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A Comparison of the Effectiveness of Using Futures, Options, or LRP Insurance to Manage Risk for Cow-calf Producers

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Introduction

Historically most cow-calf producers have not used the CME Feeder Cattle futures or options to hedge the sale price of their calves. University Extension specialists have conducted numerous workshops over many years to educate producers on the use of futures and options and yet only a small percentage of producers use these risk management tools. Feuz and Umberger (2001) found that in a survey of Nebraska cow-calf producers only 20 percent had used futures or options on futures to hedge their calves.

One reason often put forth for the lack of use of futures and options by cow-calf producers is the fixed contract size (50,000 lbs) does not work well for smaller producers. In 2002 the USDA-Risk Management Agency (USDA-RMA) introduced Livestock Risk Protection (LRP) insurance for feeder cattle. This insurance product is very similar to purchasing a Put Option. However, producers can insure as few as one head if they desire and up to 2,000 head; thus overcoming the size of contract issue with the CME feeder cattle contract.

In the last few years there has been an increase in market price volatility in the cow-calf industry. One would think that cow-calf producers would be looking for some form of risk protection. The objective of this research is to compare the expected net returns and the variability of those returns for cow-calf producers using cash, futures, options, and LRP insurance as pricing strategies when: 1) only market price level risk is considered, 2) market price level and local price (basis risk) are considered, and 3) market price level, basis risk and production risk are considered.

Methods and Data

A simulation analysis was conducted to compare the expected gross returns from using each pricing strategy. The simulation analysis was conducted using the SIMETAR add-in to Excel (Richardson, Schumann and Feldman, 2006). There were three types of risk identified and modeled in the simulation: market price level risk, local price or basis risk, and production risk. With a cash only strategy no measures were taken to manage any of these risks. The use of futures, options, and LRP insurance all addressed market price level risk, but did nothing to protect against basis risk or production risk.

A fairly simple cow-calf budget was constructed within Excel. The following variables were stochastic (allowed to vary in the simulation to depict risk): weaning rate (85-93%), steer calf weight (510-575 with heifer weight 40 pounds less) and the steer market price (heifer calf price is a fixed $8 per cwt less than the steer price). Market price was composed of two separate stochastic variables: the market price level which was the present futures price with a standard deviation of $9.83 and the local price or basis which was set at $7.51 above the futures price and had a standard deviation of $4.01. The expected mean basis for the stochastic simulation was adjusted based on the stochastically generated weight of the calf; a heavier calf had a lower expected basis and a lighter calf had a higher expected basis. More details about the simulation procedures can be found in Feuz, 2009.

When should cow-calf producers look to hedge their calves or buy LRP insurance? When the calf is born? When the previous calf is sold? When the cow is bred? Those hedges could range from approximately 7 to 16 months in duration. The feeder cattle contracts are only listed for 12 months in advance of expiration. However, while the futures contracts are listed that far in advance, often there are no options traded more than 6 months in advance of expiration. Likewise, a producer can theoretically purchase LRP insurance 52 weeks in advance of the expected sale date. However, when no options are traded that far in advance, you also cannot purchase the insurance. The reality in the market place is the options and LRP insurance is often only available for about 6 months, 26 weeks prior to the expected sale date. Many cow-calf producers who forward contract their calves either direct with a buyer or through a satellite video auction do not do so prior to July. For this simulation a 17 week forward pricing scenario was used essentially taking an action in early summer for an expected fall calf sale.

Four separate simulations of 500 iterations each were conducted: the first simulation involved only market level risk and the weight of calves to sell was expected to equal 50,000 pounds, one CME feeder cattle contract; the second simulation was the same as the first with the exception that the number of cows were reduced to show differences in the pricing alternatives when there is not sufficient weight to fulfill a feeder cattle contract; the third simulation analysis involved market level risk and basis risk for the expected 50,000 pounds of calves to sell; and the fourth simulation included market level, basis risk and production risk.

Results

The initial simulation was run with only market price level risk as a stochastic variable. Figure 1 contains cumulative distribution functions (CDFs) of the four pricing alternatives. A few important observations can be made from this set of CDFs. The futures hedge eliminates most of the market price level risk faced by cow-calf producers. The model sells 15% of the cows each year as culls, and no price protection is taken on them. That is the source of variability. Since the futures were assumed to be efficient, there is an equal probability that cash prices will be higher or lower than the hedged price. Both the put option and LRP insurance protect against downside price risk and yet allow producers to take advantage of higher market prices. There is also little difference between the put option and LRP insurance. A futures hedge, a put option, and LRP insurance all behave as theory would suggest and as is taught to producers by Extension specialists.

The second simulation (Figure 2) involved looking at the pricing alternative when there was not sufficient number of calves being marketed to fill a feeder cattle contract. In the first scenario, the number of cows to calve was set so that the expected pounds of calves to sell would equal 50,000. For this second scenario, cow numbers were reduced so that the expected pounds of calves to sell would be 25,000. With this scenario, the futures hedge becomes more risky as producers are over hedged. Effectively they are speculating on half of a contract. The LRP insurance is superior to the put option if the market is above the expected price, but the put is superior if the market declines. The reason for this is that when prices rise, there is no insurance indemnity paid nor option premium to sell in the market place. However, with the put, producers had to pay for insurance on 50,000 pounds, whereas with the LRP insurance, producers only paid for 25,000 pounds. When prices decline, the put is superior because producers receive the put premium on 50,000 lbs but the LRP insurance only pays out on the insured 25,000 lbs.

The third simulation scenario involved the addition of basis risk with market level risk. This is the price risk that cattle producers face. Figure 3 contains the CDFs for this simulation. The futures hedge pricing alternative still reduces price risk the most. However, variability or risk as measured by the standard deviation of per cow returns as more than doubled for the hedge pricing scenario when both basis and market level risk is considered, as compared to the first scenario when only market level risk was considered. The put option and LRP insurance alternative are still very close in their distribution of returns.

The last simulated scenario involves market level, basis and production risk. The CDFs for this simulation are displayed in Figure 4. The distributions appear similar to those from the previous scenario with the addition of slightly more variability. The means and variances for each simulated distribution for this final scenario were tested for significant differences. The futures hedge pricing alternative results in a statistically smaller variance than all other alternatives. Using either put options or LRP insurance statistically reduces variance from the cash alternative and option and LRP variance are statistically equivalent.

Implications

There are several implications from this research. The first implication is that producers can reduce the variability of returns by using futures, put options or LRP insurance. However, with a futures hedge, which eliminates the most variability, that reduction not only

eliminates significant downside risk but also caps upside potential. This remains a stumbling block for many producers. Another implication from this research is that it appears that LRP insurance is a good substitute for buying a put option for those producers who would prefer to deal with an insurance salesman rather than a commodity broker. The LRP insurance premiums are priced similar to the put option premiums and the resulting distributions of returns are statistically equivalent. For those smaller producers, who have not been able to utilize the option market because they could not fill a feeder cattle contract, it appears the LRP insurance is a viable alternative.

References

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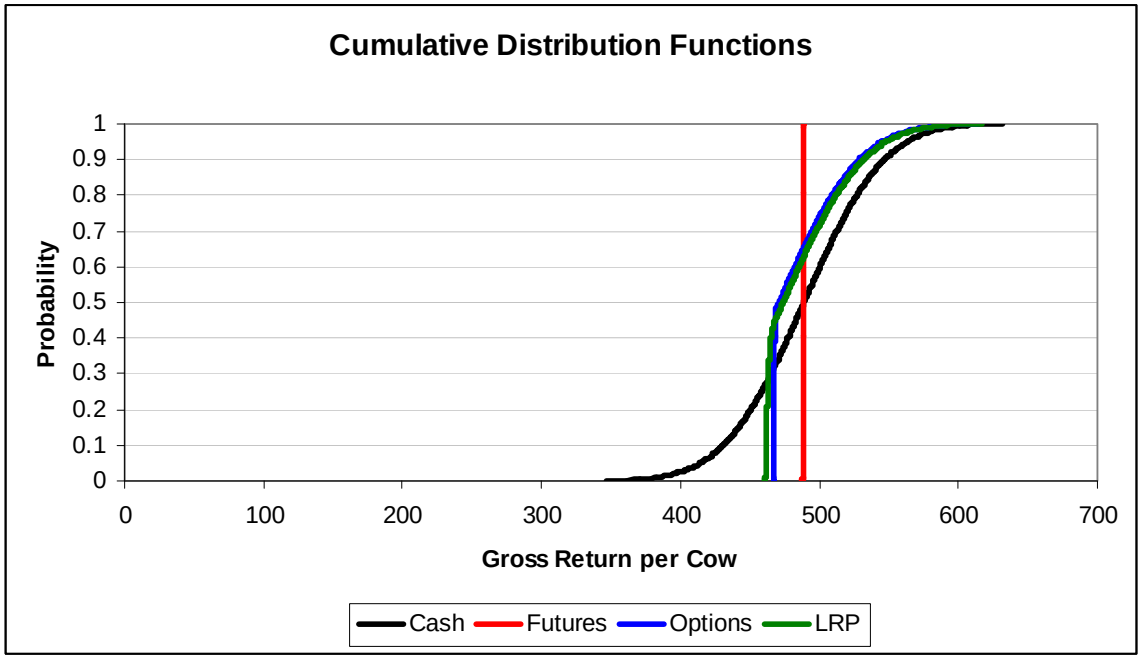

Figure 1. CDFs for the pricing alternatives when only market level risk is considered.

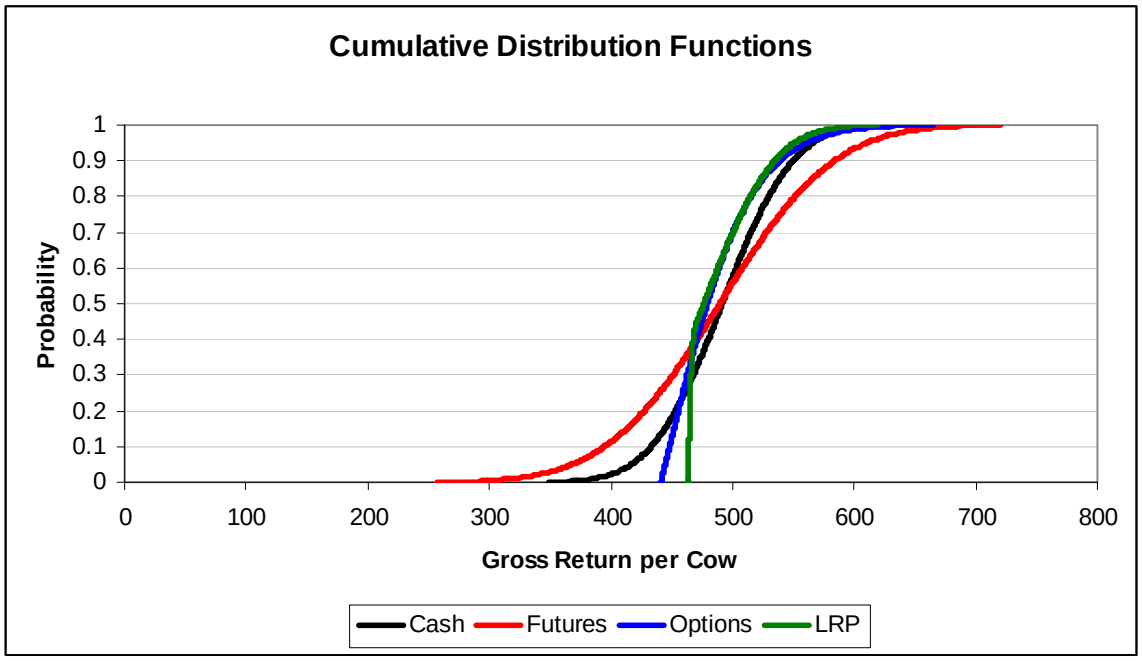

Figure 2. CDFs when only market level risk is consider but when there is less than a full contract of weight to sell.

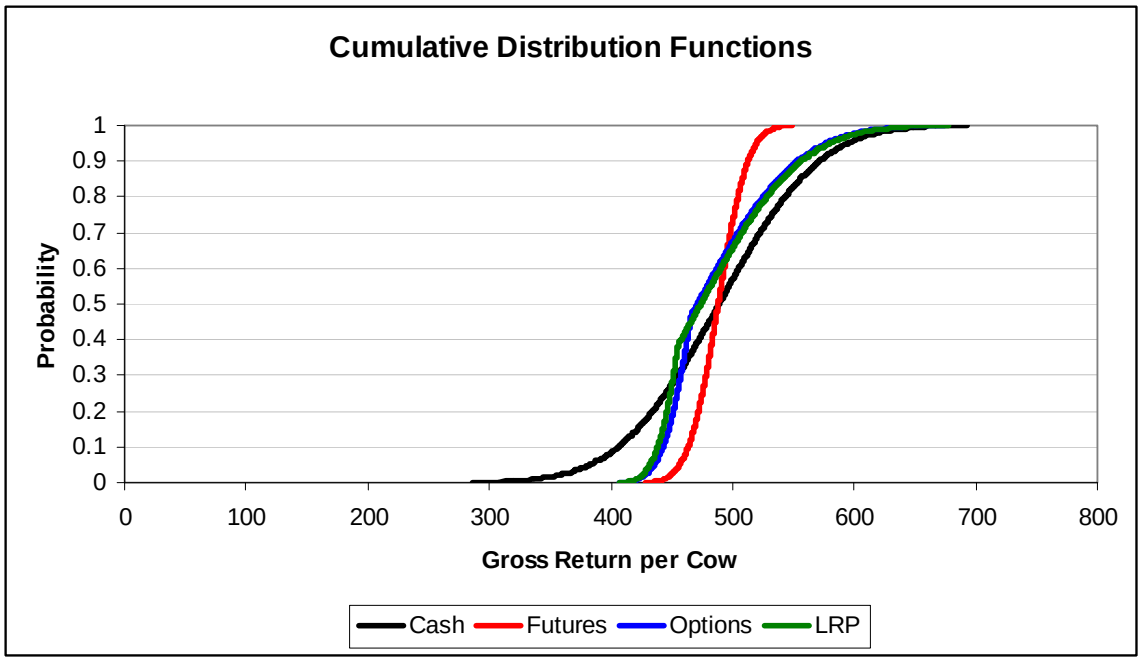

Figure 3. CDFs for the pricing alternatives when market level and basis risk are considered.

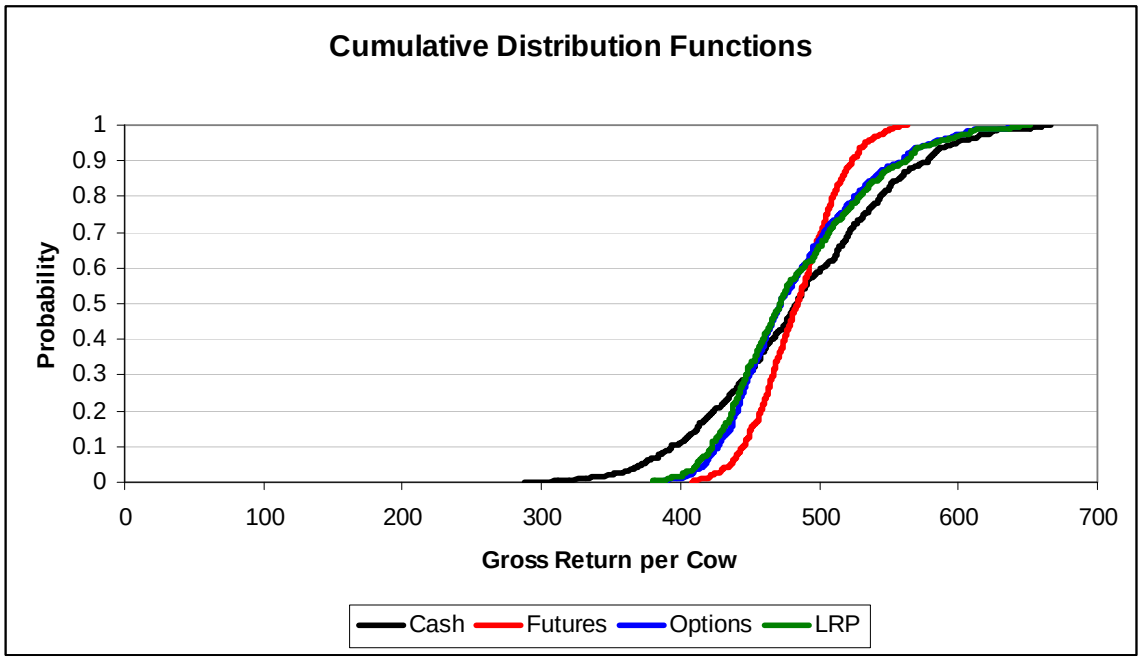

Figure 4. CDFs for the pricing alternatives when market level, basis, and production risk are considered