sell-back activities kept dairy product prices and manufacturing milk prices from rising sharply during the fall. The CCC purchase and sell back activities provided stability and removed much of the market price risk.

From 1950 to 1981, the support level for manufacturing milk was set between 75 and 90 percent of parity. Under the parity formula the support price moved up slowly for the first 20 years, going from $3.05 per hundredweight in 1950 to $4.60 per hundredweight in 1970. But between 1970 and 1980 the support price increased more than 2 1/2 times, from $4.66 per hundredweight to $13.10 per hundredweight. Dairy farmers responded with increased milk production. By the late 1970's and early 1980's, the level of milk surpluses, CCC purchases and costs were deemed unacceptable by congress. Parity was abandoned in 1981 and replaced with congressional action to determine the support prices using the level of CCC purchases and costs as the criteria. From 1981 to 1990 the support price was reduced eight times, to $10.10 per hundredweight. Provisions in the 1990 Farm Bill will keep the support price no lower than $10.10 through 1995, but probably no higher.

The $10.10 support price and associated CCC purchase prices for cheddar cheese[5], nonfat dry milk and butter offer only a very low safety net to prices. Except for butter, the prices of cheese, nonfat dry milk and, in turn, manufacturing milk prices will remain above support levels most of the time due to market forces. The federal dairy price support program no longer provides for price stability or assumes much of the market price risk.

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[4] The sell-back percentage of 110 percent of CCC purchase price has been adjusted from time to time. Since early 1991, sell-back has been suspended as part of a package of administrative policies to prop milk prices.

[5] The CCC purchase price for 40# block cheddar cheese has been reduced from $1.395 per pound in 1981 to the existing level of $1.1175 per pound.

The result of the low milk support price level and the correspondingly low CCC purchase price for cheddar cheese is greater price volatility for milk and cheese. During the 1960's and early 1970's the Minnesota-Wisconsin Price Series (M-W)[6] would change by no more than 30 cents per hundredweight from low to high within a year and from one year to the next. During the late 1970's and early 1980's, changes in the M-W were larger, and almost exclusively positive because of large changes in the support price. Since 1988, the situation has changed dramatically. The M-W price has been consistently above the support level and highly variable (Figure 1). For example, in March, 1989 the M-W as $10.98 per hundredweight. By December it had increased almost $4.00 to $14.93 per hundredweight. A year later, December, 1990, the M-W had fallen $4.74 to $10.19 per hundredweight. During 1991, the M-W changed $2.48 per hundred weight from a low of $10.02 in March to a peak of $12.50 in December. The M-W changed $1.61 per hundredweight in 1992 from a low of $10.98 in March to a peak of $12.59 in July.

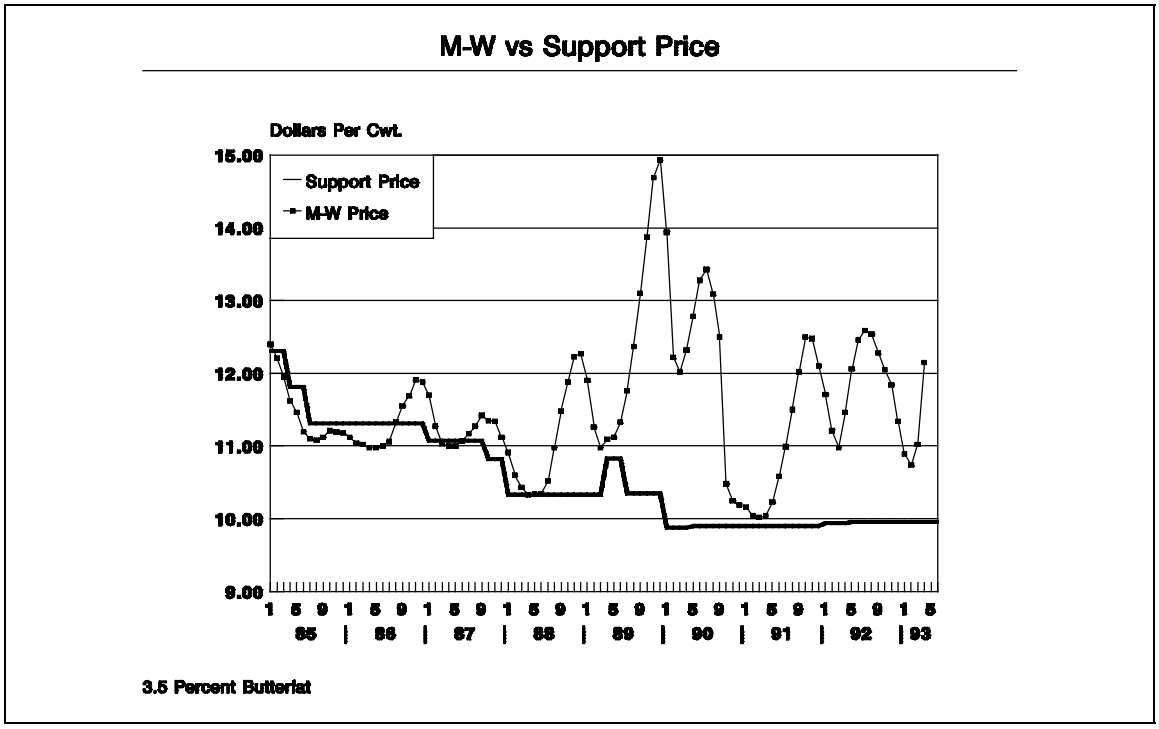

Figure 1

Increased variability in the M-W price is tied directly to increased variability in cheese prices. About 90 percent of the change in the M-W can be explained by changes in cheese prices. This is because nearly 70 percent of Minnesota's manufacturing milk and nearly 90 percent of Wisconsin's manufacturing milk is used for cheese. Under relatively high CCC

[6] The price for Grade B milk, 3.5 percent milkfat, paid by Minnesota and Wisconsin butter, milk powder and cheese plants.

support prices for cheese and surplus cheese during 1980-1988, cheese prices stayed close to support. For example, the average within-year change in National cheese Exchange prices for 40# cheddar blocks during 1980-1987 was 9 cents per pound, with a range from peak to low of 2 cents to 17.5 cents per pound. With the current low CCC purchase price for cheese, cheese prices have shown substantially greater fluctuations. The National Cheese Exchange peak-to-low price change for 40# cheddar blocks was 37.74 cents per pound in 1990, 27 cents in 1991 and 23.4 cents in 1992 (Figure 2).

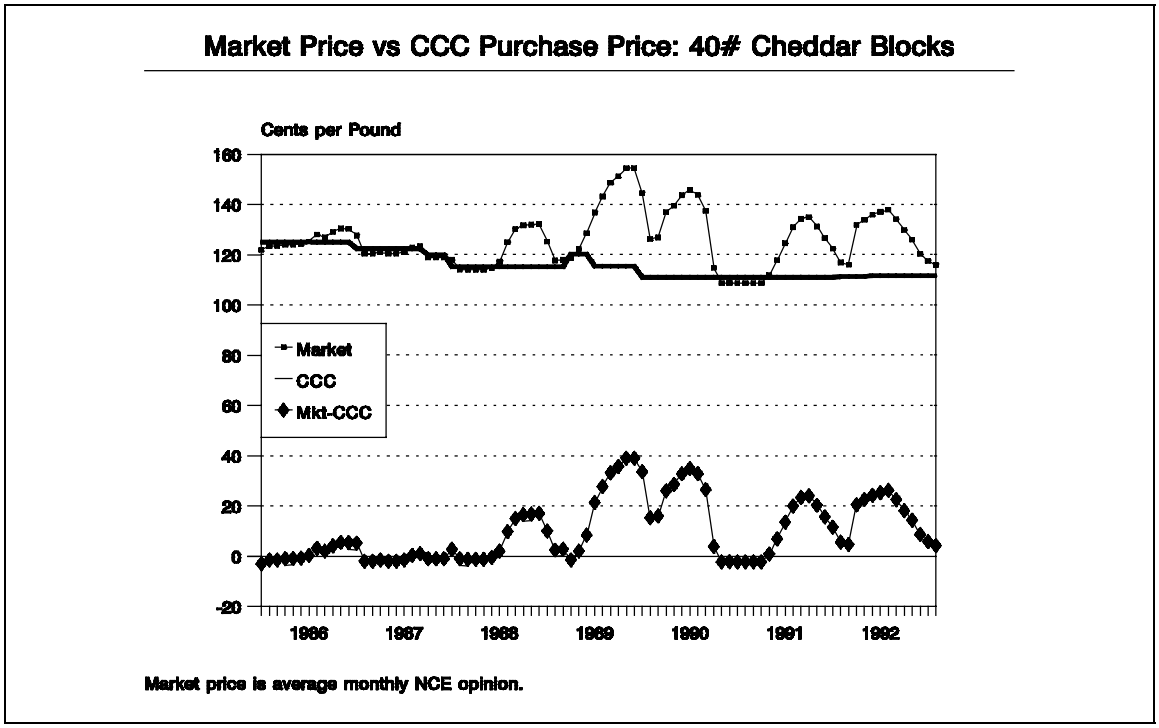

Figure 2

Both cheese manufacturers and cheese buyers have a strong interest in using cheese futures to reduce the market price risk associated with increased price volatility. Both have suffered major economic losses from volatile cheese prices during the 1989-1992 period.

For cheese manufacturers, this price volatility would be less of a problem if the price troughs occurred when cheese was being placed into inventory and the peaks occurred when cheese was being sold out of inventory. In that case, the seasonal price rise would offset storage costs. In 1989, this situation did occur. During the inventory building period of March through June, 40# cheddar blocks increased from $1.1775 to $1.3525 per pound. Then during the heavy sales period of October through early December, 40# cheddar blocks were $1.5125 to $1.545 per pound.

In contrast to 1989, 1990 showed a counter-seasonal price pattern. The price of 40# cheddar blocks was $1.2675 per pound in early March, peaked at $1.4675 per pound near the

end of July, and then plummeted to a low of $1.0875 per pound by early November. This drop of 38 cents per pound was financially devastating to cheese manufacturers, who had earlier purchased milk to make cheese at prices that were much too high to support cheese sales at the depressed fall prices. Cheese buyers holding large cheese inventories at the end of July for fall sales were also hurt in the sense that competitors purchasing at the low fall prices were at a substantial competitive advantage.

As we will demonstrate later, it may be possible for cheese sellers and buyers to protect against rapid price movements in either direction through futures market hedging. Hedging offers an opportunity for inventory holders to protect themselves against price declines and an opportunity for cheese buyers to protect themselves against price increases. Because of the close relationship between cheese prices and the M-W, cheese futures also offer the potential for reducing the market price risk for dairy farmers as well.

Will a cheese futures market replace the National Cheese Exchange?

The cheese futures market is not a replacement for the National Cheese Exchange. The National Cheese Exchange is a cash market for actual sale of cheese. The futures market for cheddar cheese will trade contracts committing delivery or acceptance of cheese sometime in the future. But this is not to say that no deliveries will occur. Some cash market cheese traders may use the cheese futures in addition to or even instead of the National Cheese Exchange in making their cheese selling and buying decisions.

Concern over the National Cheese Exchange partly motivated the recent interest in cheese futures. The National Cheese Exchange is a "thin market." Less than 1 percent of the cheddar blocks and cheddar barrels produced in the U.S. are actually sold on the Exchange. Trading is also dominated by a few traders. Hence, the question arises as to whether the opinion prices on the National Cheese Exchange adequately reflect the national market supply and demand for cheese.

Cheese futures will broaden the price discovery process. Both cheese hedgers and speculators will be continually evaluating supply and demand factors as well as other market indicators. Based on their analysis and expectations of future price movements, trades will be made and prices discovered. Once prices are discovered, the New York Coffee, Sugar and Cocoa Exchange, Inc. will be responsible for disseminating these prices to the public on a daily basis through market reports and newspapers.

The question may be asked, won't the hedgers be the same players as those that trade on the National Cheese Exchange? All of the traders in the National Cheese Exchange are potential hedgers in the cheese futures market. Other cheese sellers and users who do not currently trade on the National Cheese Exchange may also hedge using cheese futures. But the largest complement of new players will be speculators. There is no speculator activity in

the National Cheese Exchange. The addition of speculators in the cheese futures market adds to the number of players involved in the price discovery process.

How can futures trading reduce market price risks?

Futures markets may be used to reduce market price risk. This is accomplished through hedging. Hedging, as previously defined, is taking simultaneous but opposite or offsetting transactions on the cash and futures markets.

In effect, hedging involves using futures contracts as a substitute for a future cash market transaction. The hedger sells or buys futures contracts that are similar in volume to anticipated cash market sales or purchases sometime later in time.[7] This futures market sale or purchase is made in an attempt to "lock in" the price for the futures contract as the price for the future cash market sale.

A manufacturer may try to lock in a finished product price objective through hedging. On the cash market, the initial transaction is procuring raw product and manufacturing a finished product, which is functionally equivalent to a purchase. To lock in the price objective the initial and opposite position on the futures market will be a short sale, that is, the manufacturer will sell a futures contract. The futures contract month chosen will be near the time the cash sale will take place. Later, when the cash sale is made the short position on the futures market will be covered or offset by the purchase of an identical futures contract. Since opposite positions have been taken on the cash and futures market, any loss (gain) from a price decline (increase) in the cash market would be offset from a gain (loss) on the futures market *if the predicted relationship between cash and futures market prices holds*. If prices had fallen (increased) an equal futures contract would have been purchased at a lower (higher) price than the initial sell contract resulting in a gain (loss) on the futures. The net result is the price objective is realized.

The relationship between cash and futures prices is related to *basis*, which is discussed later. Cash and futures market prices for the same commodity do not always move together. But they will *converge* or come together as the delivery date for the futures contract approaches. Convergence is assured through *arbitrage* between cash and futures markets. To illustrate arbitrage, suppose the cash price for a commodity was well below the futures price for exactly the same commodity a few weeks before the delivery date on the futures contract. Arbitragers would buy cheap (the physical commodity) and sell dear (the futures contract). This would bid up the cash price and pull down the futures price, thus causing convergence.

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[7] The futures contract volume and the cash market volume do not have to be identical in a hedging transaction. In fact, hedgers will usually sell or buy futures contracts that total less than their expected cash market sales or purchases. Futures contract volume in excess of expected cash market volume represents speculation in the futures market.

If the cash commodity was trading at a premium to the futures contract, opposite arbitrage transactions would similarly pull the prices together.

Holders of inventory stand to incur losses from price declines. Obtaining inventory is a purchase transaction on the cash market. The inventory price risk may be reduced by initially taking a short (sell) position on the futures market. Later, when the inventory is sold on the cash market, the short position would be covered by a purchase of an equal futures contract. Any loss (gain) from a decline in inventory value would be offset by a gain (loss) in the futures market.

A wholesaler could use hedging to offer a cash forward contract for its finished product at a specified price. The market risk is that the seller will experience greater acquisition costs than anticipated and losses or reduced profits will occur when the forward price is received. Forward pricing on the cash market is a selling transaction. To protect his/her profit objective from forward pricing, the seller would hedge by initially taking a long position; i.e., buy a futures contract. Later, when the product is made and delivered on the cash market at the forward price, the seller will sell an equal futures contract. If product costs had increased (decreased), the loss (gain) in the cash market by selling at the forward price would be offset by a gain (loss) in the futures market.

A buyer may use hedging to help ensure the cost of commodities purchased. For example, a food processor may protect its profit margin objective by locking in ingredient costs. The initial futures transaction would be a long position; buying a futures contract for the commodity to be purchased on the cash market later. Later, when the commodity is needed and purchased on the cash market, the futures position is covered by selling an equal futures contract. If commodity prices had risen (fallen), the loss (gain) in the cash market operation would be offset by the gain (loss) in the futures market.

The above discussion may lead one to believe that losses (gains) in the cash market are exactly offset by gains (losses) on the futures market and that the price objective is exactly realized. More likely than not, the net price result is not this perfect. The net price could be lower or higher than the objective. It all depends upon what happens to the basis. The basis is the difference between the cash price of a commodity and the price of the same or similar futures contract. For purposes of hedging, basis is *predicted* when the hedge is placed, and the actual basis may be different when the hedge is lifted. Transportation costs, storage costs, and product characteristics that are different from futures contract specifications make up the relevant basis pertaining to the cheddar cheese futures contract. These factors may cause cash prices to be different from (higher or lower than) futures prices, and to change in a manner different from futures prices.

Basis is calculated by subtracting the futures price from the cash price. Therefore, if the cash price is higher than the futures price, then the basis is positive. If the futures price is higher than the cash price, then the basis is negative. Regardless of whether it is positive or

negative, basis is said to *strengthen* if the cash price rises relative to the futures price, and to *weaken* if the cash price falls relative to the futures price.

Knowing and understanding the basis is essential for successful hedging. In hedging transactions, the price or profit objective will differ from its expected value by any difference between the expected basis and the actual basis when the hedge is lifted. For example, suppose that in a short hedge (initial position is a sell), the seller expects the cash market price for 40# block cheddar cheese to be 5 cents higher than the futures market price (+5-cent basis) when the hedge is lifted. If the basis strengthens by 5 cents (the cash market price is 10 cents per pound higher than the futures price, the net price will be above the price objective by 5 cents. If the basis had weakened by 5 cents (Cash market price equal to futures market price), the net price will be 5 cents below the price objective. For a long hedge (initial position is a buy), the opposite effects occur; the net price is exceeded when the basis weakens and the net price is not achieved when the basis strengthens.

Hedging reduces market price risk, but basis risk, the risk the basis will be different from what is predicted, always exists. Since basis is easier to forecast than prices, basis risk is less than market price risk. Cheese futures contracts are new, and there is no available historical information on basis for cheese. An understanding of cheese basis will improve over time as futures trading in cheese takes place.

How could cheese manufacturers use futures trading to reduce risk?

We have talked in a general sense about how futures trading can be used to shift risk to speculators. Now, let's look at some specific examples of how hedging can be used to "lock in" a price to a cheese plant.

First, let's consider a simple case of how a plant might hedge to forward price expected cheese production. This involves the sale of futures contracts equal in volume to the amount of cheese production at a future time. Assume that in July 1993, Aceinthehole Cooperative expects to make and sell 200,000# of cheddar blocks in the month of November. Management is worried about a repeat of October 1990, when cheddar cheese prices dropped 20 cents per pound in a single trading session on the National Cheese Exchange, and wants to protect its manufacturing margin. In July, the November cheddar cheese contract is trading at $1.20/#, which is higher than what Aceinthehole thinks the cash price for its cheese will be in November.

Under these circumstances, the appropriate action is to *sell* 5 November futures contracts @ $1.20. This is known as a "short" sale, or "going short in the market" -- Aceinthehole is selling cheese that it hasn't even produced yet. Five contracts is equal in volume to Aceinthehole's expected inventory of cheddar cheese in November (5 X 40,000# = 200,000#). In effect, Aceinthehole is forward selling the stock of cheese it expects to have in November in the month of July, using the futures market. Through its futures market sale,

the cooperative has sold the right to deliver 200,000# of cheese in November at a price of $1.20 per pound.

Aceinthehole does not receive the value of its cheese when it sells the commitment to deliver. It has only sold the commitment, and will have realized any potential benefits until it makes delivery or offsets its futures market position with a purchase.

Now, lets see what happens when November rolls around. We'll look at two cases. In the first case, let's suppose that Aceinthehole's pessimistic forecast about November cheese prices materializes. The November futures price is $1.10/#, 10 cents less than when the cooperative sold the five contracts. Aceinthehole *buys* 5 November futures contracts @ $1.10 to offset its previous sale and close out its short futures position. Since it sold the contract for 10 cents per pound more than what it bought it for, it gains $20,000 on its futures market transaction (we are ignoring brokerage fees). Aceinthehole still has 200,000# of cheese to get rid of, which it *sells* in the cash market for $1.10/#, yielding $220,000. The sum of futures market profits ($20,000) and cash market sales revenue is $240,000. Dividing by 200,000# of cheese shows a per pound revenue of $1.20, which is the price that the cooperative wanted to lock in.

This sounds good, but what if Aceinthehole's November price forecast was pessimistic, and that an unanticipated shortage of cheese causes the cash market and the futures market to go up? That's case II. The November futures price is $1.50/#. Aceinthehole has to *buy* 5 November contracts @ $1.50, which means it loses 30 cents per pound, or $60,000 on its futures market transactions![8] But, at the same time, it can sell its 200,000# of cheese at $1.50 per pound, giving it $300,000 in receipts. The combination of futures market losses and cash market sales gives total revenue of $240,000, or $1.20 per pound -- exactly the price that Aceinthehole was trying to lock in.

Looking at both cases, Aceinthehole has assured itself of $1.20 per pound on its November cheese inventory, regardless of which way the market moves. If the market goes down, then futures market gains offset cash market losses. If prices rise, then cash market gains offset futures market losses.

Perceptive readers may already have noticed that we have stacked the deck in these two examples. We assumed that the cash and futures market prices were equal at the time the futures commitment was covered or "closed out." The equality of cash and futures market prices is not important, but this "perfect hedge" does require that the *difference* between the cash and futures remains at the level anticipated when the hedge was placed. In other words, we assumed that the BASIS was constant. As we noted above, that may not be the case.

[8] The cooperative will also have to post additional margin with its broker as the price moves against it.

If the relationship between cash and futures prices is different from what was expected, then hedgers could experience corresponding losses or profits. But regardless of what happens to basis, the seller of a futures contract always has the option of making delivery on its futures market commitment. In either of the two cases above, Aceinthehole can delivery its 200,000# of cheese to the buyer(s) of its futures contract at the $1.20 per pound price. Since the contract specifies delivery anywhere in the United States, the cooperative will not experience any delivery costs. Consequently, the $1.20 per pound price is an assured price -- Aceinthehole has locked in its price.

To complicate things a bit more, let's look at a case where the cheese manufacturer sells a product that is different from the cheddar cheese specified in the futures contract. We'll assume that Aceinthehole sells aged cheddar, which trades at a premium to 7-60 day cheddar. In this case, hedging is still a good strategy to reduce price risk, but the basis will be positive and basis risk will be greater. Moreover, Aceinthehole cannot deliver against its futures commitment because it does not have cheese that meets the contract specification. This same case applies to manufacturers of cheese varieties other than cheddar. The prices for other cheeses will move with cheddar cheese prices, but the normal basis may be positive or negative and there will be greater basis risk.

Assume that in July 1993, Aceinthehole has 120,000 pounds of cheddar cheese in its warehouse that it intends to age and sell in November. Storage and opportunity costs are 2.5 cents per pound per month, so the cooperative needs at least a ten cent premium over the young cheddar price in November to cover its aging costs. We'll also assume that in Aceinthehole's area, the normal basis (cash price for young cheddar minus futures price) is 5 cents per pound. If Aceinthehole is a Midwestern cooperative, this is a realistic assumption. The cheddar cheese futures contract is likely to reflect the cash market in the lowest-price major cheese producing region, which is California. Hence, the normal basis (for cheese 7-60 days old) in other regions would be expected to be positive and less than or equal to the cost of transporting cheese from California.

Under these conditions, Aceinthehole's expected basis is 15 cents per pound. The cooperative wants to hedge its inventory value using the November cheddar cheese contract. It sells 3 November contracts @ $1.20. Adding its expected basis of 15 cents yields an expected cash market price for its aged cheddar of $1.35 per pound. This is Aceinthehole's price objective.

In November, let's assume that the cheese futures market has fallen to $1.15 per pound and that the cash price for aged cheddar is $1.25 per pound. The basis has weakened to 10 cents per pound from its anticipated 15 cents. Aceinthehole sells its aged cheddar for $1.25 cents per pound, losing 10 cents per pound relative to its price objective. The cooperative covers its futures commitment by buying 3 contracts @ $1.15, making 5 cents per pound profit. The net result is a loss of 5 cents per pound relative to the price objective. Because the basis weakened (cash price relative to futures price was less than expected), Aceinthehole's, futures market gain did not completely offset its cash market loss.

How could a cheese buyer use futures trading to reduce risk?

Now, let's flip the coin to look at how a cheese buyer might lock in it's price. Again, we will assume a perfect hedge, that is, that cash and futures market price coincide or that the basis is constant relative to expectations.

Let's assume that in July 1993, Mightyfine Cheese Distributors signs a contract with Realbig Grocers to deliver 200,000# of random-cut cheddar cheese in November 1993 at a fixed price of $1.50/#. Mightyfine's costs for cutting, wrapping, procurement, delivery, and overhead are $0.30/#. The November cheddar cheese contract is trading at $1.20/#.

The hedge in this case involves a purchase of futures contracts. Mightyfine *buys* 5 November contracts @ $1.20. It takes a long position in the futures market by purchasing November futures contracts equal in volume to the amount of cheese it actually wants to buy in November to meet its contract with Realbig. This means that the company has purchased a commitment to receive 200,000# of cheddar cheese at a price of $1.20 per pound. Adding its margin of 30 cents per pound indicates that it Mightyfine can procure block cheddar at $1.20 per pound, it can sell profitably at $1.50 per pound.

Again, we'll look at two cases. In the first case, assume that the futures price for block cheddar in November is $1.10, 10 cents per pound below what Mightyfine paid for the contract. Mightyfine closes out its long futures position by *selling* 5 November contacts @ $1.10. It loses 10 cents per pound, or $20,000 on this transaction (again, we are ignoring brokerage charges). At the same time, Mightyfine buys 200,000 pounds of block cheddar at $1.10 per pound to meet its commitment to Realbig Grocers. Its cost of cheese is only $220,000 compared to the $240,000 it expected to pay. Hence, Mightyfine's total cost, considering both cash and futures market transactions, is the $220,000 it paid for cheese in the cash market plus its $20,000 loss in the futures market for a total of $240,000, or $1.20 per pound -- exactly the price that it was trying to lock in.

In case II, we'll assume that the November futures price rises to $1.50 per pound, 30 cents per pound above what Mightyfine paid for the contract. Mightyfine closes out its long futures position by selling 5 November contracts @ $1.50. It gains 30 cents per pound, or $60,000, on the transaction. But it has to buy cheese to meet its contract obligation to Realbig at $1.50 per pound, for a total cost of $300,000. Mightyfine's total cost in this case is the $300,000 cash market purchase less the $60,000 futures market profit for a net of $240,000 -- $1.20 per pound.

Again, we are assuming away basis risk. But Mightyfine does not have to close out its futures market position. It can elect to take delivery on the cheese that it has purchased in the futures market. This will ensure the $1.20 per pound cost, but Mightyfine will have to pay for the cost of transporting the cheese from the delivery point chosen by the seller of the contract.

What we have described so far are routine hedges as well as perfect hedges. The hedges are perfect in the sense that basis risk is assumed away. The hedges are routine in the sense that the hedgers were assumed to hold on to their futures positions (commitments to deliver or receive cheese) until they engage in offsetting cash market transactions (selling or buying cheese). In real life, hedgers would likely employ a selective hedging strategy, closing out their futures positions if and when the direction of price movements becomes clear and it becomes costly to stay hedged. For example, in the short hedge illustration, Aceinthehole would be ill-advised to maintain its short position in the futures market when it becomes apparent that cheese prices are unquestionably on the rise. The firm is losing money with every up-tick of the market, since it will have to buy back its futures contracts at an increasingly higher price. By buying back its futures contracts, it will lose money on its futures transaction, but it can avoid even larger losses (at the expense of risking a subsequent cash price decline).

Similarly, when it becomes apparent that cheese prices are unquestionably falling below the "locked in" price, long hedgers like Mightyfine will want to close out their futures position to save money on their futures transactions and benefit from the bear market on their cash purchases.

We need to inject words of caution about prematurely lifting hedges. To repeat, hedges should be lifted only when it becomes *apparent* that prices are *unquestionably* moving against the hedger. Lifting a short hedge only to have prices plummet could be very costly. Remember that an unhedged position in the cash market represents speculation, and speculators can be burned.

How could dairy farmers benefit from futures trading?

There are several answers to this question. First and most simply, reduced inventory price risk will benefit cooperatives and, therefore, their members. The ability to hedge against inventory losses will improve the bottom lines of cooperatives engaged in manufacturing cheese by allowing them to shift the risk of inventory losses to speculators and long hedgers. But farmers can benefit in other ways. A futures market for cheese allows cheese manufacturers to forward price milk, something that has not been possible in the past. Let's look at how forward pricing might work.

On July 1, 1993, Realgood Cheese Factory initiates a revolutionary milk pricing program. It will sign fixed price contracts with dairy farmers. The price per hundredweight that Realgood will pay is 10 times the futures price for cheddar cheese in any month the farmer selects minus $1.50. Farmers cannot change their pricing month until the delivery date for that contract month, and they cannot receive any more than the contracted price; the contract is a fixed price contract, not a minimum price contract.

Farmer A signs up for the program on July 1 and picks November 1993 as her pricing month. The November cheddar cheese contract is trading at $1.45, so her contract price is $13.00 per hundredweight. Farmer A produces 400,000# of milk per month.

After the contract is signed, Realgood has a fixed financial obligation of $260,000 to Farmer A (5 months X 4,000 Cwt. @ $13.00). To hedge that obligation, Realgood sells 5 November contracts @ $1.45, representing a total value of $290,000. The difference represents a make and storage allowance of 15 cents per pound of cheese, assuming a 10 pound yield.

If the price that Realgood can get for cheddar cheese on the cash market between July and November 1993 is consistently below $1.45/#, then Realgood can deliver the cheese produced with Farmer A's milk against the contract. Alternatively (and more likely), Realgood can sell in the cash market (at less than $1.45) and buy back its futures contracts (also less than $1.45), offsetting cash market losses with futures market gains.

If the cash prices goes above $1.45, Realgood sells at the higher price and buys back an equivalent amount of the short sell (or lifts the hedge if it is confident that cash prices will remain above $1.45).

How can this work? How can Realgood guarantee a price when it has no idea what the milk market is going to do? What happens if there is a drought or a big surplus of milk, moving milk prices rapidly up or down?

To answer these questions, you may want to work through some examples with rising and falling cheese and milk prices. But the concept is really quite simple. Realgood is protecting itself against a falling milk market by hedging its purchase of milk in the cheese market. Realgood will make cheese from Farmer A's milk. It can make about 10 pounds of cheese per hundredweight of milk that it buys from Farmer A. Realgood simply converts the amount of milk in its contract with Farmer A to cheese equivalent, and then hedges that equivalent in the futures market through a short sale of cheese. If cheese prices fall from the level specified in the pricing month, then Realgood offsets cash market losses with futures market gains.

But what if cheese prices go up? That really doesn't matter, since the pricing contract is for a fixed milk price. Realgood's hedge assures it's ability to pay $13.00 per hundred-weight, no less and no more, as long as the expected basis materializes.[9]

[9] With a routine hedge, Realgood can only employ a fixed price contract. However, Realgood could use a minimum price guarantee by selling put options instead of futures contracts. Options trading represents a more sophisticated and more complex risk management strategy. We will discuss cheddar cheese options in a subsequent Marketing and Policy Briefing Paper.

Basis in this case is the difference between the gross value of 10 pounds of milk to the cheese plant and the cheddar cheese futures price. This is considerably more complex than the notion of basis when dealing with hedges that involve cheese as specified in the futures contract. And this basis is more likely to be variable and subject the plant to basis risk. Factors influencing the milk-cheese basis include cheese yields, byproduct values (whey cream and whey solids), and plant costs.

One other problem: What if Farmer A produces less than 400,000 pounds of milk in a month, which is less than the cheese equivalent of the 40,000 pound cheddar cheese futures contract that Realgood needs to sell in order to hedge the price guarantee? What is important to making this forward milk pricing program work is not the milk production of any one patron, but the combined volume of all patrons who select a particular pricing month. For a typical cheese plant, it is likely that the aggregate milk volume being priced would be equivalent to several cheddar cheese contracts.

A third way that farmers can benefit from a futures market for cheese is through direct cross hedging. From the example above, it is obvious that Realgood is protecting itself in its guaranteed milk price program by hedging in the futures market. Realgood knows that it can get about 10 pounds of cheese from each hundredweight of milk it processes. So it can short sell cheese equivalent to the amount of milk it needs to produce that cheese. Hedging cheese to protect against a milk price obligation is known as a cross hedge. Realgood is using a cross hedge to ensure its ability to pay a fixed price for milk. That is something that some dairy farmers can do themselves, either individually or collectively. But remember that cross hedging involves greater basis risk than hedging in the same commodity

Let's look at a dairy farmer cross-hedge. Suppose that Farmer A sees what Realgood Cheese Factory is up to, and decides that she is just as capable of locking in a price as Real-good. She figures that, based on historical evidence, a cheddar cheese price of $1.45 per pound should result in an M-W price of $13.00, and that the Grade A price for her milk normally runs $1.00 higher than the M-W. She also figures that milk prices are likely to be down this fall, and an M-W of $14.00 would look pretty good. She wants to lock in that price by cross-hedging against the November cheddar cheese contract, which is trading on July 1 at $1.45/#.

To cross hedge, Farmer A *sells* 1 November cheddar cheese contract @ $1.45. She has sold a commitment to deliver 40,000# of block cheddar at a price of $1.45. Of course, Farmer A does not make cheese, and she has no intention of making delivery on the contract. She is using the short sale to hedge her anticipated milk production in November.

November rolls around. Let's first assume that the November futures price for 40# block cheddar is $1.10/#, a whopping 35 cents per pound under the price when Farmer A sold short. To close out her futures position. Farmer A *buys* 1 November contract @ $1.10, making $14,000 (less brokerage fees) on her futures transaction.

That's the good news. But while the cheese futures was falling in the tank, the milk price was falling just as rapidly. Farmer A finds that the M-W price in November is $9.50 per hundredweight and her Grade A price is $10.50. So she can sell her 400,000# of milk for only $42,000.

But things are not that bad. Adding the $14,000 profit in the futures market to the $42,000 revenue from milk sales yields $56,000. Dividing total revenue by milk marketed (4,000 hundredweight) yields $14.00 per hundredweight -- Farmer A's original price objective.

But suppose the cheese and milk markets rose? Suppose the November futures price for cheese is $1.60/#? In that case, Farmer A *buys* 1 November contract @ $1.60. Her loss on the futures transaction is 15 cents per pound, or $6,000. But at the same time, the M-W price has risen to $14.50 and Farmer A's Grade A price is $15.50, meaning that she makes $62,000 on her 4,000 hundredweight of milk. Adding milk sales and futures transaction losses yields $56,000, or $14.00 per hundredweight -- the price objective.

Again, we have simplified this example by assuming no basis risk, that is, that the Grade A milk price for Farmer A has a perfectly predictable relationship to the cheese futures price. As noted before, a perfectly predictable basis is unlikely in a cross hedge, where the two commodities are not identical. Several things could cause the basis to vary from expectations, and therefore cause Farmer A's hedge to either make or lose money. For example, cheese manufacturing margins could increase or decrease from normal, or the Grade A premium could change relative to expectations.

But while there is basis risk in cross hedging farm milk against cheddar cheese futures, cheese prices and milk prices do move closely together. That's because all milk prices are tied closely to the M-W price through federal order pricing rules (see Figure 3). And cheese prices are very highly correlated with the M-W price because of the importance of cheese manufacturing in the states of Minnesota and Wisconsin, where the M-W price is collected (Figure 4).

By now, you might be saying that 400,000 pounds is a lot of milk. Most Wisconsin herds, for example, produce less than 1 million pounds in an entire year. Will cross-hedging by dairy farmers be limited to very large producers? The answer is, not necessarily. Obviously, large producers are more likely to have monthly milk sales equivalent in volume to a 40,000 pound cheddar cheese futures contract. But existing dairy cooperatives could assist their members by pooling marketings and placing and lifting hedges based on their combined marketings. Alternatively, specialized cooperatives might be formed for the specific purpose of managing dairy farmers' price risk through futures trading.

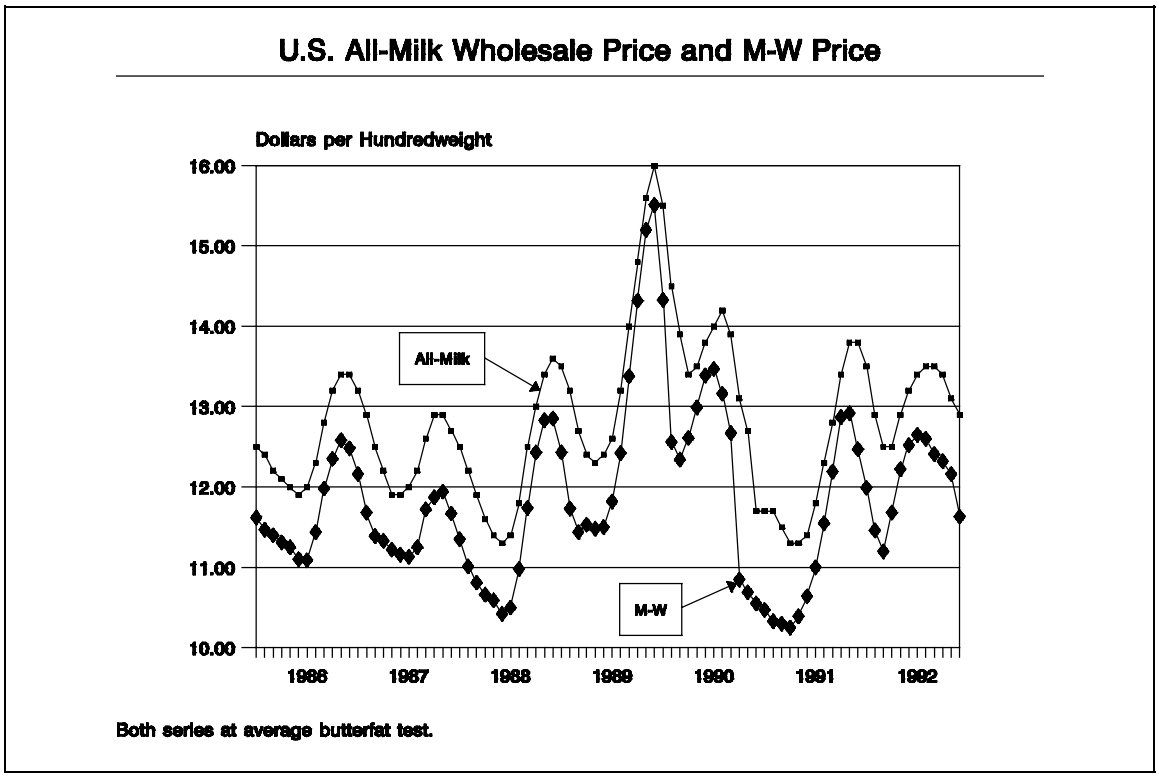


Figure 3

Also, remember that contracts for future delivery can be bought and sold as long as 18 months prior to their expiration (delivery) date. If a dairy farmer's expected milk marketings between the time of futures contract sale and the delivery month are greater than 400,000 pounds, then the farmer can engage in cross hedging. But this kind of cross hedge would be subject to considerable basis risk. That's because the smaller farmer would be selling milk in the cash market (to a dairy plant) continuously for a long period before expiration of its futures contact. Monthly cash prices could vary substantially around the hedged price objective. Also, the hedger in this case might be obligated to frequently meet margin calls over the long hedge period.

Will using the futures market to hedge or cross hedge guarantee a profit?

Absolutely not! Hedging is a means of managing risk, not a means of guaranteeing a profit. Obviously, if costs are less than prices locked in through hedging, the difference represents profit. But the prices that are locked in through hedging may not be profitable prices. The examples we have used assumed price levels that might generally be considered profitable. But we could just as well have used lower milk and cheese prices that were clearly unprofitable to dairy farmers. The futures market gains and losses would not change, but the bottom lines to hedgers would.

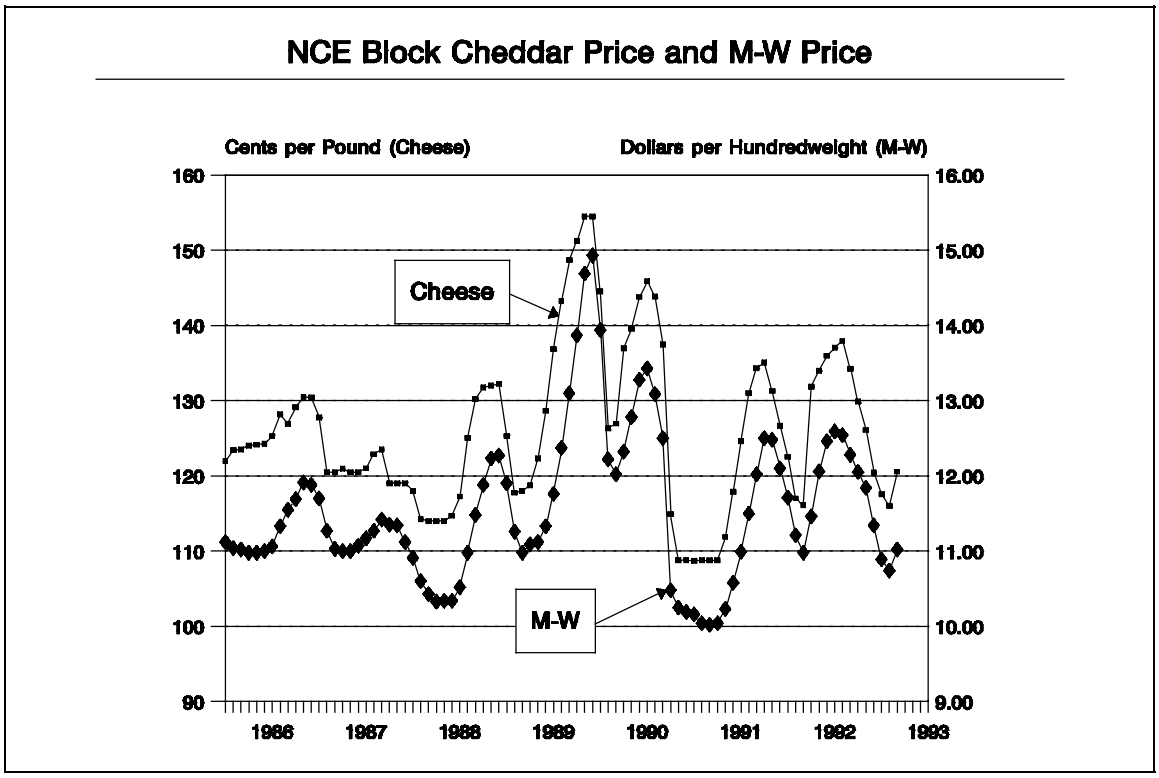


Figure 4

In other words, hedging is a risk management tool that should be used if and only if it can help increase profits or decrease losses. If hedging would only serve to lock in a loss, then hedging wouldn't make economic sense unless the loss could be even larger without hedging.

Will futures trading in cheese increase cheese and milk prices?

No. Cheese prices are determined by fundamental forces of supply and demand for cheese. In turn, milk prices are the product of supply and demand for cheese and other dairy products. Futures trading will not change these fundamental factors.

Futures prices represent the collective opinion of traders as to future cash market supply and demand conditions. The cash and futures markets are distinct and separated by time. Cash market and futures market prices coincide only at the time the futures contract expires, that is, when they represent the same point in time.

Will futures trading in cheese reduce the volatility in cheese and milk prices?

Maybe, maybe not. Again, cash market fundamentals dictate cash market prices. Expectations of future cash market fundamentals dictate futures market prices. The increased volatility of cheese prices in recent years is a result of the dairy price support level being lowered to the point that it seldom if ever serves as a price floor. To the extent that supply and demand factors cause cash market prices for cheese to change rapidly, futures market trading will not change price volatility.

But some argue that hedged cheese manufacturers may be more willing to hold cheese inventories, rather than selling at reduced prices, during forecasts of possible increased cheese supplies and lower prices. This could serve to stabilize cash market prices. However, if increased cheese supplies become a reality, market forces will lower cheese prices. Cheese futures trading should be viewed as a market tool to manage market price risk in an environment of price volatility, not as a means to reduce volatility.

Will futures trading really help the dairy industry?

If futures trading won't raise milk prices or guarantee a profit and probably won't diminish price volatility, then what good is it for dairy farmers? We've answered that question before, but it bears repeating: Futures trading provides a tool to manage price risk. If dairy cooperatives and dairy farmers use that tool, then they can benefit by locking in cheese and milk prices in advance. If they do not use that tool, then they are neither better off nor worse off than without a forward contract market.

It is important to stress the last point. Some dairy farmers and others have expressed the concern that futures markets are nothing more than legalized gambling casinos; that rampant speculation in cheese futures contracts can only hurt dairy farmers; that only large dairy interests will use the futures market, and only in ways that spell trouble for dairy farmers. While there is no experience in cheese futures trading to refute these concerns, neither is there any evidence before the fact that cheese futures trading will have any effect on cash prices for cheese.

We can't at this time predict who will trade futures contracts. Nor can we say whether trading activity will be adequate to support widespread hedging, or whether farmers or small cheese plants will take the time necessary to learn how to effectively hedge. But we can say that there is potentially something to be gained and nothing to be lost through the introduction of a cheese futures contract.

Appendix I
More Hedging Examples and Some Hedging Morals

Example #1: *Forward price expected block cheddar cheese production*

Date	Cash Market	Futures Market	Basis
July 1993	Expected Nov. 1993 cheddar cheese production is 40,000#. Normal local basis is $.05 Price objective is $1.25	SELL 1 Nov. contract @ $1.20	$0.05
Case I - Futures price decline/no basis change:			
Nov. 1993	Sell 40,000# of 7-38 day cheddar blocks @ $1.15	BUY 1 Nov. contract @ $1.10	$0.05
Gain/(Loss)	($0.10)	$0.10	
Net Gain	$0.00		
Case II - Futures price increase/no basis change:			
Nov. 1993	Sell 40,000# of 7-38 day cheddar blocks @ $1.40	BUY 1 Nov. contract @ $1.35	$0.05
Gain/(Loss)	$0.15	($0.15)	
Net Gain	$0.00		
Case III - Futures price decline/basis weakens:			
Nov. 1993	Sell 40,000# of 7-38 day cheddar blocks @ $1.13	BUY 1 Nov. contract @ $1.10	$0.03
Gain/(Loss)	($0.12)	$0.10	
Net Gain	($0.02) = basis change		

Moral: · Hedging eliminates risk only if there is no change in basis. Basis changes can result in losses to hedgers (relative to price objective). The basis in this case is small and predictable because the commodity specifications in the cash and futures markets are the same.

Example #2: *Protect value of aged cheese inventory*

Date	Cash Market	Futures Market	Basis
July 1993	Inventory of 40,000# of cheddar blocks for sale as aged cheddar in Nov. Normal premium over young cheddar is $0.10 plus location premium of $0.05. Price objective is $1.35.	SELL 1 Nov. contract @ $1.20	$0.15
Case I - Futures price decline/basis strengthens:			
Nov. 1993	Sell 40,000# of aged cheddar blocks @ $1.30	BUY 1 Nov. contract @ $1.10	$0.20
Gain/(Loss)	($0.05)	$0.10	
Net Gain	$0.05 = basis change		
Case II - Futures price increase/basis weakens:			
Nov. 1993	Sell 40,000# of aged cheddar blocks @ $1.37	BUY 1 Nov. contract @ $1.25	$0.12
Gain/(Loss)	$0.02	($0.05)	
Net Gain	($0.03) = basis change		

Moral:

- Here, the basis includes an anticipated aging premium, which contributes to basis risk. In general, the more different the cash commodity from the futures commodity, the larger the basis risk
- Basis risk is not always bad. If the basis moves in favor of the hedger (strengthens for a short hedge; weakens for a long hedge), then there will be a gain relative to the price objective.
- A strengthened basis always helps a short hedge (the hedger receives more relative to the futures price than expected); a weakened basis always hurts a short hedge (the hedger receives less relative to the futures price than expected).

Example #3: *Forward price Mozzarella cheese production*[1]

Date	Cash Market	Futures Market	Basis
July 1993	Mozzarella cheese maker expects to have 40,000# of high-moisture product to sell in Nov. Normal discount for high-moisture Mozzarella relative to young cheddar is $0.10. Price objective is $1.10.	SELL 1 Nov. contract @ $1.20	($0.10)
Case I - Futures price decline/no basis change:			
Nov. 1993	Sell 40,000# of product @ $1.05	BUY 1 Nov. contract @ $1.15	($0.10)
Gain/(Loss)	($0.05)	$0.05	
Net Gain	$0.00		
Case II - No Futures price change/basis weakens			
Nov. 1993	Sell 40,000# of product @ $1.05	BUY 1 Nov. contract @ $1.20	($0.15)
Gain/(Loss)	($0.05)	($0.00)	
Net Gain	($0.05) = basis change		

Moral:

- Even with no change in the futures market price, basis risk may still result in a loss (or profit) to hedgers.
- Weakening of the basis means that cash prices are lower relative to futures prices than expected. When the basis is negative, a weakened basis means that the difference between cash and futures prices becomes greater. When the basis is positive, basis weakening means that the cash and futures prices get closer together.

[1] This example uses *high-moisture* Mozzarella, which may trade at a discount to block cheddar, in order to illustrate a negative basis. Regular Mozzarella would sell at a premium to block cheddar

Example #4: *Lock in raw product cost for fixed price contract*

Date	Cash Market	Futures Market	Basis
July 1993	Processed cheese maker signs contract to deliver 25,000# of cheese powder to a snack food manufacturer in November. Needs 40,000# of fresh cheddar blocks to make the powder (38% moisture in raw product/0.5% moisture in finished product). Local basis is normally $.05. Signs contract to sell powder @ $2.50 per pound based on November futures price of $1.20.	BUY 1 Nov. contract @ $1.20	$0.05

Case I - Futures price decline/no basis change:

Nov. 1993	Buy 40,000# of cheddar blocks @ $1.20. Make and sell 25,000# of cheese powder @$2.50	SELL 1 Nov. contract @$1.15	$0.05
Gain/(Loss)	$0.05	($0.05)	
Net Gain	$0.00		

Case II - No Futures price change/basis weakens:

Nov. 1993	Buy 40,000# of cheddar blocks @ $1.24. Make and sell 25,000# of cheese powder @ $2.50	SELL 1 Nov. contract @ $1.20	$0.04
Gain/(Loss)	$0.01	$0.00	
Net Gain	$0.01 = basis change		

Moral:

- A long hedge protects buyers from price increases in the same way that a short hedge protects sellers from price decreases.
- A strengthened basis always hurts a long hedge (the hedger must pay more relative to the futures market than expected); a weakened basis always helps a long hedge (the hedger pays less relative to the futures market than expected).

Example #5: *Dairy farmer hedge*

Date	Cash Market	Futures Market	Basis
July 1993	Dairy farmer hedges expected November milk production using November cheddar cheese futures. Expects to sell 400,000 pounds of milk. Local basis is $.05. M-W price expected to be $1.00 less than 10 times the local cheddar block price. Grade A milk price expected to exceed M-W price by $.75/Cwt. Price objective for milk is $12.25/Cwt., equivalent to $1.225/# cheddar block price.	SELL 1 Nov. contract @ $1.20	$0.025

Case I - No futures price change/basis strengthens:

Nov. 1993	Sell 400,000# of Grade A milk @ $12.50/Cwt.	BUY 1 Nov. contract @ $1.20	$0.05
Gain/(Loss)	$0.025	$0.00	
Net Gain	$0.025 = basis change (= $.25/Cwt. gain)		

Case II - Futures price decline/basis weakens:

Nov. 1993	Sell 400,000# of Grade A milk @ $11.55/Cwt.	BUY 1 Nov. contract @ $1.15	$0.005
Gain/(Loss)	($0.07)	$0.05	
Net Gain	($0.02) = basis change (= $.20/Cwt. loss)		

Moral: · There are many components making up the basis in a complex cross-hedge like this one. Therefore, there are many things than can make the basis different from what is predicted when the hedge is placed.

Appendix II
More on Basis

We have stressed the importance of understanding basis for successful hedging, and we have shown how hedges are affected when the basis is different from expectations. In this appendix, we expand our discussion of what makes up basis and, therefore, what creates basis risk. We also provide some historical price data related to possible basis risk in a raw milk hedge using the block cheddar futures contract.

Basis is the difference between the cash market price of the commodity being hedged and the futures market price for the relevant contract. While basis can be calculated at any time in reference to any delivery month, the important basis for protecting a price objective through hedging is the predicted difference between the cash price and the hedge month futures contract price when the hedge is expected to be lifted. Basis is estimated when the hedge is set. The possibility that the basis will be different from the estimate when the hedge is lifted and an offsetting cash market transaction is made represents basis risk.

If the hedge is held until the delivery month, the basis will be small and predictable *if the cash commodity is exactly the same as the futures commodity*. That's because cash and futures prices converge in the delivery month because of actual or potential arbitrage trading between cash and futures markets.

If the hedge is lifted between futures market delivery months, then the basis is more unpredictable. There is no experience in cheese futures trading. We don't know whether cash prices for cheddar cheese in mid-August, for example, will generally be higher that the September futures price (inverted market) or lower (carrying charge market). Adding uncertainty to the between-delivery month basis is the fact that cheese production is continuous but seasonal. Only trading experience -- and perhaps several years worth -- will provide us with guidance on this issue.

For hedges involving young cheddar cheese blocks, the only factor affecting basis is transportation cost from the lowest-price region. Since there are no delivery points specified in the cheddar cheese contract, the futures price will reflect the region where delivering on the futures contract would be the cheapest; that is, where the cash commodity can be acquired at the lowest cost. Recently, cheddar cheese prices have been lowest in California, where a state marketing order keeps cheese milk costs low and where surplus cheese must be transported long distances to find a market. The local basis for young cheddar cheese blocks in the region with the lowest cash market prices will be about zero. In other regions, cheese prices will be higher, and therefore the basis will generally be positive. But note that the basis could change with changes in local cheese supply and demand conditions, since the futures market pricing region will change with changing regional price relationships.

At least for part of the year, it is possible that the cheddar cheese futures price would reflect the National Cheese Exchange as an implicit delivery point. The National Cheese

Exchange "opinion" for block cheddar is usually lower than what sellers in most regions are being paid for cheddar blocks, and the Exchange may lead the market during price reversals.

For cheddar cheese that does not match the specifications of the cheddar cheese futures contract, the basis will reflect, on average, the price differences between the cash commodity and block cheddar cheese. That difference would be negative for barrel cheddar, reflecting lower manufacturing costs, and positive for aged cheddar blocks, reflecting higher storage costs. Similarly, the basis for non-cheddar varieties will generally be positive. Since many cheese varieties are priced in reference to the National Cheese Exchange block cheddar price, there may not be substantial basis risk in hedges involving non-cheddar cheeses. But basis risk will increase the more different the cheese is from block cheddar.

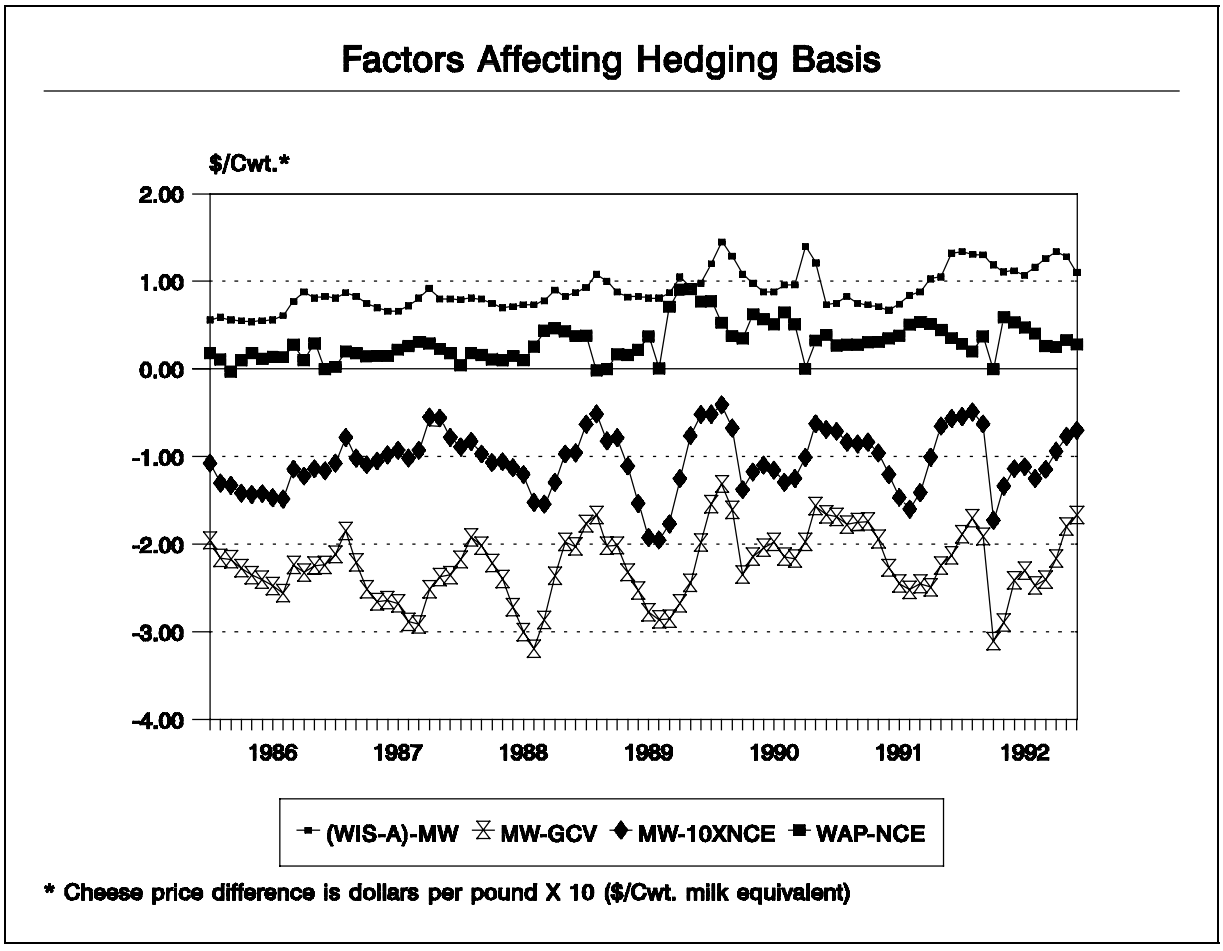
Calculation of basis becomes more complex in cross hedging milk against the cheddar block contract. Since over 40 percent of all milk is used for cheese, there is obviously a strong correlation between cheese and milk prices. Also, fluid milk, which absorbs another 40 percent of milk, is priced in reference to the Minnesota-Wisconsin price, which reflects milk value in two major cheese states. Nonetheless, the relationship between milk prices and cheese prices is variable, leading to basis risk for dairy farmers involved in cross hedging.

The calculation of a milk/cheese cross hedge basis is illustrated below:

	$1.25 per pound	Futures price quote for delivery month
Plus	+ 0.05 per pound	Local Basis (normal amount by which block cheddar cheese price exceeds futures price in the delivery month)
Equals	1.30 per pound	Local block cheddar price
Times	10.00 pounds	*Approximate* cheese yield per Cwt. of milk
Equals	$13.00 per Cwt.	Cheese value to plant
Plus	+ 0.50 per Cwt.	Byproduct value to plant (whey cream and solids)
Equals	13.50 per Cwt.	Gross value of milk used to produce cheese
Minus	- 1.00 per Cwt.	Manufacturing margin (make allowance)
Equals	12.50 per Cwt.	Net value to milk producers
Plus	+ 0.75 per Cwt.	Grade A price premium
Equals	13.25 per Cwt.	Milk price objective
Divided by	10.00 pounds	*Approximate* cheese yield per Cwt. of milk
Equals	$1.325 per pound	Equivalent cheese price objective
Minus	-$1.250 per pound	Futures price
Equals	$0.075 per pound	Imputed Basis

There are several components of this margin that are subject to considerable risk. The local basis may vary from the expected nickel because of abnormal supply and demand conditions for cheese. Cheese yield varies seasonally and with weather and other factors. Byproduct values are subject to the uncertainties of butter and whey product markets. Manufacturing margins are influenced by unpredictable competitive conditions. Premiums are influenced by fluid milk utilization and a host of other variables.

Appendix Table 1 provides some insights into the variability of selected prices making up basis. Appendix Figure 1 shows the price differences in graphical form. Note that some of the series demonstrate long-term trends (the Wisconsin Assembly Point 40# Block Cheddar price Minus the National Cheese Exchange 40# Block Cheddar price; Wisconsin Grade A milk price minus the Minnesota-Wisconsin Manufacturing Milk price [M-W price]). Others show a pronounced seasonal pattern (M-W price minus Gross Cheese Value per Hundredweight; M-W price minus 10 times the National Cheese Exchange 40# Block Cheddar price). These tendencies can help predict basis.



Appendix Figure 1

Appendix Table 1. Selected prices relevant to computing basis in cheese and milk hedges.

Year	Month	NCE 40# Blocks (NCE)	Wis Assy Point 40# Blocks (WAP)	Wis Grade A Milk (WIS-A)[1]	M-W[1] (M-W)	Gross Cheese Value (GCV)[2]	WAP Minus NCE	WIS-A Minus M-W	M-W Minus GCV	M-W Minus 10 X NCE
		Cents per Lb.		Dollars per Cwt.			$/Lb.	Dollars per Cwt. Value	Blocks	
	1	121.95	123.80	11.68	11.12	13.08	0.018	0.56	-1.96	-1.08
	2	123.44	124.50	11.63	11.04	13.20	0.011	0.59	-2.16	-1.30
	3	123.50	123.20	11.58	11.02	13.19	-0.003	0.56	-2.17	-1.33
	4	124.00	125.00	11.53	10.98	13.26	0.010	0.55	-2.28	-1.42
	5	124.15	126.00	11.52	10.98	13.34	0.018	0.54	-2.36	-1.44
	6	124.25	125.40	11.55	11.00	13.41	0.011	0.55	-2.41	-1.43
1986	7	125.31	126.70	11.62	11.06	13.54	0.014	0.56	-2.48	-1.47
	8	128.15	129.50	11.94	11.33	13.89	0.013	0.61	-2.56	-1.49
	9	126.94	129.70	12.32	11.55	13.79	0.028	0.77	-2.24	-1.14
	10	129.15	130.20	12.57	11.69	14.02	0.010	0.88	-2.33	-1.23
	11	130.50	133.40	12.72	11.91	14.16	0.029	0.81	-2.25	-1.14
	12	130.44	130.40	12.71	11.88	14.12	-0.000	0.83	-2.24	-1.16
	1	127.75	128.00	12.51	11.70	13.82	0.003	0.81	-2.12	-1.08
	2	120.50	122.50	12.14	11.27	13.12	0.020	0.87	-1.85	-0.78
	3	120.50	122.30	11.86	11.03	13.24	0.018	0.83	-2.21	-1.02
	4	120.94	122.40	11.75	11.00	13.51	0.015	0.75	-2.51	-1.09
	5	120.50	122.00	11.70	11.00	13.66	0.015	0.70	-2.66	-1.05
	6	120.50	122.00	11.73	11.07	13.71	0.015	0.66	-2.64	-0.98
1987	7	121.00	123.20	11.83	11.17	13.85	0.022	0.66	-2.68	-0.93
	8	122.88	125.50	11.99	11.27	14.16	0.026	0.72	-2.89	-1.02
	9	123.50	126.60	12.23	11.42	14.34	0.031	0.81	-2.92	-0.93
	10	119.00	121.90	12.27	11.35	13.87	0.029	0.92	-2.52	-0.55
	11	119.00	121.30	12.14	11.34	13.72	0.023	0.80	-2.38	-0.56
	12	119.00	120.80	11.92	11.12	13.47	0.018	0.80	-2.35	-0.78
	1	118.00	118.40	11.70	10.91	13.09	0.004	0.79	-2.18	-0.89
	2	114.25	116.10	11.41	10.60	12.52	0.018	0.81	-1.92	-0.83
	3	114.00	115.60	11.23	10.43	12.45	0.016	0.80	-2.02	-0.97
	4	114.00	115.10	11.08	10.33	12.54	0.011	0.75	-2.21	-1.07
	5	114.00	115.00	11.04	10.34	12.74	0.010	0.70	-2.40	-1.06
	6	114.69	116.20	11.05	10.34	13.06	0.015	0.71	-2.72	-1.13
1988	7	117.25	118.30	11.25	10.52	13.52	0.010	0.73	-3.00	-1.21
	8	125.06	127.60	11.71	10.98	14.17	0.025	0.73	-3.19	-1.53
	9	130.25	134.60	12.26	11.48	14.35	0.043	0.78	-2.87	-1.54
	10	131.75	136.40	12.78	11.88	14.24	0.046	0.90	-2.36	-1.29
	11	132.00	136.30	13.06	12.23	14.21	0.043	0.83	-1.98	-0.97
	12	132.25	136.00	13.14	12.27	14.30	0.037	0.87	-2.03	-0.96
	1	125.31	129.10	12.83	11.90	13.67	0.038	0.93	-1.77	-0.63
	2	117.75	117.60	12.34	11.26	12.93	-0.002	1.08	-1.67	-0.52
	3	118.00	118.00	11.98	10.98	13.00	0.000	1.00	-2.02	-0.82
	4	118.75	120.40	11.97	11.09	13.11	0.016	0.88	-2.02	-0.79
	5	122.31	123.90	11.94	11.12	13.44	0.016	0.82	-2.32	-1.11
	6	128.65	130.80	12.16	11.33	13.86	0.021	0.83	-2.53	-1.54
1989	7	136.88	140.60	12.57	11.76	14.54	0.037	0.81	-2.78	-1.93
	8	143.25	143.30	13.18	12.37	15.23	0.000	0.81	-2.86	-1.96
	9	148.70	155.80	13.97	13.10	15.95	0.071	0.87	-2.85	-1.77
	10	151.25	160.30	14.92	13.87	16.55	0.090	1.05	-2.68	-1.26
	11	154.50	163.60	15.62	14.69	17.13	0.091	0.93	-2.44	-0.76
	12	154.50	162.20	15.91	14.93	16.91	0.077	0.98	-1.98	-0.52

Appendix Table 1 (Cont.). Selected prices relevant to computing basis in cheese and milk hedges.

Year	Month	NCE 40# Blocks (NCE)	Wis Assy Point 40# Blocks (WAP)	Wis Grade A Milk (WIS-A)[1]	M-W[1] (M-W)	Gross Cheese Value (GCV)[2]	WAP Minus NCE	WIS-A Minus M-W	M-W Minus GCV	M-W Minus 10 X NCE
		Cents per Lb.		Dollars per Cwt.			$/Lb.	Dollars per Cwt.		
	1	144.56	152.30	15.14	13.94	15.49	0.077	1.20	-1.55	-0.52
	2	126.31	131.60	13.67	12.22	13.54	0.053	1.45	-1.32	-0.41
	3	126.95	130.70	13.31	12.02	13.63	0.037	1.29	-1.61	-0.68
	4	137.00	140.50	13.40	12.32	14.67	0.035	1.08	-2.35	-1.38
	5	139.56	145.80	13.76	12.78	14.93	0.062	0.98	-2.15	-1.18
	6	143.80	149.50	14.16	13.28	15.32	0.057	0.88	-2.04	-1.10
1990	7	145.88	151.00	14.31	13.43	15.41	0.051	0.88	-1.98	-1.16
	8	143.85	150.30	14.05	13.09	15.24	0.064	0.96	-2.15	-1.29
	9	137.50	142.60	13.46	12.50	14.67	0.051	0.96	-2.17	-1.25
	10	114.88	114.90	11.88	10.48	12.46	0.000	1.40	-1.98	-1.01
	11	108.75	112.00	11.46	10.25	11.82	0.033	1.21	-1.57	-0.63
	12	108.81	112.70	10.92	10.19	11.85	0.039	0.73	-1.66	-0.69
	1	108.72	111.40	10.91	10.16	11.85	0.027	0.75	-1.69	-0.71
	2	108.75	111.50	10.87	10.04	11.82	0.028	0.83	-1.78	-0.84
	3	108.75	111.50	10.77	10.02	11.77	0.028	0.75	-1.75	-0.86
	4	108.75	111.80	10.77	10.04	11.78	0.030	0.73	-1.74	-0.84
	5	111.90	115.00	10.94	10.23	12.17	0.031	0.71	-1.94	-0.96
	6	117.88	121.40	11.25	10.58	12.85	0.035	0.67	-2.27	-1.21
1991	7	124.58	128.40	11.73	10.99	13.44	0.038	0.74	-2.45	-1.47
	8	131.03	136.10	12.34	11.50	14.02	0.051	0.84	-2.52	-1.60
	9	134.34	139.70	12.90	12.02	14.47	0.054	0.88	-2.45	-1.41
	10	135.06	140.20	13.53	12.50	14.99	0.051	1.03	-2.49	-1.01
	11	131.31	135.80	13.53	12.48	14.72	0.045	1.05	-2.24	-0.65
	12	126.67	130.20	13.42	12.10	14.23	0.035	1.32	-2.13	-0.57
	1	122.53	125.40	13.05	11.71	13.60	0.029	1.34	-1.89	-0.54
	2	116.99	119.00	12.52	11.21	12.92	0.020	1.31	-1.71	-0.49
	3	116.07	119.80	12.28	10.98	12.90	0.037	1.30	-1.92	-0.63
	4	131.90	131.90	12.65	11.46	14.57	-0.000	1.19	-3.11	-1.73
	5	133.98	139.90	13.17	12.06	14.96	0.059	1.11	-2.90	-1.34
	6	135.98	141.30	13.58	12.46	14.87	0.053	1.12	-2.41	-1.14
1992	7	137.06	141.80	13.66	12.59	14.89	0.047	1.07	-2.30	-1.12
	8	137.95	142.00	13.70	12.54	15.01	0.041	1.16	-2.47	-1.25
	9	134.28	136.90	13.54	12.28	14.68	0.026	1.26	-2.40	-1.15
	10	129.89	132.40	13.39	12.05	14.22	0.025	1.34	-2.17	-0.94
	11	126.10	129.40	13.12	11.84	13.64	0.033	1.28	-1.80	-0.77
	12	120.41	123.20	12.44	11.34	13.01	0.028	1.10	-1.67	-0.70
Mean		126.34	129.37	12.48	11.58	13.83	0.03	0.90	-2.25	-1.05
St. Dev		10.77	12.24	1.11	1.01	1.11	0.02	0.22	0.39	0.34
Minimum							-0.00	0.54	-3.19	-1.96
Maximum							0.09	1.45	-1.32	-0.41
Coef. of Var.							0.69	0.25	-0.17	-0.33
Maximum Deviation from Mean:				Positive			0.06	0.55	0.93	0.64
				Negative			-0.03	-0.36	-0.95	-0.90

[1] Milk values are adjusted to reflect 3.5 percent butterfat content

[2] Gross cheese value is cheese yield for milk of 3.5 percent butterfat and 3.15 percent protein (using Van Slyke formula) times NCE block price plus .27 pounds butter times Chicago Mercantile Exchange butter price plus 5.82 pounds dry whey times central states dry whey price.