HEDGING POTENTIAL IN CALIFORNIA CATTLE MARKETS

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Introduction

The potential of any futures market to serve as an effective hedge against price risk depends on the relationship between that market's futures price and the local cash price relevant to an individual hedger (Blank et al., p. 217). However, cash prices of commodities vary over time, space, and product form (Bressler and King), therefore each futures market's potential as an effective risk management tool will vary for hedgers pursuing different objectives and involved in different temporal, spatial and product markets.

The goal of this paper is to demonstrate the relationship between an individual hedger's objectives and the potential for successful hedging in various markets and to analyze these relationships for California cattle markets. The results derived from a simple model are used in an empirical analysis of the hedging potential in the case of California cattle markets. These results are intended to help readers understand the influence of price behavior over space, time and product form on the effectiveness of using a futures market as a hedging tool. The results also offer guidance to hedgers in the specific cattle markets evaluated.

The Objective of Hedging and Hedging Potential

For decades, it was assumed that the objective of hedging has to reduce price risk. However, if hedgers are viewed as investors, the motive for all market activities is to earn a return. Risk associated with an investment is considered by risk averse investors to be a by- product of market activity, not the object. The incentive for any action is the expected return, whereas risk is a disincentive. With this perspective it is unrealistic to assess business decisions using risk as the only criterion. This view of all investors being profit maximizers[1] does not preclude hedgers from acting like risk minimizers at some points in time. For example, if stable prices are expected, all hedgers behave as risk minimizers during that period even though they are still maximizing utility.

Since profit is defined as a function of cash and futures prices, factors which influence hedging objectives and hedging potential include a hedger's risk aversion, confidence in a forecast of expected prices, correlation between cash and futures prices, the nature of basis, and the ratio of basis variance to cash price variance. This analysis focuses on the correlation between cash and futures prices, the nature of basis and the Variance Ratio (see Blank and Thilmany). Together these three statistical measures illustrate how effective hedging is as a tool to accomplish either of a hedger's potential objectives.

Hedging Potential Across Time, Space, and Product Form

Differentiation of products can be based on elements of a product's form, geographical location, or the time it is available to the market (Bressler and

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[1] Profit maximizers are substituted for utility maximizers here, with the understanding that risk considerations enter into their business decisions.

King). The California cattle industry is especially interesting because cattle are less storable and more expensive to transport than most commodities. Commodities which are storable and relatively inexpensive to transport, such as corn, have a basis[2] which can be reliably estimated using the cost of storage and transportation. However, delivery on cattle futures contracts is not economically feasible for California producers and, consequently, basis will not necessarily converge to any specific value at a futures contract's maturity date.

Commodity prices are related across time by storage costs, but cattle is not truly "storable." Some production flexibility allows producers to market their cattle in more than one time period, so prices are expected to be somewhat related across seasons. However, the change in basis across seasons (i.e., April vs. October contract maturities) may differ.

There is potentially a separate spatial equilibrium between California markets (where intra-market transportation may be feasible) and more distant markets. As a separate spatial market, the California industry will share some widespread shocks with other, U.S. markets, but there are factors that affect California only. Although prices in a local area may be related to prices in regional markets, the price in a local market depends on local supply and demand and the costs of transportation into or out of the local market (Bressler and King).

A market may also be viewed as extending through alternative and successive forms of a product with a consistent structure of prices interrelated through processing costs

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[2] "Basis" is defined as the difference between futures and cash prices of a product.

(Bressler and King). For this reason, feeder and slaughter animal contracts will have related, but not perfectly correlated cash and futures prices. Also, there are likely to be unique market conditions for alternate product forms such as steers versus heifers.

Empirical Analysis

The theoretical analysis discussed in the previous sections and derived in Blank and Thilmany will be illustrated by presenting empirical estimates for three measures of hedging potential for the California cattle industry. There are basically three regions with significant cattle production in California: the Southern San Joaquin Valley, the Northern San Joaquin Valley, and the Sacramento Valley.[3] This study will use market prices from Visalia, Stockton, and Cottonwood as the available cash price for producers in each of these regions, respectively, although some inter-regional transportation may occur.

The product specifications of each contract and delivery point used are listed and defined in Table 1. Futures prices from the Chicago Mercantile Exchange (CME) and monthly average spot prices (USDA) from each of the regional markets between January, 1987 and August, 1991 are included in the sample. To illustrate temporal price differences, Table 1 includes the mean futures price and the mean basis for both the April and October contracts for all cattle products and locations. In general, these statistics show two primary results: the October futures price is, on average, consistently below the April futures price and, the October mean basis is consistently less than the April mean basis for these California markets.

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[3] These regions include the mountains on both sides of the valley. For example, the Sacramento Valley includes cattle sold in the Sierras to the east and the Coastal Range to the west.

TABLE 1-CONTRACT DEFINITIONS AND SUMMARY STATISTICS

| | April Contract | | October Contract | |
| | Seasonal Contract | | | |
Contract, Product and Delivery Location	Mean Futures Price	Mean Basis*	Mean Futures Price	Mean Basis*
Cottonwood Slaughter Bulls, Utility	$72.54	$13.16	$69.57	$10.19
Cottonwood Slaughter Cows, Utility	$72.54	$25.05	$69.57	$21.88
Cottonwood Feeder Steers #1, 600-700 lbs.	$79.65	-$3.92	$78.87	-$4.71
Cottonwood Feeder Heifers #1, 500-600 lbs.	$79.65	$1.92	$78.87	$1.14
Stockton Slaughter Steers, 1100-1300 lbs.	$72.54	$0.12	$69.57	-$2.85
Stockton Slaughter Heifers, 100-1200 lbs.	$72.54	$1.87	$69.57	-$1.10
Stockton Feeder Steers #1, 600-700 lbs.	$79.65	-$2.28	$78.87	-$3.06
Stockton Feeder Heifers #1, 500-600 lbs.	$79.65	-$1.47	$78.87	-$2.25
Visalia Slaughter Steers #2 & #3, 1100-1300 lbs.	$72.54	$0.03	$69.57	-$3.00
Visalia Slaughter Heifers #2 & #3, 1000-1200 lbs.	$72.54	$1.57	$69.57	-$1.40
Visalia Feeder Steers #1, 600-700 lbs.	$79.65	$0.27	$78.87	-$0.39
Visalia Feeder Heifers #1, 500-600 lbs.	$79.65	$0.62	$78.87	-$0.12

Sample: Monthly data from January 1987 to August 1991.
*Where basis is defined as the difference between the futures and cash price.

The nearby futures contract price series was used to estimate the long-run (five-year average) price correlations and Variance Ratios (VRs are defined as basis variance divided by cash price variance; see Blank and Thilmany). The price correlations were less than one in the majority of the cases. The estimated Variance Ratios were greater than one in 42 of the 96 cases, (and significantly greater in six cases).

The systematic nature of basis can be measured several ways, based on various theories of basis. The primary criteria of this study was to estimate whether basis has systematic or seasonal patterns that producers can predict. In this analysis, an equation to estimate basis was developed for each location that included lagged values of basis and a time trend, as well as other information available to producers (see Blank and Thilmany).

Statistical estimation of the cattle price data was performed and four tests were used to measure whether a contract exhibited systematic basis. Using the statistical results (see Blank and Thilmany), the hedging potential for various combinations of market attributes was broadly categorized. Exhibit 1 summarizes the likely hedging objective and potential for the twenty-four combinations of product form, hedging season and cash market location.

Applications of Results

The empirical results of this study have useful applications for the California cattle market. There are many similarities in potential hedging objectives across location, time and product form, as demonstrated by the large number of cases where the best potential objective for hedging is utility maximization (see Exhibit 1). Yet, it is interesting to note that there are distinct differences in the potential for various hedging strategies throughout the three

Exhibit 1 - Potential Hedging Objectives Among Space, Time and Product Form Combinations		
Contract Combination	**Potential Objective**	**Supporting Evidence**
Cottonwood Slaughter Bulls,		
April Contract	Utility Maximization	High VR, systematic basis
October Contract	Limited potential for utility max	High VR, High correlation, systematic basis
Cottonwood Slaughter Cows,		
April Contract	Utility maximization	High VR, systematic basis
October Contract	Utility maximization	High VR, systematic basis
Cottonwood Feeder Steers,		
April Contract	Risk minimization	Low VR, High correlation, non-systematic basis
October Contract	Utility maximization	High VR, systematic basis
Cottonwood Feeder Heifers,		
April Contract	Both objectives possible, but risk minimization may dominate	Low VR, High correlation, systematic basis
October Contract	Utility maximization	High VR, Low correlation, systematic basis
Stockton Slaughter Steers,		
April Contract	Utility maximization, but only limited potential	High VR, Low correlation, non-systematic basis
October Contract	Utility maximization	High VR, Low correlation, systematic basis
Stockton Slaughter Heifers,		
April Contract	Limited potential for hedging	High VR, non-systematic basis
October Contract	Utility maximization	High VR, Low correlation, systematic basis
Stockton Feeder Steers,		
April Contract	Utility maximization	High VR, systematic basis
October Contract	Utility maximization	High VR, Low correlation, systematic basis
Stockton Feeder Heifers,		
April Contract	Utility maximization, but only limited potential	High VR, High correlation, systematic basis
October Contract	Utility maximization	High VR, Low correlation systematic basis
Visalia Slaughter Steers,		
April Contract	Limited potential for hedging	High VR, non-systematic basis
October Contract	Utility maximization	High VR, Low correlation systematic basis
Visalia Slaughter Heifers,		
April Contract	Utility maximization, but only limited potential	High VR, Low correlation non-systematic basis
October Contract	Utility maximization	High VR, Low correlation systematic basis
Visalia Feeder Steers,		
April Contract	Utility maximization	High VR, Low correlation systematic basis
October Contract	Limited potential for hedging	High VR, High correlation
Visalia Feeder Heifers,		
April Contract	Risk minimization, but only limited potential	Low VR, High correlation non-systematic basis
October Contract	Both objectives are possible	Low VR, systematic basis

regional markets included in this study, as well as among product forms and seasons.

Cottonwood

The Cottonwood region illustrates how independent a local market's prices can be from futures prices determined at a distant, centralized market. This independence is realistic since Cottonwood is the most remote of the three California delivery points and because this local market deviates from the futures contract with respect to product form. In the case of slaughter cattle, Cottonwood trades utility beef from slaughter cows and bulls instead of higher grade beef from steers and heifers. This deviation also may

account for the weak relationship between local cash and futures prices.

Among the different product forms (feeder vs. slaughter) and delivery dates (October vs. April) there are few differences in the potential for different hedging objectives by players in the cattle futures market. With the exception of the April contract for Feeder Steers and Feeder Heifers, potential hedging objectives focus on utility maximization. As evident by the high variance ratio and systematic nature of the basis in the majority of contracts, seasonal basis patterns dominate the relationship between cash and futures prices. In this case, hedging would not guarantee a fixed price at the local market, so utility maximization, rather than risk minimization, is the only potential objective.

It is interesting that the two exceptions to the norm in the Cottonwood market occur in the April feeder markets. The market conditions surrounding these two contracts allow for hedgers to effectively minimize their risk. Theoretically, the potential to minimize risk using the April contract for both feeder markets is primarily based on the low variance ratio, which shows that the hedger's basis is less volatile than the cash market.

In terms of product form, it is possible to retain feeder cattle until they reach slaughter weight, unlike slaughter cattle that will only slightly increase (or possibly decrease) in value if left in the feedlot. The option to process feeder cattle into a different product form (slaughter cattle) makes another cash market available in the future, if local cash prices are not favorable. This is especially true in the case of April contracts as many cattle producers only have resources to feed out during the summer season when grazing land is available.

Cottonwood offers good potential for hedgers in general. The opportunities for utility maximizing hedgers are strong in all but three cases evaluated here. Two of the exceptions are the April Feeder Heifer and Steer contracts which demonstrate good potential for risk averse hedgers. The other anomaly, the October Slaughter Bull contract, is the only case with limited potential for any hedging objective.

Stockton

Stockton is similar to Cottonwood in that the prevailing potential objective for hedgers is utility maximization. However, the Stockton market offers no potential for the producers who use hedging as a risk minimization tool, and offers only limited potential for utility maximization in several specific contracts. The majority of the contracts demonstrate low correlation, as well as high variance ratios between cash and futures prices. These market conditions make it possible for hedgers to maximize profit, but not to effectively minimize risk, meaning that relatively sophisticated hedging strategies are needed.

Further, the April Slaughter cattle contracts and April Feeder Heifer contracts display limited potential for either hedging objective. The most clear case is the April Slaughter Heifer contract where the market conditions make it difficult for a hedger to benefit from using the futures market. The April Feeder Heifer and April Slaughter Steer contracts have limited potential for utility maximization by hedgers for two separate reasons. April Feeder Heifer cash and futures prices have a strong and predictable relationship. However, the basis is more variable than the relatively stable cash price which indicates little potential for profiting from hedging and the chance of increasing the hedger's risk. The April Slaughter Steer futures and cash prices have a weak and unpredictable relationship which allow for little profit maximizing or risk minimizing potential.

Stockton offers good opportunities for utility maximization in some cases, but there are several markets where limited potential for either objective exist. In sum, hedging in these markets may not be advisable except for the most experienced of traders. Price risk may be better managed using forward contracts, if available.

Visalia

The Visalia markets have the most diversity with respect to the availability and type of objective available to hedgers. There appears to be some similarities among seasonal contracts and product forms. The April Slaughter contracts have potential for profit maximization, whereas April Feeder contracts have potential for risk minimization. The October Slaughter contracts present opportunities for profit maximization, whereas October Feeder Heifers may be effective for both objectives and Feeder Steers have limited opportunities for either objective.

Similar to the Cottonwood market, the April Feeder contracts both offer an effective means for hedgers to minimize risk. The strong, yet unpredictable, relationship between cash and futures prices, as well as the relatively low variability of basis, makes risk minimization possible. The market conditions which may affect the relationship between cash and futures prices are explained above in the Cottonwood section.

Similar to the Stockton case, the Visalia October Slaughter contracts offer hedgers the ability to maximize profits. On the other hand, the April Slaughter contracts and the October Feeder Steer contracts have only limited potential for either objective because of weak, unpredictable relationships between futures and cash prices. The most general case is the October Feeder Heifer contract where both hedging objectives may be viable because local

cash price changes are seasonally correlated with changes in the futures market.

In general, Visalia has a diverse set of opportunities for hedgers. Similar to Cottonwood, April Feeder contracts offer risk minimizing hedgers good potential and October Slaughter contracts present hedging possibilities to utility maximizing hedgers. The October Feeder Heifer is unique in that it is the only case which offers good potential to both risk minimizing and utility maximizing hedgers. The remaining cases are not reliable markets for hedgers to participate in as they offer little potential for either objective.

There are also some similarities across hedging seasons. Hedging in October is best for traders pursuing the broader objective, utility maximization, because the chance of hedging failures is lower.

Across locations, Cottonwood has the best potential for successful hedging, while Stockton offers little potential for risk minimization, and Visalia has volatile potential. The totals for the four product forms clearly indicate that feeder markets offer more hedging potential than do markets for slaughter animals. Risk minimization may be pursued successfully in either feeder animal market while California slaughter animal markets offer no apparent potential for risk minimization and significant chances of hedging failure.

Conclusions

The California cattle industry provides a unique opportunity to examine the potential for hedging by producers for whom delivery to the futures market is not practical. Although there is evidence of correlation between futures and local cash market prices, this relationship varies across time, space, and product form. The variable nature of the futures-cash price movements reduces the

potential for successful hedging for California cattle producers pursuing price risk minimization. While potential for utility maximization (which requires sophisticated hedging strategies) is widely offered by the markets analyzed, the more restrictive objective of risk minimization can be pursued successfully much less often.

These results may provide insight to the issue of why producers have been reluctant to use the futures market for hedging. If risk minimization is the objective of hedgers who are aware that achieving it is questionable in these markets, then it is reasonable for them to avoid hedging. Ultimately, the results of this study imply that increased hedging activity will occur more rapidly if producers are educated as to how a broader definition of hedging, that involved in utility maximization, can be incorporated into their business decision making.

References

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