CHAPTER 4: EMPIRICAL ANALYSIS OF ALLIANCE DESIGN

4.1 Introduction

Due to the relatively recent emergence of beef alliances, in addition to the proprietary nature of their operations, there is little information available to alliance managers and members to help guide alliance design decisions. This chapter provides alliances with information on participant compensation and risk sharing arrangements that may be utilized in an alliance. There is no pre-determined formula for how an alliance should be organized given a specific set of circumstances. However, since most alliance procedures and policies are a result of bargaining by participants, the alliance has a greater chance at success when its members understand the most likely effects of design choices.

The overall objective of this chapter is to begin providing analytical content to the decisions made by beef alliances when designing their individually unique structures. From Stage 2 of the alliance model, these design choices include ownership of the alliance, participant compensation, and risk sharing agreements. The analysis presented in this chapter focuses on the last two design choices, compensation and risk sharing.

This chapter is thus targeted towards understanding three primary issues alliances face:

1) The effects of margin sharing between cattle owners and packers in an alliance;
2) The potential that premiums from branded beef product lines have for increasing alliance participant returns; and
3) The possibility of exchanging premium rights for margin sharing agreements, and the relative value of each compensation type to cattle owners and packers.

4.2 Margin Sharing and Premium Allocation

Alliance Margins

In this analysis the alliance being reflected is composed of cattle owners, feeders, a packer, and an alliance manager. Both the alliance manager and cattle feeders are paid a constant fee for their services. Cattle owners, having retained ownership of cattle through slaughter, earn a market determined margin equivalent to the average cattle feeder margin

outside the alliance. Cattle packers earn a market based margin equivalent to average margins being earned by packers outside the alliance.

These margins are determined by identifying "baseline" cattle value before slaughter and after slaughter. This baseline can be defined differently according to alliance objectives. An alliance targeting lower quality retail markets may identify baseline cattle as Select yield grade 2, while another alliance targeting higher quality outlets may identify baseline as Choice yield grade 3 cattle. After defining the "baseline", the cattle owner earns a feeding margin equal to baseline cattle value before slaughter minus feeding and production costs. Cattle packers earn a margin equal to wholesale baseline cattle value minus baseline cattle value before slaughter.

While the "baseline" cattle value is defined differently according to an alliance's objectives, clear motivations exist for cattle owners before the decision is made. Cattle owners receive the entire baseline value for each steer marketed, but usually only a percentage of any premiums generated. Therefore, owners will seek to join alliances with the highest defined baseline cattle level that their cattle can qualify for without incurring discounts. It is not in the best interest of owners to receive a lower baseline value and share premiums generated by high quality cattle with other alliance members when those premiums are generated primarily as a result of the owner's investment in higher quality cattle.

Regardless of how "baseline" cattle are defined, market based margins impose a variance in each participant's returns. Cattle owners or packers concerned with lowering alliance participation risk are inclined to include margin sharing as a design characteristic of the alliance. Margin sharing between cattle owners and packers has become a relatively common method for compensating alliance members. Many margin sharing proponents see it as a solution for risk reduction, while others have sought to share margins in lieu of rights to premiums generated by high quality cattle. No empirical research exists for alliance members to use as guidance when bargaining for these alliance design choices. The following simulation analyzes which participant, cattle owners or packers, may be more inclined to press for margin sharing agreements.

Premiums

Many alliances are organized to capture premiums from the sale of higher quality beef products. The success of each alliance in generating premiums varies according to numerous

factors such as target markets, level of coordination by participants, and management. Regardless of premiums earned, however, each alliance must deal with the fundamental issue of dividing them among alliance members.

For most alliances, the share of premiums garnered by each participant results from negotiation and bargaining. Cattle packers, for instance, may feel entitled to the majority of premiums earned to recoup their investments in brand development and marketing. Cattle owners may argue for a large percentage of premiums, reflecting their investment in management technology and genetics that ultimately produce higher quality cattle.

Premiums are calculated differently in each alliance according to organizational guidelines and accounting procedures. In this analysis, the premium (or discount) to be shared among alliance participants is calculated as the difference between baseline carcass value and the eventual merchandised value of cuts from the carcass. If an alliance designated baseline cattle to be Choice YG3, then any carcass grading higher than Choice YG3 and sold for a higher than baseline price would generate a premium equal to the difference. For example, if Choice YG3 carcasses were valued at $115.00/cwt. and a Choice YG2 carcass was merchandised for $117.00/cwt., a $2.00/cwt. (carcass weight) premium, coming largely from the added meat yield, would be generated and split between alliance members. If cattle do not meet the baseline quality level, discounts are assessed and they can be large.

Alliance participants all have an interest in knowing the size of the premium pool when bargaining for premium allocations. Participants may be less demanding for premium shares when the premium is small versus when it is large. Due to the proprietary nature of alliance organizations, detailed information on the amount of premiums available in any alliance are not published in detail.

Premiums to bargain for may also alter the position alliance participants take regarding compensation. Rather than centering only on margin sharing, the existence of premiums allows for greater flexibility in deciding how each alliance participant is compensated. Under some circumstances, alliance participants may be willing to forego margin sharing in favor of a higher level of premium rights. Producers with exceptional genetics that produce premium cattle might be interested primarily in the premiums. Conversely, margin sharing may at times be more beneficial than rights to any premiums generated. Empirical evidence on the relative worth of each compensation method allows alliance participants to engage in negotiations with more

complete information, decreasing the likelihood of destructive opportunistic behavior by other participants.

Regardless of how they are distributed, premiums are the primary way in which the number of dollars to be allocated can be increased. Differing ways of sharing packer and feeding margins allocate the same pool of dollars. Planning for and producing high quality cattle can expand the total dollars involved by earning market premiums, and this is and will be a primary motivation for alliances.

4.3 Data

Cattle Owner and Packer Margins

Historical weekly margin data were obtained for both cattle owners and packers. It is important to remember that cattle owners in the alliance are allocated a market determined margin equivalent to the average cattle feeder margin outside the alliance. Therefore, cattle feeding margin data were obtained to approximate cattle owner returns in the alliance. Weekly cattle feeder margin data were interpolated from monthly margin estimates in the Kansas State University Cattle Feeder Return Series from January 5, 1990 to June 30, 2000; a total of 548 weekly observations.

KSU's monthly margin estimates were converted to weekly margin estimates by making two modifications. First, the monthly average marketing weight of fed cattle, and second the monthly breakeven costs per cwt., were both assumed constant for each week of the month. Weekly breakeven costs were then subtracted from Western Kansas fed steer prices reported by the Livestock Marketing Information Center[1] to calculate a weekly per head cattle owner margin. Estimated owner margins for each week are listed in Table A1 of the Appendix.

Weekly packer margins were obtained from Andrew Gottschalk[2], industry analyst. Per head packer margins are comprised of all carcass values including all hide and byproduct credits and represent an industry-wide average profit margin. As an industry average, individual packers may generate higher (or lower) margins at certain times. Packer margin estimates were

[1] LMIC information is at: http://www.lmic1.co.nrcs.usda.gov.
[2] Andrew Gottschalk can be reached at 1-888-220-3344, or http://www.hedgersedge.com

received for the same time period, January 5, 1990 to June 30, 2000; a total of 548 observations. Estimated packer margins are also listed according to week in Table A1 of the Appendix.

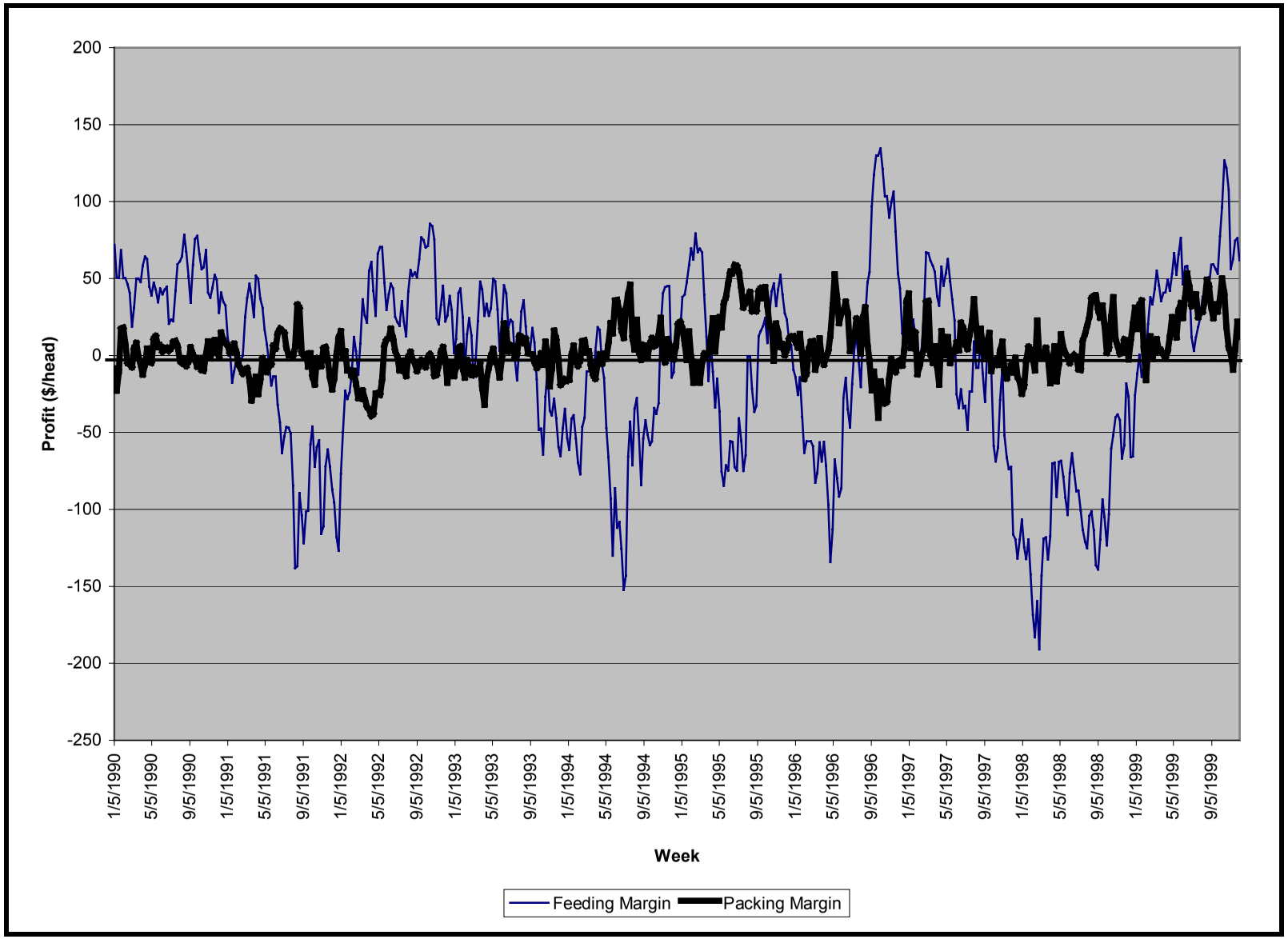
Because margin data from alliance owners and packers were not available due to proprietary reasons, the margins obtained from KSU and Gottschalk were assumed to be representative of weekly cattle owner and packer margins earned in the simulated alliance. These two series reflect essentially the same Western Kansas base price out of the feedyard and into the packing plant. The historical weekly margins are used as an approximation of the margins earned by marketing "baseline" cattle through the alliance organization. Table 4.1 provides the descriptive statistics for each margin series.

Table 4.1: Descriptive statistics of weekly feeding and packing margins ($/head) from January 5, 1990 to June 30, 2000

	High	Low	Mean	Std. Deviation	Correlation Coefficient
Feeding Margins	134.44	-190.91	-4.37	61.02	
					-0.1185
Packing Margins	58.75	-40.46	6.38	18.12	

Figure 4.1 presents both feeding and packing weekly per-head margins from 1990 to 2000. The statistics in Table 4.1 are clearly represented in the graphic presentation. The feeding margins are clearly more variable than the packing margins, and the periods of sustained losses are longer in the feeding margins.

Figure 4.1: Weekly feeding and packing margins (1990-2000)



Premiums

Prices and premiums earned for a sample of 2683 cattle marketed through a large U.S. beef alliance were collected. The sample cattle were delivered from a variety of producers and approximate the average number of cattle slaughtered per week by the alliance. The sample provides baseline carcass values and premiums for only one time period, rather than a stochastic series as is the case with the feeding and packing margins.

The sample data showed 28% (745 head) of cattle received by the packer were of baseline quality, Choice YG3, with a carcass value/cwt. of $112.99. Another 21% (558 head) of cattle qualified for a branded product line above the Choice YG3 quality level. These "premium" cattle were sorted into 13 different higher value lines where they earned a higher value/cwt. than the baseline cattle, thus generating a "premium" to be allocated between alliance members.

The premiums earned by the 558 cattle in each of the 13 product lines are shown in Table 4.2, ranging from $0.12/cwt. to $7.47/cwt. on a carcass weight basis. These premiums are the difference between the merchandised beef price and the baseline Choice YG3 price of $112.99/cwt. "Brand" 1, 2, and 3 are brand specific product lines, labeled to protect the proprietary nature of the data.

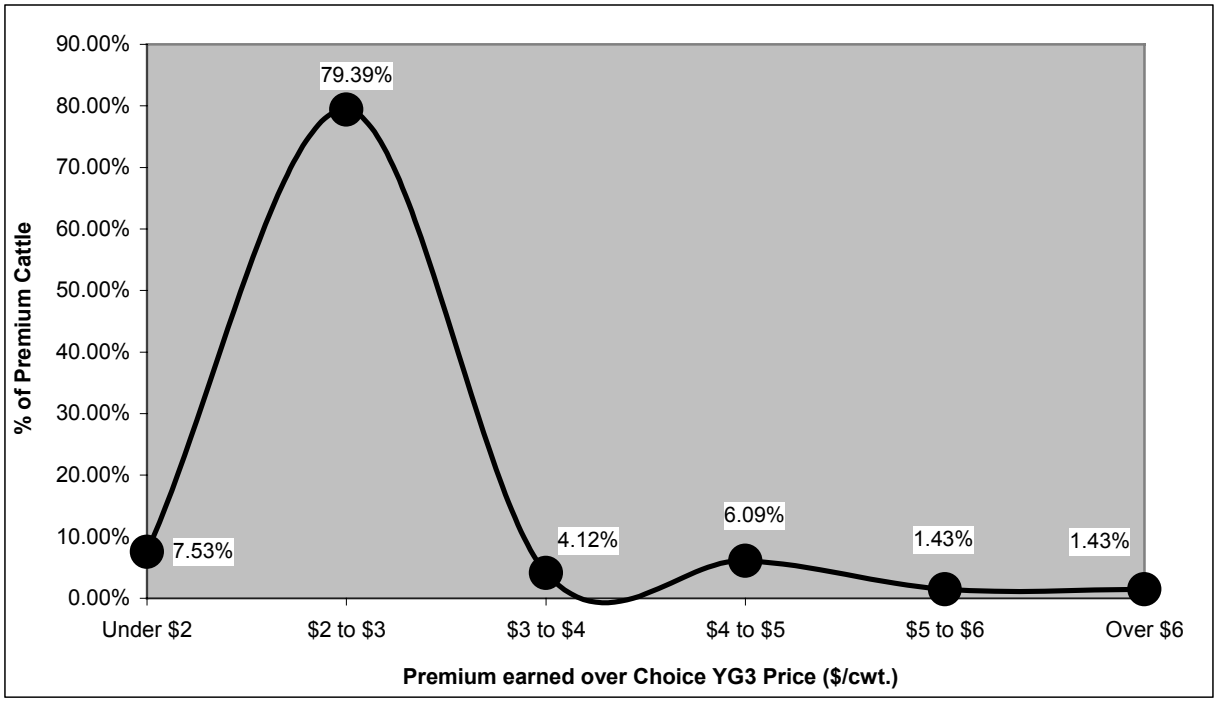
Table 4.2 can be interpreted as follows. The sample of cattle revealed a 21% chance for a steer to qualify for a branded product line above the baseline Choice YG3 level. Of those cattle that qualified for a premium line, 51.96% were merchandised as Choice YG2 product, earning a premium of $2.25/cwt. on a carcass basis due to the added meat yield. Similarly, 10.39% of premium cattle were merchandised as Choice YG1 products, earning a premium of $2.61/cwt. on a carcass basis.

Figure 4.2 shows the frequency of sample premium values earned by qualifying cattle. The sample of alliance cattle had the highest probability of receiving $2 to $3/cwt. premiums if they qualified for a premium product line. It should be made clear that premiums will only be earned when merchandised prices exceed baseline cattle prices. Therefore, there will be times when cattle exceed Choice YG3 quality, but do not earn a premium because of market conditions and the inability of the packer to garner a premium.

Table 4.2: Sample of premiums earned by alliance cattle in 13 premium product lines

Premium = Merchandised Price – Choice YG3 Price				
Premium Line #	**Premium Line Name**	**Head Count**	**% of Total**	**Premium ($/cwt.)**
1	Choice YG2	290	51.96	2.25
2	Choice YG1	58	10.39	2.61
3	*Brand1* YG3	42	7.53	0.12
4	*Brand1* YG2	28	5.02	2.33
5	*Brand1* YG1	2	0.36	2.70
6	*Brand2* YG3	34	6.09	4.02
7	*Brand2* YG2	6	1.08	5.32
8	*Brand2* YG1	2	0.36	6.17
9	*Brand3* YG3	65	11.65	2.94
10	*Brand3* YG2	23	4.12	3.87
11	*Brand3* YG1	2	0.36	5.71
12	Prime YG3	3	0.54	6.44
13	Prime YG2	3	0.54	7.47

Figure 4.2: Frequency of premiums earned over baseline price by qualifying cattle ($/cwt.)



4.4 Analysis

Simulations were performed using the *@Risk* software package to analyze outcomes for alliance cattle owners and packers under alternative margin sharing and premium allocation designs. The analysis is divided into two sections:

- Simulations of cattle owner and packer margins under three margin sharing types:
  1) Cattle owners transferring up to 50% of their margin to packers
  2) Packers transferring up to 50% of their margin to cattle owners
  3) Cattle owners and packers equally sharing up to 50% of their respective margins
- Simulations of cattle owner and packer margins under equal sharing of margins up to 50%, combined with various premium rights for each participant. These scenarios were tested for three alternative states of nature:
  1) 25% of cattle qualifying for a product line above Choice YG3
  2) 50% of cattle qualifying for a product line above Choice YG3
  3) 75% of cattle qualifying for a product line above Choice YG3

It is important for the reader to understand the two different types of "margin sharing" tested. Margin sharing can take the following two forms:

1) **Unilateral sharing**, or direct transfer of margin, where one party transfers a % of their own margin to another party with nothing in return. For example, cattle owners may directly transfer 20% of their earned margin to packers. Cattle owners would be left with a margin equal to 80% of its original value. Packer margin would then be equal to 100% packing margin + 20% owner margin.
2) **Equal margin sharing**, where both parties exchange an equal % of their own margins with one another. For example, if 20% equal margin sharing was agreed on, then packers would receive 20% of the cattle owner margin and owners would receive 20% of the packer margin. Cattle owner margin would be equal to 80% owner margin + 20% packer margin. Packer margin would be equal to 80% packer margin + 20% owner margin.

Therefore the first analysis deals specifically with margin sharing between cattle owners and packers. The second analysis incorporates premium rights, assuming both cattle owners and packers have already agreed to equal margin sharing.

The *@Risk* Software Program

The *@Risk* software program allows a user to define input distributions to be sampled during a simulation. These distributions may be discrete or continuous, and numerous distributions can be created for the simulation to sample from. For each iteration, a value is randomly selected from each pre-defined input distribution and used in the calculations set forth in an *Excel* worksheet. The calculated values from all iterations are then stored in a separate worksheet cell for later analysis. The software program therefore allows for a large number of "what if?" scenarios to be performed by a user when endogenous variables take a wide range of values. In this manner, users can get a better idea of most likely outcomes when variable factors change over time.

Defining the input distributions can be tricky if a researcher only has a small sample of data. The *BestFit* program that accompanies *@Risk* solves this problem by searching for the most likely population distribution that could have produced the sample data. *BestFit* takes the sample data input by a user and compares it to 26 pre-defined distribution types. Using the Chi-Square statistic as a goodness-of-fit test, *BestFit* uses an iterative search process to find the parameters for each distribution type that minimize the Chi-Square statistic. The Chi-Square statistic is defined as:

$$X^2 = \sum_{i=1}^{n} \frac{(P_i - p_i)^2}{p_i}$$

where P_i = *the observed probability value for a given histogram bar*

p_i = *the theoretical probability that a value will fall with the X range of the histogram bar*

After optimizing the parameters of all possible distributions, *BestFit* ranks each distribution according to Chi-Square statistic values. The distribution returning the lowest Chi-Square value is ranked as the most likely population distribution for the sample data. By finding the

distribution and its corresponding parameters that minimize the Chi-Square test statistic, *BestFit* is increasing the probability that the sample data came from that distribution. The minimization of the Chi-Square statistic does not guarantee that the distribution chosen by *BestFit* produced the sample data. However, the *BestFit* procedure is superior to randomly assigning a convenient-to-use distribution to use in the *@Risk* simulations.

If two or more input distributions are defined, *@Risk* can adjust for correlation between them. For two distributions that are negatively correlated, accounting for the correlation reduces the probability of *@Risk* sampling highly unlikely events, such as two record high observations at the same time.

4.4.1 Margin Sharing Analysis

To simulate all three margin sharing scenarios, the input distributions to sample from needed to first be defined. Using the *BestFit* software program, historical cattle feeding and packing margins were analyzed to determine the distribution type that described each historical series best. Both cattle feeder and packer historical weekly margins were entered as sample data into *BestFit*, where the data were first sorted and converted into a histogram to create a probability density function. Figures 4.3 and 4.4 show the cattle owner and cattle packer margin frequency distributions, respectively, created by *BestFit*.

BestFit found that cattle owner margins can be best represented by a normal distribution with an expected margin value of $-4.37/head and a standard deviation of $61.02. Cattle packer margins are represented by a logistic function with an alpha level of 6.38 and a beta level of 9.92. Table 4.3 presents *BestFit* results for the top three population distribution candidates.

Table 4.3: *BestFit* results for possible feeding and packing margin population distributions

	Chi-Square Value	Mean	Std. Deviation
Feeding Margins			
Normal (-4.37, 61.02)	100.37	-4.37	61.02
Erf (1.16e-2)	101.64	0.00	61.02
Logistic (-4.37, 33.42)	123.90	-4.37	60.62
Packing Margins			
Logistic (6.38, 9.92)	71.86	6.38	17.99
Normal (6.38, 18.12)	76.68	6.38	18.12
Erf (3.90e-2)	193.12	0.00	18.12

Figures 4.5 and 4.6 graphically compare the highest-ranking distributions with the empirical samples of owner and packer margins respectively. Graphics for other distributions can be found in the Appendix.

Figure 4.3: Cattle owner margin frequency distribution (1990-2000)

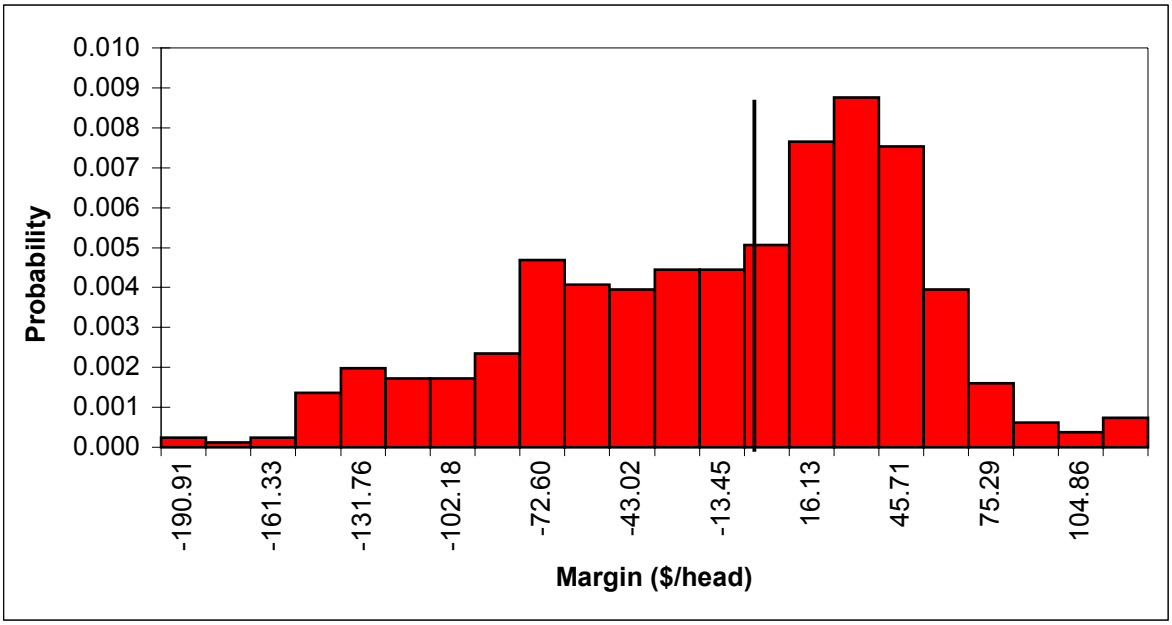


Figure 4.4: Cattle packer margin frequency distribution (1990-2000)

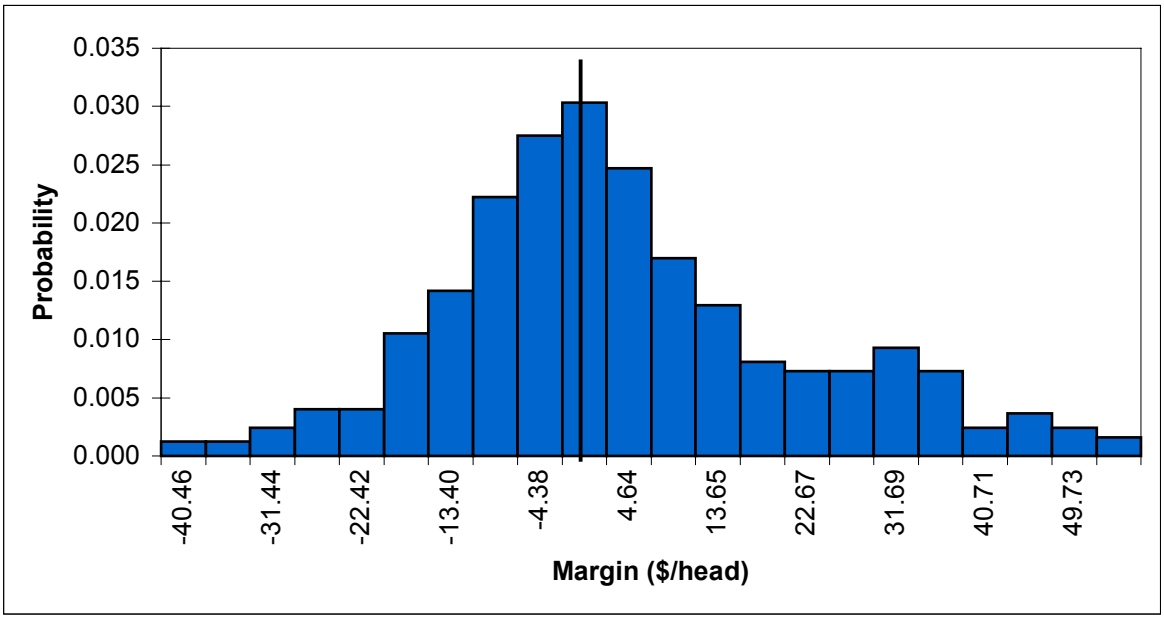


Figure 4.5: Owner margin frequency distribution and *BestFit* approximation through the minimization of the Chi-Square statistic -- Normal (-4.37, 61.02)

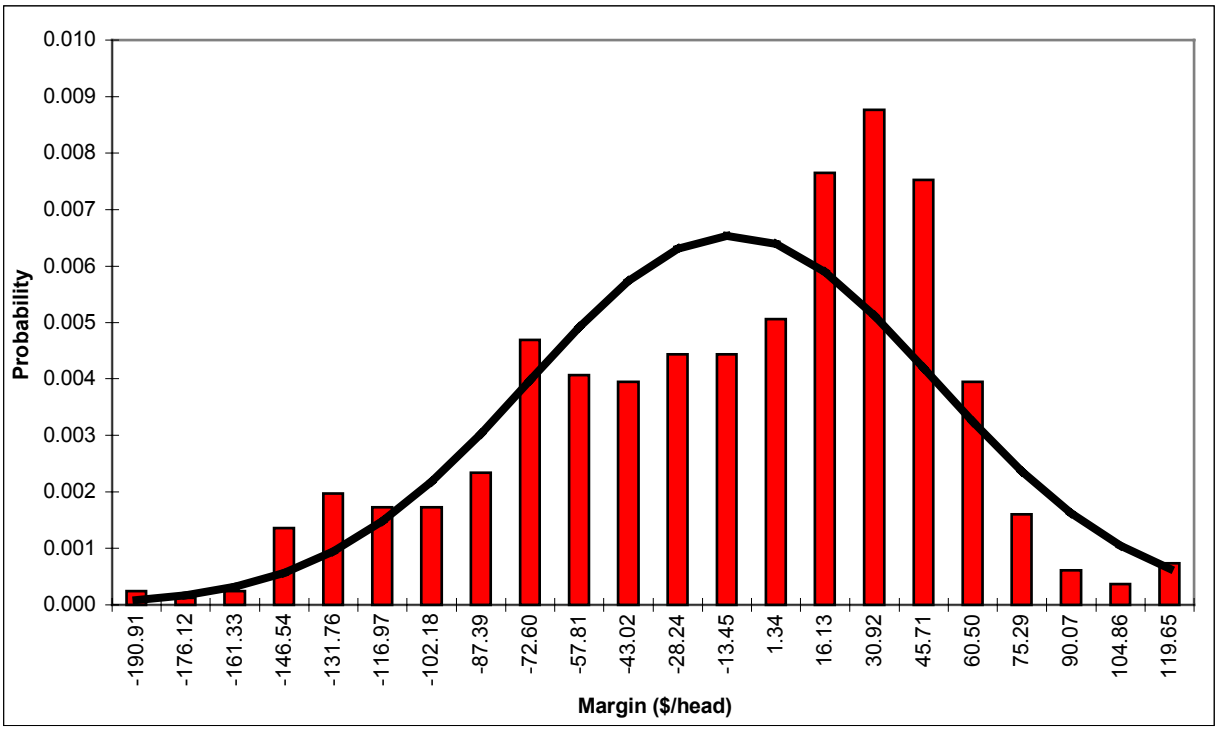
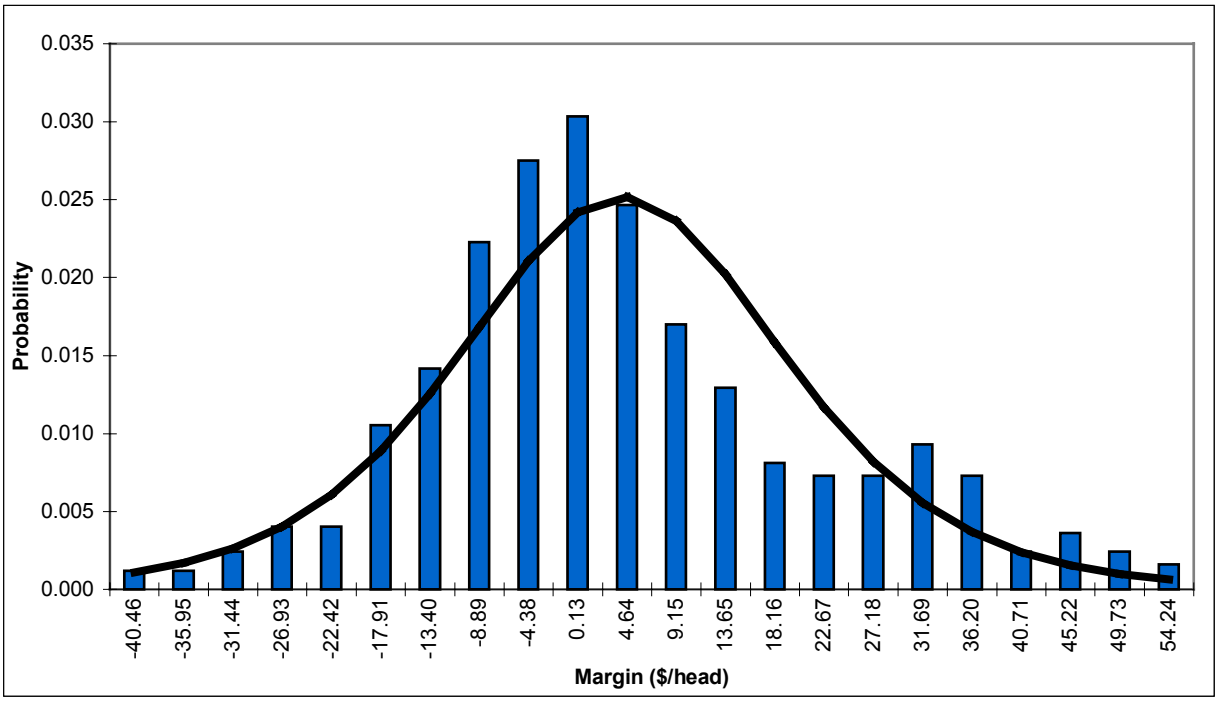


Figure 4.6: Packer margin frequency distribution and *BestFit* approximation through the minimization of the Chi-Square statistic – Logistic (6.38, 9.92)



Using the newly defined distributions[3] to represent alliance cattle owner and packer margins over time, the *@Risk* program randomly selected margin values to divide according to the three different sharing rules. The inverse correlation existing between feeding and packing margins was accounted for by entering the correlation coefficient, -0.1185, into the *@Risk* correlation coefficient matrix.

In order to analyze each sharing arrangement, *@Risk* performed a simulation of 10,000 iterations that randomly sampled both cattle owner and packer margin distributions. These sample margins were then divided according to sharing rule and each result stored before beginning the next iteration. At the end of 10,000 iterations, *@Risk* had generated 10,000 observations for each tested margin sharing scenario – thereby forming unique distributions for each one. Performing 10,000 iterations ensured that each output distribution ultimately converged to a stable state, decreasing the probability that the sharing results would change if more iterations were performed.

The first simulation determined the effect of alliance cattle owners transferring up to 50% of their margin to packers. The high variance of historic feeding margins lends support to the *a priori* belief that alliance cattle owners will be interested in risk reduction methods with packers. The second simulation focused on the effects of packers transferring up to 50% of their margin to cattle owners. The final simulation examined impacts of equal margin sharing between participants. This simulation tested the outcome from cattle owners and packers sharing 10%, 20%, up to 50% of their margin with each other, and receiving an equal percentage in return. Ultimately, the scenario examined the effect of cattle owners and packers equally sharing 50% of their margins.

[3] The distributions chosen by the *BestFit* program do not completely capture historical margins in a graphical sense, and the calculated Chi-Square values were not statistically significant at the widely used .05 confidence level. However, judgment was made that it was better to have a poorly fitting distribution representing alliance margins than to rely solely on empirical data. In order to utilize the power of *@Risk*'s simulation programming, a continuous distribution was needed from which to sample. Historical margins provide possible margin levels, but all margin levels have a discrete and equal probability of being sampled in each iteration of the simulation. In addition, *BestFit* results provide a robust distribution that is not constrained by past history, and allows for far more observations than would historical data. Over a longer time period, cattle feeding margins would tend to be normally distributed around zero. This is an industry with no barriers to entry and no sustained economic rents (prices above average total costs) being captured by participants. This lends more weight to using the normal distribution to approximate cattle owner margins.

4.4.2 Equal Margin Sharing in Combination with Premium Allocation Analysis

The second component of the analysis incorporated premium rights into the compensation design. For this analysis both cattle owners and packers were assumed to have agreed to **equal**, rather than unilateral, margin sharing if any was desired by either participant. Equal margin sharing means that both cattle owners and packers exchange an equal % of their own margin. *@Risk* conducted 12 simulations under a variety of margin sharing and premium allocation designs, with each iteration recording margins earned by cattle owners and packers, as well as the premium (if any) generated and divided by allocated rights.

The 12 simulations performed by *@Risk* were divided into three groups, with each group representing a different level of steer quality in the alliance. The first group represented a high quality alliance where 75% of cattle qualified for above baseline premium product lines. Group two represented an average quality alliance where 50% of cattle qualified for a premium, while group three demonstrated lower quality results with only 25% of cattle qualifying for an above baseline premium.

For each alliance quality group, four simulations were performed to generate results from different margin sharing and premium allocation rules between cattle owners and packers. These simulations analyzed the outcome if each participant was awarded from 0% up to 100% of the premiums generated (at intervals of 25%), while equal margin sharing ranged from 0% to 50%.

For each iteration, *@Risk* performed the following process. First, margins were sampled from pre-defined cattle owner and packer distributions, generating a margin earned by each participant. These simulations assumed that no correlation existed between type of premium (if any) earned, and level of either owner or packer margin[4]. Second, the program randomly selected whether that iteration (representing one steer being marketed) would qualify for a premium product line at all. For example, in the high quality alliance 75% of iterations would qualify for a premium versus only 25% in the low quality alliance.

If the steer qualified, *@Risk* randomly selected the premium line it qualified for based on the empirical sample probabilities for each premium line, as shown in Table 4.2. To

[4] In reality, this assumption of zero correlation is likely incorrect. When cattle are overfed and the market is filled with heavy Yield Grade 4 cattle, the premiums for High Choice or even Prime beef can disappear. Live cattle prices might decrease sharply, leaving the packer with better margins when the feeding margins can be large negative levels.

demonstrate, a premium-qualifying steer had a 52% chance to be a Choice YG2 carcass, and only a 0.54% chance to be a Prime YG2 carcass. Due to the lack of available data, the percentage of premium qualifying cattle merchandised through each premium line, and the premium earned, remained constant for each simulation. Therefore an above baseline steer in a low quality alliance had the same probability of being merchandised as Prime YG2 as a steer in a high quality alliance would, 0.54%, and would earn the same $7.47/cwt. premium. To reflect the roughly 10% chance that cattle may qualify for one of the above baseline premiums yet receive no premium due to market conditions, each steer was given only a 90% probability of receiving the appropriate premium amount shown in Table 4.2.

After any premiums earned by a steer were calculated, they were converted to a per-head live basis by assuming 7.56 cwt. on a carcass basis for each steer. Therefore, a $2/cwt. carcass premium results in a $15.12 per head premium to be divided between cattle owners and packer. The appropriate percentage of both cattle owner and packer margin was then shared between them, and the premiums were allocated to each participant as defined by the given simulation.

4.5 Margin Sharing: Results and Conclusions

4.5.1 Margin Sharing: Results

The first margin sharing scenario tested the effects of cattle owners transferring up to 50% of their margins to packers, receiving nothing in return. Table 4.4 presents the outcome for both owners and packers.

Table 4.4: Owner and packer margins ($/head) as owners transfer up to 50% of their margin to packers

		% of Owner Margin Transferred To Packer					
		0	**10**	**20**	**30**	**40**	**50**
Owner	*Mean*	-4.37	-3.93	-3.50	-3.06	-2.62	-2.19
	Std. Deviation	61.02	54.92	48.82	42.72	36.61	30.51
Packer	*Mean*	6.38	5.94	5.50	5.07	4.63	4.19
	Std. Deviation	17.99	18.34	20.59	24.20	28.67	33.66

Cattle owners experience an increase in their expected margin as they transfer more of their margin to the alliance packer. Not only does expected margin increase from -$4.37/head to -$2.19/head, but the standard deviation of owner margins decreases from $61.02 to $30.51/head.

Cattle packers, on the other hand, do not experience an increase in expected margin or a decrease in margin standard deviation when they receive a percentage of cattle owner margins. Instead, expected packer margins decrease from $6.38/head when they receive none of the owner margin, to $4.19/head when they receive 50% of owner margins. Margin standard deviation also increases from $17.99 to $33.66/head.

Figures 4.7 and 4.8 graphically represent the effects of cattle owners transferring their margin to packers. Mean margin is represented by the white line in the middle of each figure, while the maroon band on both sides of the mean line represent values one standard deviation unit above and below the expected margin amount. The green band represents the 95th and 5th percentile values of the margin distribution at each corresponding level of sharing.

Figure 4.7: Cattle owner expected margin and variance as margin transfer to packers increases to 50%

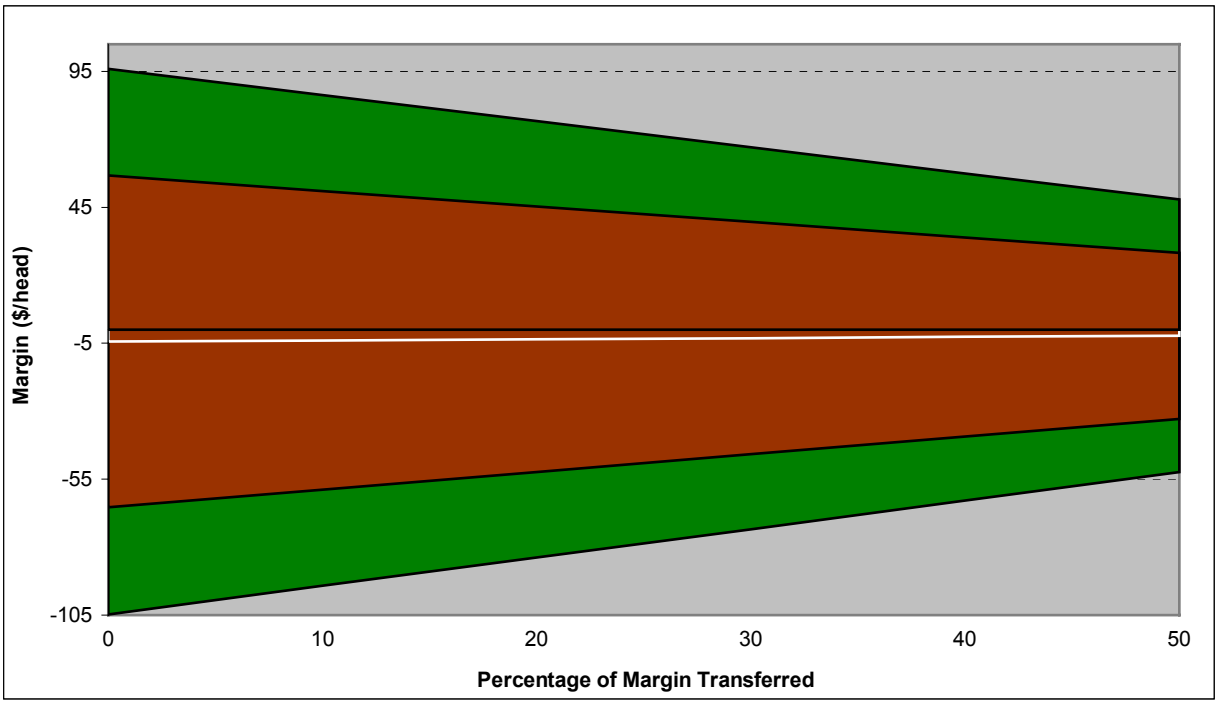


Figure 4.8: Packer expected margin and variance as receipt of owner margin increases to 50%

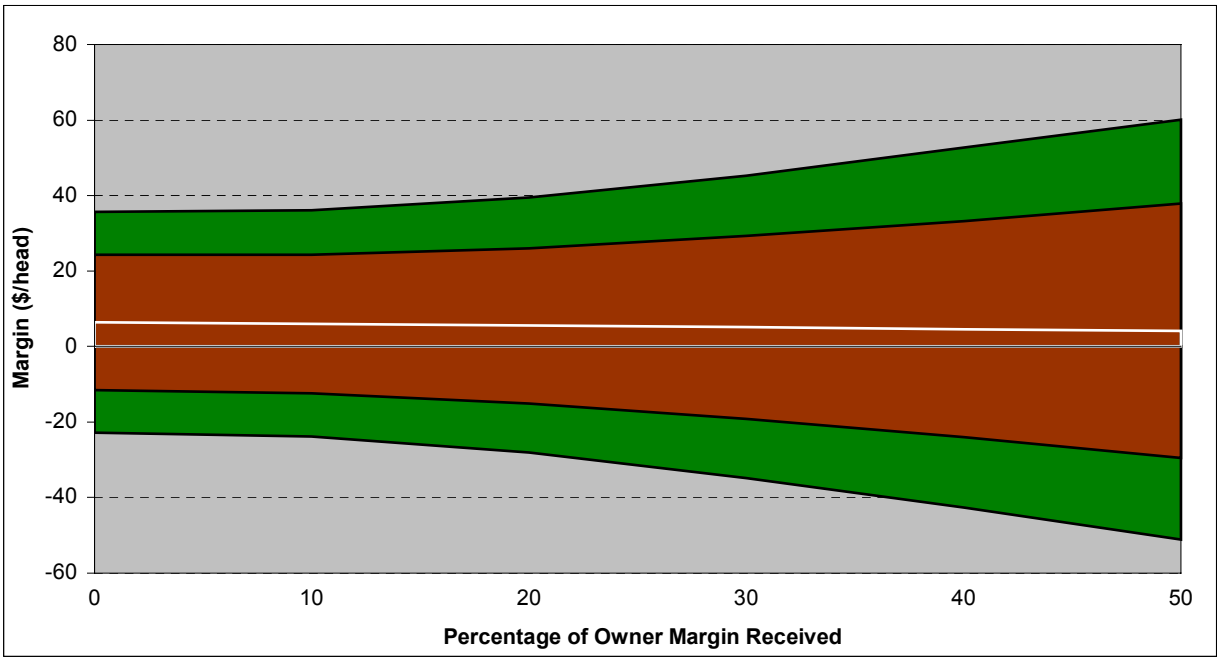


Table 4.5 provides the results when cattle packers transfer their margins to cattle owners, and receive nothing in return. The results indicate that cattle owner expected margin increases from -$4.37/head to -$1.18/head as they receive up to 50% of the packer margin. Cattle owner margin variability, however, does not significantly change when receiving larger percentages of the packer's margin, remaining around $61.00/head. Packer margins decrease from $6.38/head to $3.19/head, and margin variability decreases from $17.99 to $9/head as the packer transfers a larger percentage of their margin to cattle owners. Figures 4.9 and 4.10 present these results graphically.

Table 4.5: Owner and packer margins ($/head) as packers transfer up to 50% of their margin to owners

		% of Packer Margin Transferred To Owner					
		0	**10**	**20**	**30**	**40**	**50**
Owner	*Mean*	-4.37	-3.73	-3.10	-2.46	-1.82	-1.18
	Std. Deviation	61.01	60.82	60.68	60.59	60.55	60.57
Packer	*Mean*	6.38	5.74	5.10	4.46	3.83	3.19
	Std. Deviation	17.99	16.19	14.39	12.59	10.80	9.00

Figure 4.9: Cattle owner expected margin and variance as receipt of packer margin increases to 50%

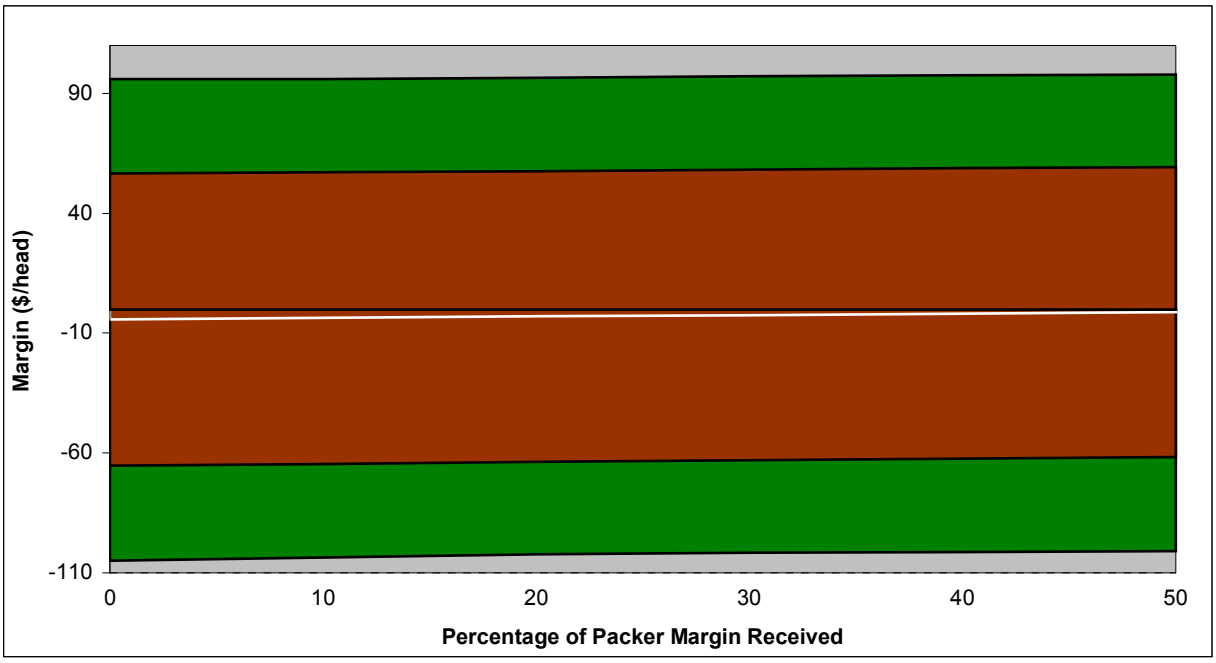


Figure 4.10: Packer expected margin and variance as margin transfer to owners increases to 50%

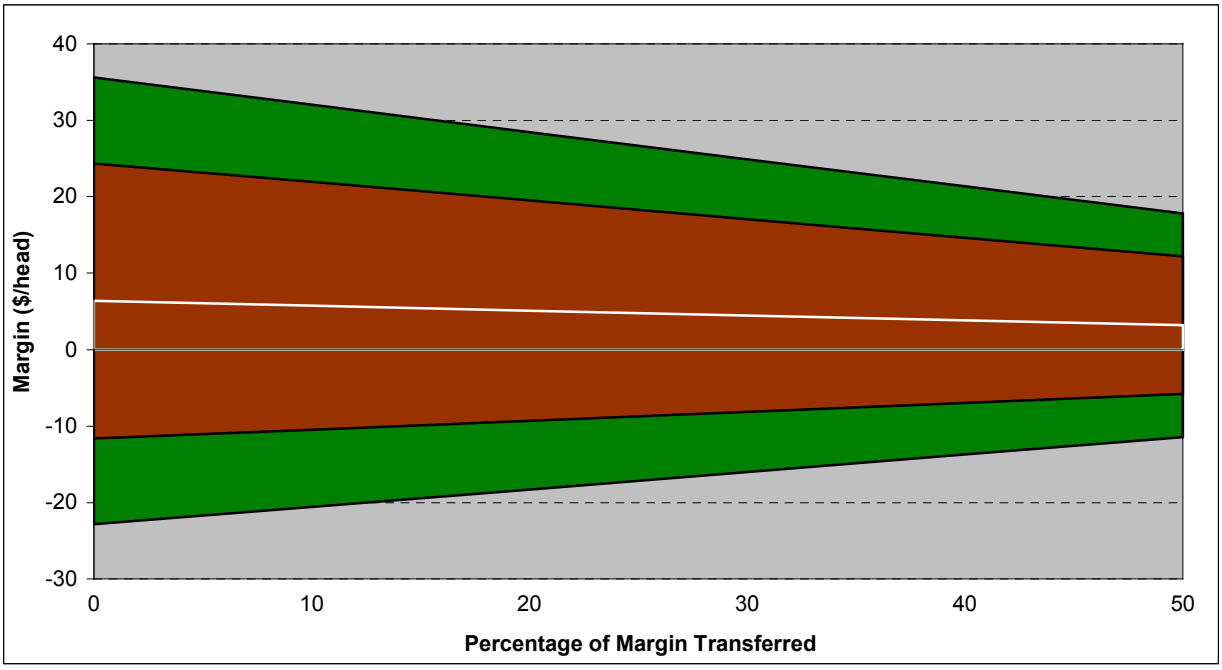


Table 4.6 provides results for equal margin sharing between alliance cattle owners and packers. Figures 4.11 and 4.12 graphically show each participant's margin as they exchange larger portions of their margin with one another.

As cattle owners share a larger percentage of their margin with packers, receiving an equal amount of packer margin in return, cattle owners increase expected margin from -$4.37 to $1.00/head, while simultaneously decreasing margin variability from $61.02 to $30.84/head.

Cattle packers have an interesting result, lowering expected margins while eventually increasing standard deviation of the margin overall. Packers experience a decrease in the level of expected margin from $6.38 to $1.00/head. At the same time, the standard deviation of the margin decreases initially from $18.00 to $16.67/head while sharing 10% of their margin, to increasing at higher levels of sharing to an eventual $30.84/head.

Table 4.6: Owner and packer margins ($/head) as both share equal percentages of their margin up to 50%

		% of Respective Margins Exchanged Between Owners and Packers					
		0	**10**	**20**	**30**	**40**	**50**
Owner	*Mean*	-4.37	-3.30	-2.22	-1.15	-0.07	1.00
	Std. Deviation	61.02	54.75	48.55	42.46	36.52	30.84
Packer	*Mean*	6.38	5.30	4.23	3.15	2.08	1.00
	Std. Deviation	18.00	16.67	17.81	21.04	25.57	30.84

An example is helpful to understand how these values are calculated. Under 40% equal margin sharing, packers return an average $2.08/head. This is calculated as follows:

- Packers earn an average margin of $6.38/head
- Packers give 40% of their margin to owners, $2.55/head
- Packers receive 40% of the owner's margin, -$1.75/head
- Average packer return under 40% equal margin sharing:

$$(6.38 - 2.55) + (-1.75) = \$2.08/\text{head}$$

Figure 4.11: Cattle owner expected margin and variance as equal sharing increases up to 50%

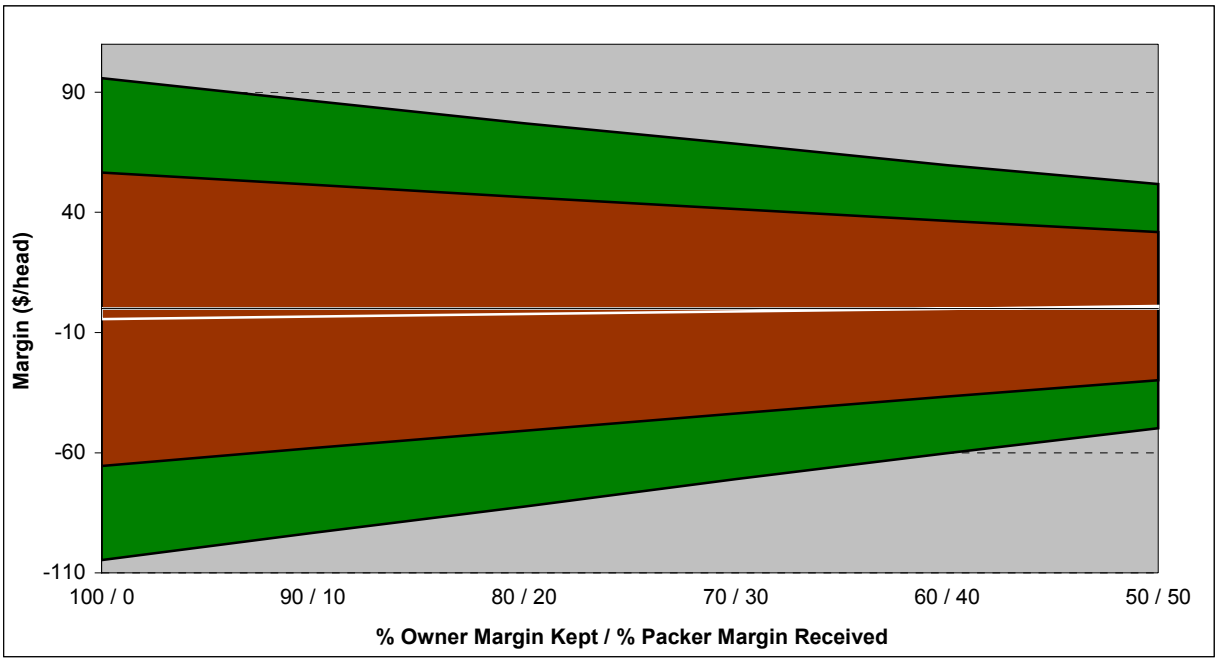
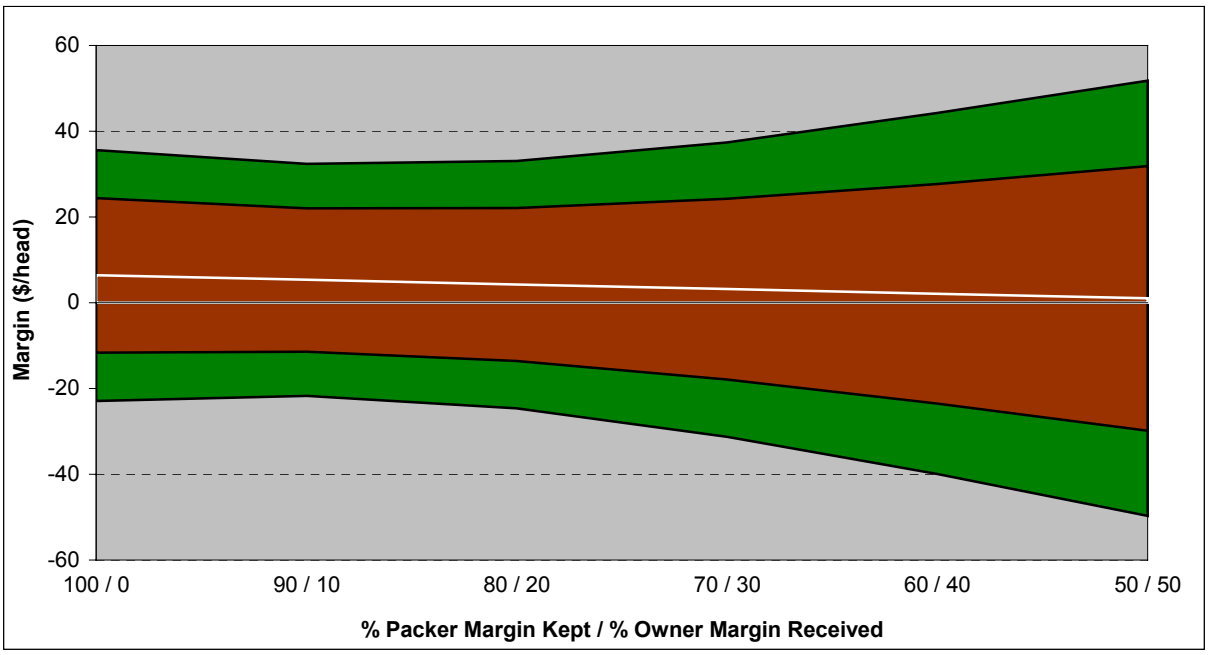


Figure 4.12: Packer expected margin and variance as equal sharing increases up to 50%



4.5.2 Margin Sharing: Conclusions

Results from margin sharing simulations suggest that cattle owners are in a position to benefit more from margin sharing arrangements than are cattle packers. In every scenario where alliance cattle owners could transfer a portion of their margin to the packer, expected margins increased at the same time standard deviation decreased. This result held without regard to whether or not owners received any packer margin in return.

The most significant improvement for cattle owners comes from equal sharing of margins with the packer. Cattle owners realized their highest expected margin of $1.00/head and very nearly the lowest standard deviation of those margins when they transferred 50% of their margin to packers, and received 50% of the packing margin in return.

These results suggest that cattle owners have a significant incentive to:

- Receive as much of the packer margin as possible; and
- Simultaneously transfer the largest percentage possible of their own margin to packers.

The importance of transferring some of their own margin to packers while receiving packing margin should not be overlooked. In all tests, cattle owners received higher expected margins with lower standard deviation by simultaneously transferring some of their margin to packers, rather than only receiving a portion of the packer's margin.

Simulation results reveal that packers would not prefer equal margin sharing arrangements. Assuming cattle packers have strong risk management programs already in place, and prefer a higher average return over lowering return variance, cattle packers would likely support receiving owner margins rather than share packing margins with cattle owners. Under equal margin sharing of 50%, packers would return only $1.00/head on average. Receiving 50% of owner margins with no packer margins going to cattle owners would increase standard deviation but only lower average return to $4.19/head.

Cattle owners are more likely to press for margin sharing agreements in alliances than are packers. Exposed to highly variable feeding margins, cattle owners as a group have little ability to collectively manage this risk. In addition, many cattle owners may have joined the alliance to reduce the variability associated with a failed pricing system, leading them to press harder for margin sharing agreements with packers. Historically, cattle feeding margins have exhibited long periods of consecutively negative returns. These negative returns for long periods of time

impose a cash flow problem on owners, and possibly frustrate obtaining financing or credit approval.

Alliance packers will be willing to accept margin sharing as part of the alliance design to reap the benefits of improved supply chain coordination. Packers who have invested large amounts of capital into branded beef product lines must attract a large number of high quality producers and compete with other packers who are pursuing those same cattle. To avoid the costly process of dealing with new cattle owners all the time, packers have an incentive to accommodate owner needs in exchange for a long-term relationship. Agreeing to margin sharing needs is just one example of packer compromises to guarantee a consistent supply of needed cattle.

Alliance packers also earn additional returns besides premiums. Cost savings from operating plants at higher utilization rates and removing the variation in daily slaughter rates can average as much as $3-6/head (Anderson and Trapp). These earnings allow packers to participate in alliances where average return may be lower than the $6.38/head available outside the alliance, but cost savings make up for the difference.

4.6 Equal Margin Sharing in Combination with Premium Allocation: Results and Conclusions

4.6.1 Equal Margin Sharing in Combination with Premium Allocation: Results

It is important for the reader to understand that this portion of the analysis assumes all margin sharing is equal between participants. For example, the statement "10% margin sharing" means that:

- Cattle owners transfer 10% of their margin earned to packers, **AND**
- Packers transfer 10% of their margin to owners.

It is reasonable to assume that owners and packers agree to equal margin sharing for the reasons set forth in the previous section.

The simulations combining premium rights with equal margin sharing allow for an examination of both cattle owner and packer motivations when given a compensation tool other than margin sharing with which to bargain. Results first provide an empirically based estimate

for the size of premiums that might be captured in three types of alliances: those with cattle that qualify for premium product lines with above average, average, or below average frequency. Table 4.7 shows the average per-head premium, and standard deviation of that premium, earned by alliance cattle.

Table 4.7: Mean and standard deviation ($/head) of premiums generated over all cattle according to alliance quality

	Mean premium earned by all cattle *($/head)*	**Std. Deviation** *($/head)*
High Quality *75% of cattle qualify for a premium line*	12.83	11.01
Average Quality *50% of cattle qualify for a premium line*	8.46	10.78
Low Quality *25% of cattle qualify for a premium line*	4.22	8.75

Table 4.7 results emphasize the potential that premiums have for improving both cattle owner and packer profits. In an alliance with cattle that grade higher than baseline 75% of the time, premiums average $12/head. Those alliances with half of all cattle qualifying for premium lines return an average of $8/head in premiums. Even lower quality alliances, where only one steer out of four qualifies for a premium line, average $4/head in premiums. These results are after discounting the premiums by the small probability that the cattle will qualify for, but not get in the marketplace, the appropriate premium.

The *@Risk* simulations also provide graphic results similar to those seen in the previous section. Figures 4.13 and 4.14 show average returns and their standard deviations for cattle owners and packers in high quality alliances, where cattle owners receive 75% of generated premiums (packers receive the other 25%).

Figure 4.13: Cattle owner expected margin and variance under 75% premium allocation and equal margin sharing increasing to 50% – High quality alliance

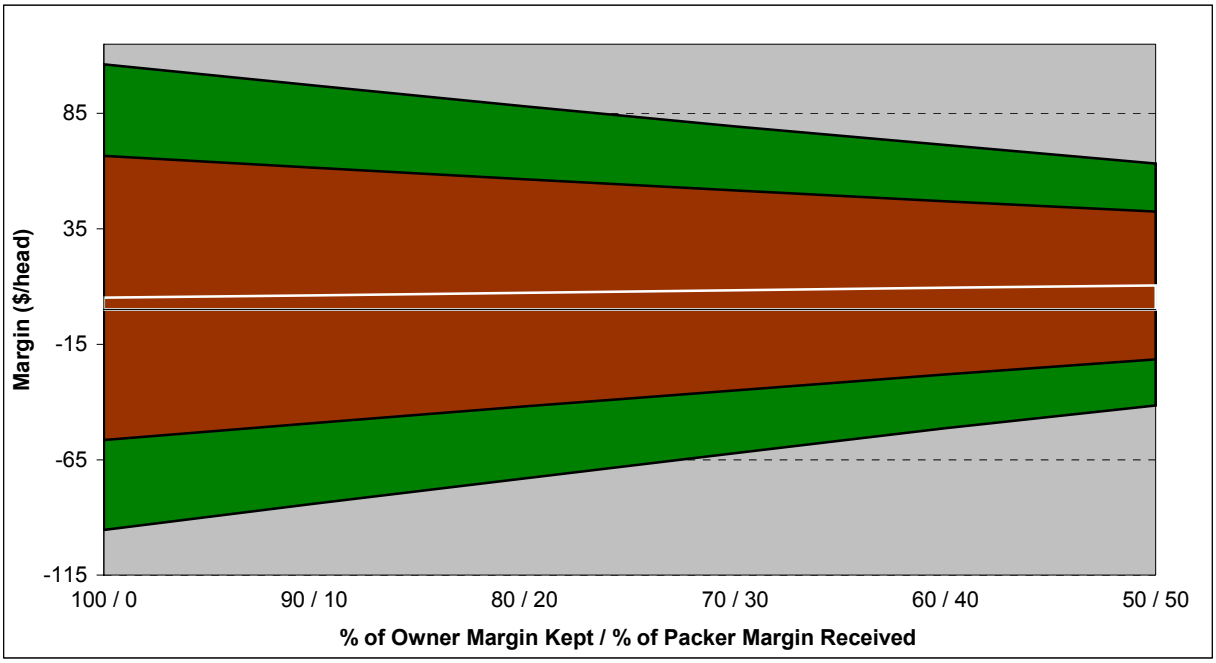
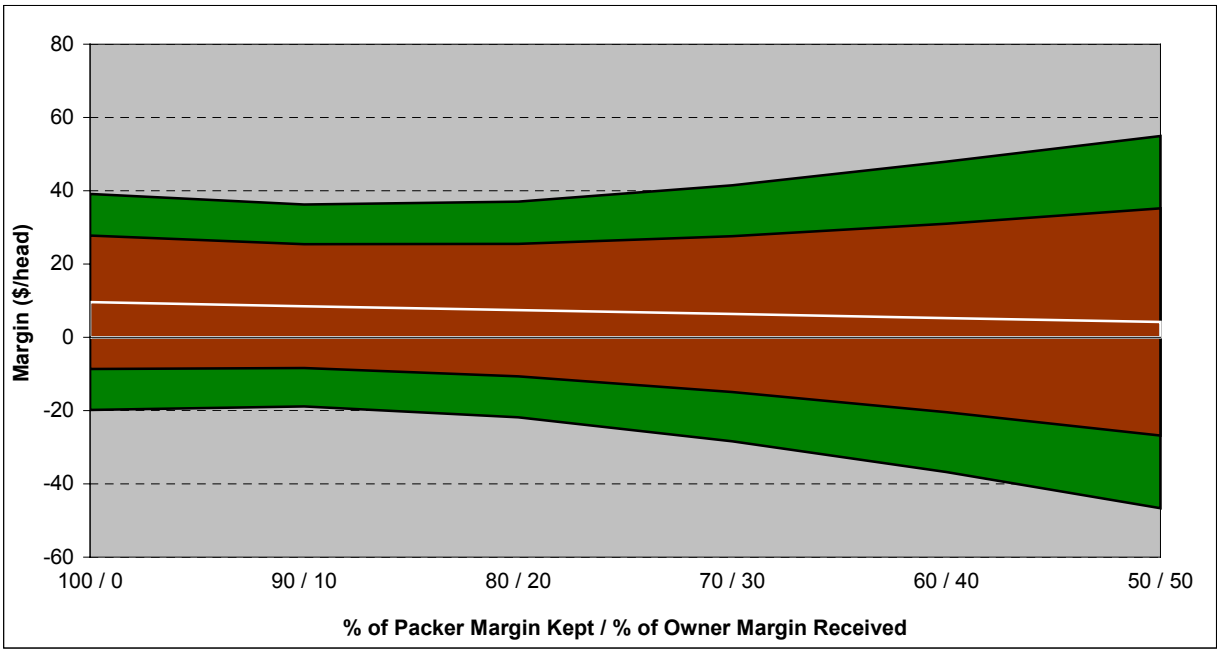


Figure 4.14: Packer expected margin and variance under 25% premium allocation and equal margin sharing increasing to 50% – High quality alliance



Figures 4.13 and 4.14 have the same shapes as seen with equal margin sharing and no premiums available, only different levels of mean return. Results from simulations show the standard deviation of cattle owner and packer returns did not change when premiums were included in compensation to alliance participants. The variation of returns was determined by the level of equal margin sharing, not the specific premium allocation design. The data used to create figures 4.13 and 4.14 are available for all scenarios tested in Appendix Table A2.

Average per head returns for both cattle owners and packers are given in Tables 4.8, 4.9, and 4.10. Table 4.8 lists average returns for cattle owners and packers in high quality alliances, where 75% of cattle marketed through the alliance qualify for one of the thirteen premium product lines. Table 4.9 shows average returns in an average quality alliance, where 50% of cattle qualify for a premium line. Finally, Table 4.10 shows the results for lower quality alliances, where only 25% of cattle marketed through the alliance qualify for a premium line.

Each of the tables is color-coded for help in analyzing the results. At the top of each table cattle owners are allocated 100% of any premiums generated by cattle and packers receive none. These cells are tinted rose, and the other cells corresponding with alternative margin sharing levels are also color-coded. As one moves down the chart, cattle owners receive less of the premium, and packers increase their share. The color-coded cells help to keep track of each participant's original position, and its equivalent return under different levels of premium.

An example will help to understand how results in these tables are calculated. In Table 4.8 cattle owners who participate in an alliance characterized by high quality cattle, are allocated 100% of all premiums generated, transfer 20% of their margin to packers, and receive 20% of the packer's margin earn an average return of $10.61/head. The $10.61/head is calculated as follows:

- Owners earn an average margin of -$4.37/head
- Owners give 20% of their margin to packers, -$0.87/head
- Owners receive 20% of the packer's margin, $1.28/head
- Owners receive an average premium of $12.83/head
- Average owner return is:

$$[(-4.37) - (-0.87)] + 1.28 + 12.83 = \$10.61/\text{head}$$

The color-coding of Tables 4.8, 4.9, and 4.10 help to determine what each participant would require or be willing to give up in order to advance to the next level of premium allocation or equal margin sharing. Continuing from the previous example of the cattle owner earning $10.61/head: if asked to give up 25% of premium allocation rights, the owner would have to be able to increase equal margin sharing to 50% in order to maintain a nearly equivalent average return of $10.61/head.

Table 4.8: Average returns ($/head) for owners and packers under various equal margin sharing rules and premium allocations -- High Quality Alliance

% of respective margins exchanged between owners and packers	Owner - 100% Premium	Packer - No Premium
0	8.46	6.38
10	9.53	5.30
20	10.61	4.23
30	11.68	3.15
40	12.76	2.08
50	13.83	1.00
	Owner - 75% Premium	**Packer - 25% Premium**
0	5.10	9.58
10	6.17	8.50
20	7.25	7.43
30	8.32	6.35
40	9.40	5.28
50	10.47	4.20
	Owner - 50% Premium	**Packer - 50% Premium**
0	2.01	12.76
10	3.09	11.69
20	4.16	10.61
30	5.24	9.54
40	6.31	8.46
50	7.39	7.39
	Owner - 25% Premium	**Packer - 75% Premium**
0	-1.17	15.84
10	-0.10	14.77
20	0.98	13.69
30	2.05	12.62
40	3.13	11.55
50	4.20	10.47
	Owner - No Premium	**Packer - 100% Premium**
0	-4.37	19.21
10	-3.30	18.13
20	-2.22	17.06
30	-1.15	15.98
40	-0.07	14.91
50	1.00	13.83

Table 4.9: Average returns ($/head) for owners and packers under various equal margin sharing rules and premium allocations -- Average Quality Alliance

% of respective margins exchanged between owners and packer	Owner - 100% Premium	Packer - No Premium
0	4.08	6.38
10	5.16	5.30
20	6.23	4.23
30	7.31	3.15
40	8.38	2.08
50	9.46	1.00
	Owner - 75% Premium	**Packer - 25% Premium**
0	1.94	8.52
10	3.01	7.45
20	4.09	6.37
30	5.16	5.30
40	6.24	4.22
50	7.31	3.15
	Owner - 50% Premium	**Packer - 50% Premium**
0	-0.16	10.59
10	0.92	9.51
20	1.99	8.44
30	3.07	7.37
40	4.14	6.29
50	5.22	5.22
	Owner - 25% Premium	**Packer - 75% Premium**
0	-2.22	12.69
10	-1.15	11.61
20	-0.08	10.54
30	1.00	9.46
40	2.07	8.39
50	3.15	7.31
	Owner - No Premium	**Packer - 100% Premium**
0	-4.37	14.84
10	-3.30	13.76
20	-2.22	12.69
30	-1.15	11.61
40	-0.07	10.54
50	1.00	9.46

Table 4.10: Average returns ($/head) for owners and packers under various equal margin sharing rules and premium allocations -- Low Quality Alliance

% of respective margins exchanged between owners and packer	Owner - 100% Premium	Packer - No Premium
0	-0.15	6.38
10	0.93	5.30
20	2.00	4.23
30	3.08	3.15
40	4.15	2.08
50	5.23	1.00
	Owner - 75% Premium	**Packer - 25% Premium**
0	-1.18	7.44
10	-0.11	6.36
20	0.97	5.29
30	2.04	4.21
40	3.12	3.14
50	4.19	2.06
	Owner - 50% Premium	**Packer - 50% Premium**
0	-2.26	8.49
10	-1.19	7.42
20	-0.11	6.34
30	0.97	5.27
40	2.04	4.19
50	3.12	3.12
	Owner - 25% Premium	**Packer - 75% Premium**
0	-3.31	9.57
10	-2.23	8.49
20	-1.16	7.42
30	-0.09	6.34
40	0.99	5.27
50	2.06	4.19
	Owner - No Premium	**Packer - 100% Premium**
0	-4.37	10.60
10	-3.30	9.53
20	-2.22	8.45
30	-1.15	7.38
40	-0.07	6.30
50	1.00	5.23

4.6.2 Equal Margin Sharing in Combination with Premium Allocation: Conclusions

Premiums can be substantial when combined with earned margins. If these data can be assumed representative of alliances, the largest potential for increasing average returns is through higher quality cattle. For cattle owners, the implication of premiums is significant. In an alliance where all premiums earned are allocated to the cattle owner, and no margin sharing exists, owners can turn an average loss of $4/head over time into a breakeven situation by improving the consistency with which their cattle qualify for premium lines to only 25%[5].

Even in alliances where most cattle do not qualify for premium product lines, premium allocation rights can make a significant difference in average returns. For those cattle owners mentioned above, the increase in qualifying percentage results in an approximately 100% increase in average return per steer marketed. At that rate, cattle owners improve average per head return 4% for every 1% increase in qualifying percentage. Further improvements in quality, such as achieving 50% of cattle qualifying for premium lines, would increase owner return 200%, to roughly $4.00/head.

The potential for premiums to improve returns for the alliance packer is large as well. For a packer allocated all premiums generated, an increase in premium qualifying percentage from 25% to 50% would raise average return from $10.60/head to $14.84/head (a 40% increase). At that rate, the packer increases return by 1.6% for every 1% increase in qualifying percentage. Packers could still maintain the increase in average return by partially subsidizing owners for any quality improvements they make.

The reader should remember from the previous analysis that packer returns decline when equal margin sharing levels increase. Simulation results show that packers are more willing to agree to equal margin sharing increases when they are allocated premium rights in return. However, the amount of equal margin sharing is dependent on the quality of cattle being marketed through the alliance. In alliances where only 25% of cattle qualify for a premium line, the packer will be willing to increase equal margin sharing by 10% in exchange for 25% of all

[5] This assumes, of course, that the costs of producing the cattle remain the same. Costs will tend to increase with investments in new technology in production and management. But the improved technology and the often superior cattle might also realize better conversions and lower costs of gain.

premiums generated. But the packer's willingness to participate in equal margin sharing runs out at 40%, when they have already been allocated 100% of all generated premiums.

The simulation results show cattle owner and packer preferences change according to the relative quality of alliance cattle.

As quality of cattle increases:

- The packer will demand less in terms of premium allocation for each increase in equal margin sharing sought by cattle owners; and
- Cattle owners will demand less premium allocation for every reduction in margin sharing sought by the packer.

As cattle quality decreases:

- Packers will demand more premium allocation in return for increases in equal margin sharing; and
- Cattle owners will demand more premium allocation for any reduction in equal margin sharing sought by the packer.

In a negotiation situation over alliance compensation design, both cattle owners and packers have a need to understand the tradeoff for each offer or concession. For example, cattle owners may seek to increase the level of equal margin sharing by 10%. In order to accommodate the request, packers will demand an appropriate increase in their premium rights. But how much premium right should be given up by cattle owners? How much premium right is needed by packers to maintain an equivalent level of return? Table 4.11 provides the marginal rates of substitution between premium rights and margin sharing needed to solve the negotiation problem.

Table 4.11: Marginal rates of substitution between changes in premium rights and changes in equal margin sharing for cattle owners and packers to maintain equivalent returns on cattle marketed through the alliance

	Low Quality Alliance *(25% of cattle qualify for premium)*	Average Quality Alliance *(50% of cattle qualify for premium)*	High Quality Alliance *(75% of cattle qualify for premium)*
1% change in premium rights is worth	0.4% change in equal margin sharing	0.8% change in equal margin sharing	1.2% change in equal margin sharing
1% change in level of equal margin sharing is worth	2.5% change in premium rights	1.25% change in premium rights	0.83% change in premium rights

Assuming a low quality alliance where there is already 20% equal margin sharing, the cattle owner request to increase sharing to 30% will be accepted if the packer can be compensated with an appropriate increase in premium rights. Table 4.11 shows packers would need a 2.5% increase in premium rights for every 1% increase in equal margin sharing. Therefore, the packer and cattle owner would both maintain an equivalent average return if equal margin sharing increased by 10%, and packers received 25% more of all premiums generated. This marginal rate of substitution holds in a low quality alliance regardless of what the current level of equal margin sharing is, 20% or any other amount. Only cattle quality changes influence the relative value of premium rights to equal margin sharing arrangements.

Cattle owner preferences for either equal margin sharing or premium rights change as cattle quality increases. When only 25% of cattle qualify for a premium line, cattle owners receive a higher average return under equal margin sharing of 50% ($1.00/head) than by having rights to 100% of premiums and no margin sharing at all (-$0.15/head). When alliance cattle quality increases, however, the premiums generated become too large for cattle owners to disregard. In the high quality alliance, owners still earn a higher average return by receiving 100% of all premiums and having no equal margin sharing ($8.46/head), than if they chose to receive 50% of premiums and equal margin sharing of 50% ($7.39/head).

The increasing value of premium allocations relative to equal margin sharing levels as cattle quality increases has important ramifications for the motivations that will exist under differing circumstances. Alliance packers anticipating an increase in cattle quality in the future

may be more willing to accept a larger amount of equal margin sharing now. As an example, packer average returns for 50% premium allocation and 20% equal margin sharing in the lowest quality alliance is $6.34/head – roughly equivalent to not participating in the alliance at all. If owners negotiate for 30% equal margin sharing, packer return drops to $5.27/head if cattle quality stays at 25% qualification levels. If alliance quality does improve by 25%, the packer will realize an average return of $7.37/head, a 16% increase in average return over what would have been realized by not agreeing to any increase in equal margin sharing and subsequently stalling negotiations. If packers believe the opposite is true, cattle quality is going to decrease, they will seek higher premium allocations for any increase in equal margin sharing sought by owners.

Since cattle owners possess the ability to improve cattle quality, agreeing to low amounts of equal margin sharing in exchange for high levels of premium allocation may pay off nicely if cattle improvement can be achieved. For example, in the lowest quality alliance, cattle owners can increase premium allocation by 1% for only a 0.4% decrease in equal margin sharing. When cattle quality improves, however, the same 1% premium allocation increase would require owners to make a 0.8% concession in equal margin sharing. In short, cattle owners have an incentive to "purchase" as much premium allocation right as possible when the price is cheap (only small concessions in equal margin sharing) and reap the rewards of higher premiums when cattle quality improves. The inverse is also true. There is an incentive for owners to give up large premium allocations in exchange for higher levels of equal margin sharing when cattle quality is expected to decline. The decline in quality may be caused by a number of sources, including participation in the alliance by more low quality cattle producers.

Results show a motivation for cattle packers to increase cattle quality by subsidizing producers. For example, if a packer has negotiated a 50% allocation of premiums and 30% equal margin sharing, average return is $7.37/head. If cattle quality increased from 50% to 75% qualification for premium lines, the same negotiated position would return an average of $9.54/head. By subsidizing owners $1.50/head to improve cattle quality to the 75% level, the packer would earn an average of $0.67/head on their investment. The increase in average per-head return reflects a return on investment of 45%, a 1.8% increase in investment return for every 1% increase in cattle quality. This result may help to explain why an alliance is willing to

subsidize certain costs of owners participating in alliances, such as free carcass data. The subsidy may result in higher cattle quality and subsequently higher returns for the alliance.

Overall, the simulation results point to a few general conclusions:

- As quality of cattle increases, packers are more willing to accept higher levels of the equal margin sharing which improves owners' positions;
- The increase in quality subsequently increases the value of premium pool sharing relative to equal margin sharing agreements;
- Decreases in cattle quality lower the value of premium pool sharing relative to equal margin sharing agreements;
- Premium allocations offer a way for both sides to negotiate new compensation and risk sharing arrangements; a flexibility that can lengthen the lifespan of the alliance and better accommodate each participant's needs;
- Incentives exist for owners and packers to negotiate for more premium allocation if they expect cattle quality to increase, or more beneficial levels of equal margin sharing if cattle quality is expected to decline; and
- Improvements in cattle quality can be subsidized by cattle packers since packers benefit significantly from the improvements in quality.

4.7 A Note on Constant Margin Arrangements

During the design process, alliances may be inclined to adopt a fixed fee method for compensating the cattle packer involved in the alliance. In this sense, the packer is earning a margin not determined by the market, but predetermined by a bargaining agreement adopted prior to beginning operations. For the sake of an example, let us assume that an alliance has determined to pay the packer a flat fee of $100 for every head of alliance cattle processed. In addition to the fee, the cattle packer will also receive a share of the premiums generated from the sale of alliance cattle.

The market based margin earned by packers not participating in the alliance is the opportunity cost of the alliance cattle packer. Therefore, when packers outside of the alliance are earning a margin of $125 per head, the alliance cattle packer is incurring an opportunity cost of $25 per head. The $25 per head becomes an internal to the alliance revenue transfer to the

alliance cattle producer. All packers are selling in the same boxed beef market. The $125 per head operating margin occurs because fed cattle prices are sufficiently low to generate the $125. Relative to the going cash market for fed cattle, alliance producers are being "overpaid" by $25 per head.

In essence then, under a fixed payment structure, there are times when the cattle packer will be subsidizing the cattle producer by the amount that the fixed and market based packing margins differ. The subsidy from packer to producer will most often occur during those seasonal or cyclical periods when cattle numbers are high and packer margins are traditionally large. Conversely, when market based margins are below the $100 margin paid to the alliance packer, the alliance cattle producers are subsidizing the packer by the difference. The subsidy from producer to packer will most likely occur during periods where cattle numbers are seasonally or cyclically down and packer margins are traditionally tighter. Therefore, a fixed payment system to the packer will be causing a subsidy or a revenue transfer to occur between cattle producers and packers depending on outside market based packing margins. This subsidy or transfer can create serious implications for alliance incentives and the economic signals being sent between participants.

Those times when outside packing margins are above alliance packing margins and alliance producers are receiving a subsidy, the economic signal they are responding to is incorrect. For example, cattle producers will believe that the $25 subsidy received from the packer is actually a result of higher quality cattle being produced. If the cattle were actually of low quality, the correct economic signal to producers would be a discount, not a subsidy. Therefore, the reliance on a fixed margin system guarantees there will be times when the economic signals sent to producers will be incorrect, exactly the scenario that prompted many beef industry participants to leave the traditional beef marketing system.

The fixed margin system also hinders the incentives each participant has to perform their alliance function to the best of their ability. In those cases where alliance packers are receiving a margin that is below their counterparts outside of the alliance, there exists a disincentive for participating in the alliance. Clearly, no participant in the alliance system will remain dedicated and focused on achieving long term success if they face high opportunity costs for participating. Situations where cattle packers are subsidizing cattle producers will also diminish the incentive to work towards truly higher value cattle. Already receiving a subsidy believed to be from high

quality characteristics, producers may not feel the push towards making needed investments in higher quality genetics and management necessary to maintain a quality value-added product at the wholesale or retail level. When the subsidy eventually reverses itself, producers may be left behind the competition in developing beef products that will be in high demand. Those times when lower packing margins outside the alliance are causing a subsidy from alliance producers to packers, alliance producers will then feel the disincentive to participate in the system. Packers, already receiving a higher fee than market based margins outside the alliance will have little additional incentive to merchandise the beef products rigorously for additional premiums.

Paying a fixed margin to alliance participants only guarantees one outcome, that there will always be a revenue transfer from one participant to another. In order for the alliance to grow stronger and prosper in the long-term, participants must be tied to the true value for their products. Receiving market determined margins for services rendered eliminates the subsidy problem and focuses all participant efforts back on the most important goal of generating premiums.

Paying an alliance participant a constant fee is a common starting point. The implications of paying the packer a constant fee have been discussed. The implications are onerous.

The error may be even more problematic if it occurs at the calf level. Producers often initiate the alliances, and they would actually like to receive a cost-based fee for their calf – such as the average budgeted cost across the past 5 years using an industry group or university data set. If that cost is, say, $80 per cwt., the alliance is in trouble when cyclical surges in cattle numbers or a short term spike in corn costs (as in 1995-96) pushes calf prices below $50 per cwt. The rest of the alliance (cattle feeder, packer) will pay subsidies of $150 per head or more, an intolerable situation. To make matters worse, it is very hard to sort out the true value of the slaughter cattle.

A constant per head per day fee to a feedyard managing the cattle on a client basis can work. If the charges are the same charges applied to all cattle the feedyard is feeding, there is no distortion of prices and margins within the alliance as compared to those outside the alliance.

4.8 Summary

Results from *@Risk* simulations presented in this chapter provide analytical content to the decisions faced by beef alliances when designing their organizations. Margin sharing was shown to be a method of compensation most likely supported by cattle owners in the alliance. Historic cattle feeding margins are more variable than packing margins, and sharing those margins with packers increases cattle owner average returns while decreasing margin variance. Cattle owners would prefer equal margin sharing with packers rather than giving or receiving a one-way transfer of margins to or from packers.

Packers not concerned with revenue variability, likely for most packers with solid risk management resources, would prefer receiving a direct transfer of owner margins over time if they have to be involved in market sharing at all. Packers face the lowest average returns under equal margin sharing scenarios. This finding supports alliance designs where packers have agreed to take on cattle owner margin risk rather than share their own packing margin with cattle owners.

Packer hesitancy towards equal margin sharing decreases with the addition of premiums to be allocated. Indeed, premium rights serve as an able substitute for equal margin sharing agreements between cattle owners and packers. Those cattle owners intent on equal margin sharing can "trade" increased percentages of sharing (thereby increasing average returns and decreasing variance) for decreased percentages of premium rights. Conversely, packers can decrease equal margin sharing (thereby increasing average return and decreasing variance) by also giving up premium rights. Premium allocation and equal margin sharing thereby create an implicit exchange rate between them, with premium allocation rights becoming more valuable as cattle quality within the alliance increases and equal margin sharing agreements increasing in value as cattle quality declines.

These empirical findings on alliance design characteristics allow for discussion of numerous strategies both cattle owners and packers could utilize to increase average returns of alliance cattle. For example, packers unwilling to increase equal margin sharing levels may agree to do so only under a stipulation of better cattle performance. If cattle begin to qualify for more premium product lines, the packer will increase average return at a rate faster than the decrease in revenue caused by equal margin sharing. Higher returns from better cattle

performance also open the possibility for partial subsidization of cattle improvement efforts. These findings can be put to use by alliance managers and participants seeking to find ways of continuing stalled negotiations, improving equitable treatment of all partners, creating an atmosphere of trust, and ultimately increasing the probability of alliance success.