

**Measuring Price Risk in Cattle and Beef Markets:  
Implications for the Design of Viable Futures Contracts**

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## **Measuring Price Risk in Cattle and Beef Markets: Implications for the Design of Viable Futures Contracts**

Recent debate within the cattle industry has surfaced concerning the viability of the futures market as a risk management tool. The Futures Working Group, formed within the NCBA, is working with the CME to address issues pertaining to the derivatives available for risk management. The group agreed a new contract may be required to improve risk management. There are many products traded in the beef market available for supporting a futures contract. Those products containing the largest levels of risk require methods capable of shifting and managing that risk. The current futures market configuration provides two important questions. Are the live cattle and feeder cattle contracts capturing the most important sources of risk? Are stocker, trim and lean beef contracts the best choice of contract or would a boxed beef contract be appropriate? These questions can be answered with a measure of risk. Each segment of the cattle industry contains an unknown level of risk in the market. To improve risk management tools, the underlying risk must be identified.

The objective of this study is to measure the level of price risk present in each segment of the cattle market from the perspective of designing viable futures contracts. Knowing the level of risk present in the underlying cash market is necessary when developing a viable futures contract. Contracts should be designed to match the physical commodity containing the greatest degree of risk. Measuring risk in the cattle market also provides insight into the effectiveness of current contracts as risk-transferring instruments.

The cattle market is represented by four boxed beef products, choice and select live cattle, steers from 400 pounds to 800 pounds and corn. The boxed beef complex will also be evaluated separately by including the seven primal values and trim. Prices are weekly averages for each category through the years of 1990 to 2000.

To measure risk in the cattle market, two methods will be used. Vector error correction is used to confine the long-run behavior of prices to converge to their long run cointegrating relationship while

allowing for short run variation. The speed at which the products adjust to the cointegrating relationship will reveal the products responsible for the largest level of risk. Risk can be measured through the dynamic impact of random disturbances on the system.

Principal component analysis on the residuals obtained from the VEC assumes market participants understand systematic variation in prices. Risk is the difference between the actual price and the expected price expressed by the residuals and the variance of those residuals. Principal components in levels and in differences assume any unique source of price variation is risk. Tomek and Peterson (1998) possess a similar view by expressing, “much of price variability can be classified as risk.” The number of substantial components provides the number of unique sources of variation. High correlation between products and components specify those products containing a large level of risk. Thus, the level of risk is measured by the source of variation and the product’s correlation with that variation.

Incorporating cointegration and principal components appears to be unique in measuring risk. Including vector autoregression allows for consideration of the long run price relationships between different segments of the cattle market. Principal components will be used similar to Tolmasky and Hindanov (2002) in capturing the variance in the cattle market with a minimum number of components. This analysis goes beyond price volatility in risk evaluation by examining the difference between actual prices and expected prices through the residual. Diersen and Garcia (1998) discuss the importance of measuring the deviation from expectations when measuring risk. This analysis will use econometric methods to measure risk in levels for evaluating the effectiveness of contemporary contracts and the introduction of new viable contracts. The success of the live cattle contract in accounting for risk will be evaluated. The recent discussion of adding a boxed beef contract will be further addressed relative to the methods employed in this analysis.

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