An Analysis of the Frequency of Marketing by Kansas Crop Producers

by

Barry K. Goodwin and Terry L. Kastens

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This study evaluates the frequency of marketing for a sample of 572 Kansas crop producers. The frequency of marketing is an important dimension of marketing practices that has received little empirical attention. At its most fundamental level, the frequency of marketing is intimately related to on-farm and off-farm commodity storage. Estimators appropriate for integer count data are utilized to evaluate the relationship among farm and operator characteristics with observed frequencies of marketing. Large, non-irrigated crop partnerships which have little rented acreage appear to market the most frequently. Young operators that spend a considerable amount of time in self-education efforts also appear to market more frequently.

Price and yield risk are among the most important factors influencing the production and marketing actions of agricultural producers. Price risk is especially important to agricultural producers. In the survey which is the focus of this study, 67% of Kansas crop farmers indicated that output and/or input price uncertainty is the major source of risk faced by their farm operation. Management of this price risk is a topic of continuing interest to producers as well as to academic researchers and extension educators. Methods for managing price risk include forward pricing, hedging, options trading, and commodity storage.

The marketing practices of agricultural producers have received considerable attention in recent years. Much of this research has focused on producers' adoption of forward and futures pricing methods. Hill; Asplund, Forster, and Stout; Makus et al.; Shapiro and Brorsen; and Goodwin and Schroeder evaluated producers' adoption of forward pricing techniques. Through this research a better understanding of the characteristics of producers associated with one dimension of agricultural marketing, forward pricing, has emerged. In general, these studies have revealed that the adoption of forward pricing techniques increases with farm size, producer education, and financial leverage.

Although understanding of forward pricing adoption has been enhanced by recent research, almost no information exists about a more fundamental and important aspect of producers' marketing practices: the *frequency* of marketing. Conventional wisdom may imply that most farmers market their commodities infrequently and around harvest time. However, marketing plans have become increasingly complex and in many cases involve more frequent marketings. Further, many farmers utilize on-farm and off-farm storage of commodities to manage price and yield risks by smoothing marketings over time. Our data, discussed in detail below, confirm that most producers market their production more often than just once per season.

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Knowledge of the frequency of marketings will add to the current understanding of producers' marketing practices. Such knowledge may also have important implications for the representativeness of price statistics. To the extent that marketings may occur frequently across the crop year, price quotes taken at harvest may not be representative of actual annual transactions prices.

The objective of this analysis is to evaluate the frequency of crop marketings for a sample of 572 Kansas wheat, corn, grain sorghum, and soybean producers. Characteristics of the producers and farm operations will be evaluated for their effects on the frequency of marketing. Because the marketing frequency data are of a discrete, count nature, econometric procedures appropriate to the analysis of count data are employed.

The plan of this paper is as follows. The following section presents a simple conceptual framework for the consideration of marketing frequency. The third section discusses the survey data and provides summary information regarding Kansas producers' frequency of marketings. The fourth section applies the econometric model to a consideration of the effects of farm and operator characteristics on marketing frequency. The final section offers a brief summary and some concluding remarks.

Conceptual Framework

At its most fundamental level, an evaluation of producers' frequency of marketing is analogous to a consideration of commodity storage. Producers, in possession of a stock of commodity upon harvest, face the decision of selling the entire harvest at time t, or holding some proportion of the stock in storage and selling at some future time t+j. A producer's marketing plan may involve a sequence of such decisions, whereby a producer sells some proportion of production at harvest and sells other portions of the harvest at future periods.

The theory of commodity storage has received considerable theoretical and empirical attention in recent years. Williams and Wright provide a comprehensive review of the theory of commodity storage. In general, the storage problem for a producer in possession of a stock of commodity is a simple dynamic programming problem with a finite horizon and a zero supply elasticity. The finite end-point is chosen to correspond to the end of the crop year, upon which all of the commodity is assumed to be sold and a new harvest/storage problem begins.

Consider a small, price-taking producer in possession of a stock of commodity A_t at time t. This producer has two options, selling the entire stock commodity at time t for P_t or holding all or some portion of the commodity in storage, S, at a cost of k per period, and selling at some future time. The producer will act to maximize the expected utility of profits, given by

$$\text{(1)} \quad E_t U(\pi_t) = E_t U\left(\left(\sum_{j=t}^{T} P_j A_j - kS_j \right) / (1+r)^{j-t} \right)$$

where r is a real discount rate. For a risk-neutral agent, storage arbitrage relationships are implied from this condition for each period such that

$$(2) \quad P_t + k = \mathrm{E}_t(P_{t+1})/(1+r) \quad , \text{ with } S_t > 0 \text{ and}$$

$$(3) \quad P_t + k \geq \mathrm{E}_t(P_{t+1})/(1+r) \quad , \text{ with } S_t = 0 \ .$$

These conditions imply that agents will choose to store and hold a stock of commodity if the current price is less than the discounted, expected future price less the costs of storage. In the case of a risk-averse agent or an agent facing capital constraints, a divergence in these conditions may appear such that a risk premium term, γ, appears in the right-hand side of (2) and (3):[1]

$$(4) \quad P_t + k = \mathrm{E}_t(P_{t+1})/(1+r) + \gamma_{t+1} \ .$$

The risk premium term may be positive or negative and may also reflect an option value or convenience premium. Expanding this condition to recognize the problem's dynamic, multiperiod nature, one may note that similar arbitrage conditions exist for any pair of future expected prices:

$$(5) \quad \mathrm{E}_t(P_{t+1})/(1+r) + \gamma_{t+1} = \mathrm{E}_t(P_{t+j})/(1+r)^{J-t} + \gamma_{t+j} \ .$$

To the extent that violations of this arbitrage condition occur (perhaps because of the risk premia terms), agents may choose to store the commodity and market portions of the stock over time. In such cases, producers may be observed to frequently market their production. It is important to note that constraints to the maximization of expected utility have been omitted. To the extent that capital constraints or other factors may limit a producer's marketing flexibility, the frequency of marketing may be constrained. For example, a producer facing a large production loan due at harvest may have to market at harvest rather than hold the commodity in storage, regardless of expected future arbitrage conditions.

This conceptual framework suggests that factors associated with constraints to a farm operation, as well as characteristics of the farm operator that might be related to risk attitudes would be expected to be correlated with the observed frequency of marketings. Thus, an empirical model of marketing frequency should include factors hypothesized to be relevant to a producer's production and marketing environment as well as factors associated with a producer's risk attitude and perception. Further, factors associated with the costs of marketing should be considered. One would hypothesize that marketing costs consists of both fixed and variable components. To the extent that fixed costs are relevant, the scale of production would be expected to be an important factor influencing the frequency of marketing. In particular, producers with more of a commodity at harvest would be expected to market more frequently since the fixed costs of marketing would be spread over a greater number of bushels. Thus, empirical models should contain quantity of production measures.

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[1] Holthausen notes that, in the absence of basis risk, producers' storage decisions, and by implication their frequency of marketing, will not be affected by risk aversion. Rather, risk averse producers will take positions in the futures market to offset the effects of risk. However, basis risk, transactions costs, marketing constraints, and other attitudinal factors may lead to divergences from arbitrage conditions for risk-averse producers, even with fully functioning futures markets.

Other characteristics of the farm enterprise are also expected to be relevant to the frequency of marketing. Farms that are principally crop enterprises (versus livestock or dairies) would be expected to market more frequently since livestock producers may choose to store a significant proportion of production for feeding on the farm. Much of the feed production in Kansas is irrigated. Thus, farms with irrigated acres may be expected to market less frequently than dryland farms since much of the crop production may be stored for on-farm feeding. Irrigated crops also have significantly higher costs of production than dryland crops. Thus, short-term operating costs may be higher and capital constraints therefore more binding. The proportion of total farm acres engaged in crop production (versus pasture, set-aside, and waste) and the proportion of total farm acres irrigated are included in the empirical model.

A farm's financial position may be relevant to lender-imposed constraints that influence the frequency of marketing. In particular, a producer who is highly leveraged may be forced to market an entire crop at harvest in order to service the farm's debt. The debt-to-asset ratio is included in the empirical models to capture such an effect. Ellinger and Barry have shown that farms with a higher proportion of rented acres tend to be more highly leveraged and face greater capital constraints. Farms with more rented acres, by definition, operate with a smaller relative capital base. The proportion of total acres rented is included in the empirical models. A dummy variable having the value of one if the producer does not depend upon short-term borrowing for operating and production funds is also included in the empirical models to capture lender-imposed marketing constraints.

The financial performance of a farm enterprise may also be relevant to the frequency of marketing. Two variables representing the performance of the farm enterprise are included in the empirical models. First, a rate of return on the farm's capital is included to capture financial performance. Second, a measure of cropping efficiency, given by the ratio of total crop revenues to total variable production expenses, is included to measure production efficiency. Farmers may tend to specialize in managing yield risk or price risk according to their own, subjective comparative advantage. Farmers who are more efficient in production may concentrate management efforts more on production and less on marketing. In this case, such farmers would be expected to market less frequently.

Producers' attitudes toward risk are expected to be important factors influencing their marketing practices. Producers' risk attitudes are represented by two variables. The first is a subjective ranking of risk preferences (1=Risk Hating, ..., 10=Risk Loving). The second is a dummy variable taking the value of one if the producer is more concerned with price risk than yield risk. Risk averse producers may be expected to market less frequently since the risk premia associated with uncertain expected future prices would be larger for such producers. However, it is also possible that a risk-averse producer would market more frequently in an attempt to smooth revenue streams over a distribution of uncertain prices. Thus, the expected effect of the subjective risk preference variable is uncertain. Producers who are more concerned with yield risk are expected to market less frequently.

Producer characteristics such as age and education are expected to be correlated with the observed frequency of marketing. Marketing programs involving frequent marketings, often in forward or futures markets, are sometimes complex. Producers with more academic and non-academic education may have advantages in implementing more sophisticated marketing plans and may thus be likely to market more frequently. The years of formal academic education of producers was included in the empirical models. In addition, a dummy variable with the value of one if the producer had attended any non-academic marketing/risk-management educational seminars was included. The years of experience in farming may also be relevant to a producer's ability to comprehend and implement sophisticated marketing plans. Alternatively, older, more experienced farmers may have accumulated knowledge regarding historical profits associated with the frequency of marketing. The producers' age was included to capture attitudes associated with age as well as to represent years of farming experience.[2] Farmers may also be educated through their reading of farm production and marketing related publications. A variable representing the number of hours per week spent reading such publications was included in the empirical models.

Diversification of a farm enterprise may also be correlated with the costs associated with marketing. A highly diversified farm faces more frequent marketings across commodities since there are many commodities to market. However, in such a case, a highly diversified farm would be expected to market any particular commodity less frequently. Marketing practices and institutions often differ from crop to crop. Producers may choose to concentrate their marketing efforts on the crop that is most important to their farm enterprise. That is, farms that are highly specialized in the crop of interest may be expected to market that crop more frequently. A dummy variable with the value of one if the crop of interest comprises at least fifty percent of the farm's total crop production is included to capture this specialization effect. The organization of the farm enterprise may influence the marketing practices of the operator. Partnerships and corporate farm enterprises may market more frequently since the objectives of several operators may influence the marketing plan.

Finally, various aspects of a producer's marketing practices may interact with one another. In particular, it is expected that producers who adopt forward and future pricing methods may market more frequently than producers who only sell in the cash market. The average proportion of production of each crop sold in forward and futures markets was included to capture such interactions.[3]

Econometric Procedures

In the empirical models of the frequency of marketing, the observed dependent variable, the number of marketings in a season, is a non-negative integer. The empirical models relate the

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[2] Age and years of farming experience are very highly correlated. Replacing age with years of experience gave almost identical results.

[3] The potential for simultaneity between the frequency of marketing and the use of forward pricing methods should be acknowledged. Evaluating the potential for simultaneity is a topic of current research.

observed frequency of marketing to a number of conceptually relevant explanatory variables. The form of the empirical models is

(6) $$\text{Prob}\left(y_i = Y | X_i\right) = f(X_i\beta) ,$$

where $y_i = 0, 1, ..., N$ corresponds to the observed number of marketings. Continuous distribution estimators do not recognize the discrete nature of the data. Count data estimators may be more appropriate as they explicitly acknowledge the discrete distribution of the data. In addition, they restrict positive probability assignment to possible events. In particular, Poisson count data estimators have been used in recent studies (Hausman, Hall, and Griliches). In the case of the Poisson model, the relationship between the frequency of marketing, y_i, and the explanatory variables is assumed to be

(7) $$\text{Prob}\left(y_i = Y | X_i\right) = e^{-\lambda_i}\lambda_i^{y_i}/y_i! \quad , \text{ where } \ln\lambda_i = X_i\beta + u_i \quad .$$

The normal distribution is a good approximation of the Poisson distribution if the Poisson parameter λ, the conditional mean and variance of the dependent variable, is large (Larson). Thus, the importance of respecting the count data nature of the dependent variable may depend on the problem at hand. Creel and Loomis (1990) note that one should be cautious in using normal MLE to model a count data process for which small values of the dependent variable are common.

One implicit assumption of the Poisson model is that the conditional mean of the dependent variable, λ, is equal to the conditional variance (Greene). Overdispersion of the population is defined as the conditional variance of the dependent variable exceeding the conditional mean. Overdispersion is a form of heteroscedasticity and estimates from the Poisson model will be downwardly biased and inefficient, but consistent. In addition, if the conditional mean is misspecified, the Poisson estimator is both biased and inconsistent. Cameron and Trivedi have suggested two regression based tests for overdispersion in the Poisson regression model. Both tests evaluate the null hypothesis that the mean and variance of the dependent variable in the regression model are equal. The first test has, as its alternative, the hypothesis that the variance is equal to the mean plus a scalar multiple of the mean. The second test has, as its alternative, the hypothesis that the variance is a quadratic function of the mean. The tests are conducted in a regression framework by regressing z_i on w_i, where

(8) $$z_i = \left(\left(y_i - \mu_i\right)^2 - y_i\right) / \left(\sqrt{2}\,\mu_i\right) \quad , \text{ and}$$

(9) $$w_i = g(\mu_i) / \left(\sqrt{2}\,\mu_i\right) \quad .$$

For the first test, $g(\mu_i)$ is equal to μ_i, the conditional mean of y. For the second test, $g(\mu_i)$ is equal to μ_i^2. Test statistics, defined as t_1 and t_2, are given by the respective t-ratios from the regressions.

The negative binomial estimator can be used when overdispersion is present.[4] The negative binomial probability law may be written as

$$\text{(10)} \qquad \text{Prob}\left(y_i = Y \mid X_i\right) = \frac{\Gamma(y_i + 1/\alpha)}{\Gamma(\alpha+1)\,\Gamma(1/\alpha)} (\alpha\lambda)^2 (1+\alpha\lambda)^{-(y_i+1/\alpha)} \quad ,$$

where $\Gamma(\cdot)$ indicates the gamma function and α is a parameter. As $\alpha \rightarrow 0$, the gamma distribution becomes degenerate and the negative binomial distribution reduces to the Poisson distribution.

Discussion of Data

Data were collected by surveying 1,963 Kansas farms in September 1992.[5] Producers identified the number of times per season that they typically marketed their crops. The survey data were matched to detailed farm management records from the Kansas Farm Management Association data bank. Of the 1,963 farms surveyed, 572 usable surveys were returned, corresponding to a 29 percent response rate. Of the 572 producers returning surveys, 538 produced wheat, 226 produced corn, 387 produced grain sorghum, and 316 produced soybeans. Several of the returned surveys were dropped from the empirical analysis due to incomplete responses. The empirical models contained 306 observations for wheat growers, 108 observations for corn growers, 205 observations for grain sorghum producers, and 114 observations for soybean producers.

Table 1 contains a summary of the frequency of marketing for the 572 producers. In every case, the mode of the implied distribution corresponds to a marketing frequency between 2 and 5 times per season. A minority of the producers chose to market a single time. For wheat and corn, only 18 percent of the producers indicated that they marketed their entire crop in a single sale. For grain sorghum and soybean producers, these percentages were somewhat higher (26 and 30 percent, respectively) but still indicated that a majority of the producers marketed more than once. Figure 1 also illustrates the frequency of marketing for each of the commodities.

Empirical Results

In accordance with the conceptual model of storage and marketing frequency, a number of variables were hypothesized to be relevant to the frequency of marketing. Definitions and summary statistics for the explanatory variables are given in Table 2. Parameter estimates and

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[4] Of course, as is true with any maximum likelihood estimator, the negative binomial estimator will produce unbiased estimates only if the true distribution is negative binomial.

[5] The survey sample was comprised of 1991 members of the Kansas Farm Management Association. Featherstone, Griebel, and Langemeier found that, when compared to the USDA's stratified Farm Costs and Returns Survey data, the Kansas Farm Management Association data are representative of commercial farming operations in Kansas.

standard errors for the Poisson and negative exponential models of marketing frequency are presented in Table 3. The results confirm that the observed frequency of marketings for wheat, corn, grain sorghum, and soybeans are correlated with farm and operator characteristics. Many of the farm and operator characteristics are statistically significant in both the Poisson and negative binomial regression models. As expected, the parameter estimates of the Poisson model are very similar to those from the negative binomial model but are generally more statistically significant. Recall that overdispersion will lead to consistent estimates but that standard errors will be estimated inaccurately.

Specification tests for overdispersion in the Poisson model are presented in Table 3. With the exception of wheat, the first test for overdispersion t_1, which considers a variance which is given by the mean plus a scalar multiple of the mean, supports the Poisson specification. The rejection for wheat occurs at the $\alpha = .06$ level. However, in every case, the second specification test t_2 rejects the null hypothesis of no overdispersion in favor of the alternative hypothesis that the variance is a quadratic function of the mean. Because overdispersion is not supported by both tests, both the Poisson and negative binomial estimates are presented. However, in light of these results, the Poisson estimates should be viewed cautiously.

As expected, the results indicate that the frequency of marketing rises as total production increases. This is a scale effect that likely reflects the fixed costs associated with marketing. The scale of production is statistically significant in every model. Farms that are more specialized in crop production, as indicated by the proportion of acres in crops versus pasture, waste, and set-aside, are more likely to market frequently. The crop proportion variable is statistically significant for both wheat and soybean models and for the Poisson corn model. This may reflect the fact that producers with a significant proportion of their farm land in pastures may feed crop production on the farm.

Corn, grain sorghum, and soybean farms that rent a significant proportion of their acreage appear to market less frequently than farms that own more of their acreage. This may be because renters face greater constraints from lenders (Ellinger and Barry), who may press for quick selling at harvest so that loans may be serviced. Irrigated corn and soybean farms market significantly less frequently than nonirrigated farms. At least in the case of corn, this may reflect the fact that much of the irrigated acreage in Kansas is used for feed production. Producers with irrigated farms may be feeding production on the farm rather than selling in the market. In addition, irrigated production involves significantly higher costs of production which may tighten capital constraints.

Financial leverage, as represented by the debt-to-asset ratio, is significantly correlated with the frequency of marketing by wheat producers. In particular, wheat farms with high relative leverage ratios market significantly less frequently than farms with low relative debt levels. The rate of return on capital is positively correlated with the frequency of marketing for corn producers. However, this rate of return is not significant for any of the other crops. A related effect is measured by the source of funds variable. Corn producers that do not depend upon short-term borrowing appear to market significantly more often than producers who borrow to cover short-term production costs. However, this effect is not statistically significant for any of the other crops.

Cropping efficiency, as measured by the ratio of total returns to variable production costs, is significantly correlated with the frequency of marketing by wheat producers but does not appear to significantly affect marketing frequency for any other crops. This may suggest that wheat producers who have a comparative advantage in managing production aspects of their farm operation may devote less attention to marketing issues, thereby marketing less frequently.

Surprisingly, producers' risk attitudes do not appear to significantly influence their frequency of marketing. The price risk variable is not significant, suggesting that those producers who are more concerned with price risk do not appear to market more frequently than those producers who are more concerned with yield risk. The subjective risk preference rating is only significant in the Poisson corn model. One explanation for the seemingly low significance among the risk variables is that the risk variables considered are too general, and not capable of isolating fear of future prices (causing a producer to sell now), from a distaste for interyear price variability, causing a producer to market often in an attempt to acquire a year's average price.

Producers that devote more efforts to self-education by reading farm publications appear to market more frequently. In particular, the hours reading variable is statistically significant for both models in the case of wheat and for the Poisson models for corn and grain sorghum. This may suggest that information gathered through such publications contributes toward the formulation of marketing plans that involve more frequent marketing.

Structural aspects of the farm enterprise appear to be relevant to the frequency of marketing in several cases. In the case of wheat and corn, farms that are specialized in production of those crops are likely to market more frequently. Farm enterprises organized as partnerships appear to market significantly more often than comparable sole-proprietorships. This may reflect the fact that the interests and objectives of several individuals are involved in marketing decisions of a partnership. Accommodating the increased number of marketing goals may bring about more frequent marketings.

The age of the producer is significantly correlated with the frequency of marketings. In particular, older producers of wheat, corn, and soybeans market less frequently. Education does not appear to be a significant determinant of the frequency of marketing except in the case of wheat, where education is statistically significant in the Poisson model. Likewise, participation in private and extension-related risk management and marketing seminars does not appear to significantly influence the frequency of marketings.

Finally, corn, grain sorghum, and soybean producers that sell in forward and futures markets appear to market significantly more frequently. This result may suggest that there is significant interaction between the frequency of marketing and the adoption of futures and forward pricing techniques. This interaction and the potential for simultaneous decision making is an important topic for future research.

Summary and Conclusions

This study evaluates the frequency of marketing by a sample of 572 Kansas crop producers. The frequency of marketing is an important dimension of agricultural marketing that has received relatively little theoretical or empirical attention. At its most fundamental level, the frequency of marketing is intimately related to on-farm and off-farm commodity storage. At harvest, producers weigh current and expected future prices as well as constraints facing their farm enterprises and risk preference factors to determine whether to sell the commodity upon harvest or place some proportion of the commodity in storage for sale at a later date.

Estimators appropriate for integer count data are utilized to evaluate the relationship among farm and operator characteristics with observed frequencies of marketing. The results indicate that large, non-irrigated crop partnerships which have little rented acreage market the most frequently. Young operators that spend a considerable amount of time in self-education efforts also appear to market more frequently.

These results may have important implications for public price statistics that are taken as indicators of prices received by producers. In particular, these results suggest that most farmers market several times, likely throughout the crop year. This may suggest that harvest-time prices are not the quotes most relevant to the prices received by producers.

The results also suggested that significant interaction may exist between forward pricing activities and the frequency of marketing, at least for corn, grain sorghum, and soybeans. Future research should further evaluate these linkages and should consider the potential for simultaneous decision making for marketing frequency and forward pricing.

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Table 1. Frequency of Marketing per Season by Kansas Crop Producers

Frequency per Season	Wheat	Corn	Grain Sorghum	Soybeans
0	.0038	.1107	.0180	.0569
1	.1784	.1770	.2610	.2975
2-5	.6561	.5177	.6021	.5222
6-10	.1338	.1327	.0982	.0918
> 10	.0279	.0619	.0207	.0316
n	538	226	387	316

Table 2. Variable Definitions and Summary Statistics for Analysis of Marketing Frequency

Variable	Description	Mean	Standard Deviation
Wheat Frequency	Number of times per season wheat is typically marketed	3.7730	3.7896
Corn Frequency	Number of times per season corn is typically marketed	3.9513	4.8044
Sorghum Frequency	Number of times per season grain sorghum is typically marketed	3.0103	2.5873
Soybean Frequency	Number of times per season soybeans are typically marketed	3.0633	3.1727
Wheat Production	Wheat production in 1991 (1000 bu.)	13.9360	21.2710
Corn Production	Corn production in 1991 (1000 bu.)	8.1872	20.3360
Sorghum Production	Grain sorghum production in 1991 (1000 bu.)	8.2940	12.8240
Soybean Production	Soybean production in 1991 (1000 bu.)	2.4765	4.7221
Crop Proportion	Proportion of farm acres engaged in crop production (versus set-aside, pasture, and waste)	.7100	.2519
Irrigated Proportion	Proportion of total farm acres irrigated	.0594	.1495
Rent Proportion	Proportion of total farm acres rented	.6204	.3037
Debts / Assets	Debt to asset ratio	.3948	.3998
Capital Return	Rate of return on managed capital (%)	-1.3415	7.1074

Table 2. (continued)

Cropping Efficiency	Ratio of crop revenues to variable crop production costs	1.7290	1.4726
Source of Funds	0 if operating funds are borrowed, 1 otherwise	.2041	.4034
Price Risk	1 if producer believe most farm risk is from prices, 0 if from yields	.6134	.4875
Hours Reading	Number of hours typically spent reading farm publications per week	4.1972	3.2289
Risk Preference	Producer's subjective risk preference ranking (1 = Risk Hating, ..., 10 = Risk Loving)	4.7671	1.9894
Specialized (wheat)	1 if at least 50% of crop production is wheat, 0 otherwise	.4410	.4970
Specialized (corn)	1 if at least 50% of crop production is corn, 0 otherwise	.1416	.3489
Specialized (grain sorghum)	1 if at least 50% of crop production is grain sorghum, 0 otherwise	.1888	.3917
Specialized (soybeans)	1 if at least 50% of crop production is soybeans, 0 otherwise	.0127	.1121
Corporation	1 if farm enterprise is a corporation, 0 otherwise	.0332	.1794
Partnership	1 if farm enterprise is a partnership, 0 otherwise	.0542	.2266
Age	Age of producer	50.6500	12.8440
Education	Years of formal education	13.8790	2.1616
Seminar	1 if producer attended risk management / marketing seminar, 0 otherwise	.6693	.4709
% Wheat FP	Percentage of wheat forward priced (average over 1989-91)	14.6480	21.6530
% Corn FP	Percentage of corn forward priced (average over 1989-91)	19.2090	26.2920
% Sorghum FP	Percentage of grain sorghum forward priced (average over 1989-91)	7.7859	17.8790
% Soybeans FP	Percentage of soybeans forward priced (average over 1989-91)	14.0400	22.1510

Table 3. Parameter Estimates and Standard Errors for Poisson and Negative Binomial Regression Models of Marketing Frequency.[a,b]

Variable	Wheat		Corn		Grain Sorghum		Soybeans	
	Poisson	Negative Binomial	Poisson	Negative Binomial	Poisson	Negative Binomial	Poisson	Negative Binomial
Intercept	.7912	.7912	1.7354	1.7354	1.0050	1.0050	1.5282	1.5282
	(.3424)**	(.5028)	(.5152)**	(.8639)**	(.4784)**	(.7075)	(.4893)**	(.9013)*
Production[c]	.0072	.0076	.0065	.0066	.0181	.0190	.0372	.0386
	(.0015)**	(.0026)**	(.0023)**	(.0036)*	(.0030)**	(.0053)**	(.0077)**	(.0171)**
Crop Proportion	.5774	.5774	.6158	.6158	.1992	.1992	.7439	.7439
	(.1487)**	(.2436)**	(.3168)*	(.4181)	(.2055)	(.3532)	(.2217)**	(.4529)*
Rent Proportion	.0288	.0288	-.7157	-.7157	-.3890	-.3890	-.6786	-.6786
	(.1260)	(.2076)	(.2016)**	(.3141)**	(.1609)**	(.2345)*	(.1644)**	(.2755)**
Irrigated Proportion	-.3265	-.3265	-.7324	-.7324	-.6151	-.6151	-1.4508	-1.4508
	(.2206)	(.3893)	(.2502)**	(.3562)**	(.3534)*	(.5547)	(.3314)**	(.5980)**
Debts / Assets	-.2823	-.2823	.0622	.0622	-.1946	-.1946	-.1069	-.1069
	(.0897)**	(.1101)**	(.1192)	(.1354)	(.1124)	(.2031)	(.1174)	(.1589)
Capital Return	.0077	.0077	.0289	.0289	.0040	.0040	.0170	.0170
	(.0053)	(.0047)	(.0103)**	(.0145)**	(.0055)	(.0158)	(.0136)	(.0260)
Cropping Efficiency	-.1077	-.1077	-.0183	-.0183	-.0254	-.0254	-.0125	-.0125
	(.0313)**	(.0640)*	(.0294)	(.0722)	(.0251)	(.0265)	(.0308)	(.0714)
Source of Funds	-.0706	-.0706	.7704	.7704	-.0471	-.0471	.1044	.1044
	(.0844)	(.1214)	(.1417)**	(.2061)**	(.1100)	(.1684)	(.1182)	(.1956)
Price Risk	.0530	.0530	-.1343	-.1343	-.0146	-.0146	-.0319	-.0319
	(.0636)	(.0876)	(.1055)	(.1531)	(.0855)	(.1341)	(.0900)	(.1651)

[a] Single and double asterisks indicate statistical significance at the .10 and .05 levels, respectively. Standard errors are in parenthesis.

[b] Partial effects may be derived by multiplying parameter estimates by respective mean values from Table 2.

[c] Production of each respective crop.

Table 3. (continued)

Variable	Wheat		Corn		Grain Sorghum		Soybeans	
	Poisson	Negative Binomial	Poisson	Negative Binomial	Poisson	Negative Binomial	Poisson	Negative Binomial
Hours Reading	.0284	.0284	.0344	.0344	.0268	.0268	.0126	.0126
	(.0098)**	(.0130)**	(.0153)**	(.0228)	(.0122)**	(.0178)	(.0151)	(.0274)
Risk Preference	.0030	.0030	-.0589	-.0589	-.0080	-.0080	.0094	.0094
	(.0161)	(.0226)	(.0291)**	(.0371)	(.0230)	(.0330)	(.0254)	(.0500)
Specialized[d]	.2179	.2179	.3038	.3038	-.1354	-.1354	-.2660	-.2660
	(.0692)**	(.0937)**	(.1403)**	(.1872)*	(.1139)	(.1771)	(.2979)	(.5143)
Corporation	-.0078	-.0078	-.5550	-.5550	-.2995	-.2995	-.5280	-.5280
	(.1634)	(.3592)	(.2578)**	(.3525)	(.2552)	(.3180)	(.2349)**	(.3615)
Partnership	.3589	.3589	.5646	.5646	.3310	.3310	.4965	.4965
	(.1046)**	(.1608)**	(.1555)**	(.2153)**	(.1357)**	(.1784)*	(.1195)**	(.2280)**
Age	-.0111	-.0111	-.0207	-.0207	-.0062	-.0062	-.0165	-.0165
	(.0030)**	(.0038)**	(.0045)**	(.0067)**	(.0042)	(.0068)	(.0042)**	(.0077)**
Education	-.0370	.0370	.0108	.0108	.0314	.0314	.0030	.0030
	(.0155)**	(.0238)	(.0262)	(.0371)	(.0211)	(.0331)	(.0230)	(.0429)
Seminar	-.0171	-.0172	.1239	.1239	-.0969	-.0969	-.0719	-.0719
	(.0654)	(.0937)	(.1263)	(.1824)	(.0861)	(.1133)	(.0931)	(.1638)
Percent FP	.0003	.0003	.0081	.0081	.0040	.0040	.0075	.0075
	(.0014)	(.0023)	(.0021)**	(.0027)**	(.0022)*	(.0035)	(.0018)**	(.0032)**
α		.1382		.0873		.1244		.2257
		(.0383)**		(.0636)		(.0514)**		(.0753)**
Log Likelihood	-642.80	-643.07	-233.35	-234.00	-406.33	-407.65	-360.51	-352.23
t_1	1.91*		1.38		1.55		1.65	
t_2	2.76**		2.85**		3.07**		1.79*	

[d] Specialized takes the value of 1 if at least 50% of crop production is in the particular crop and is 0 otherwise.

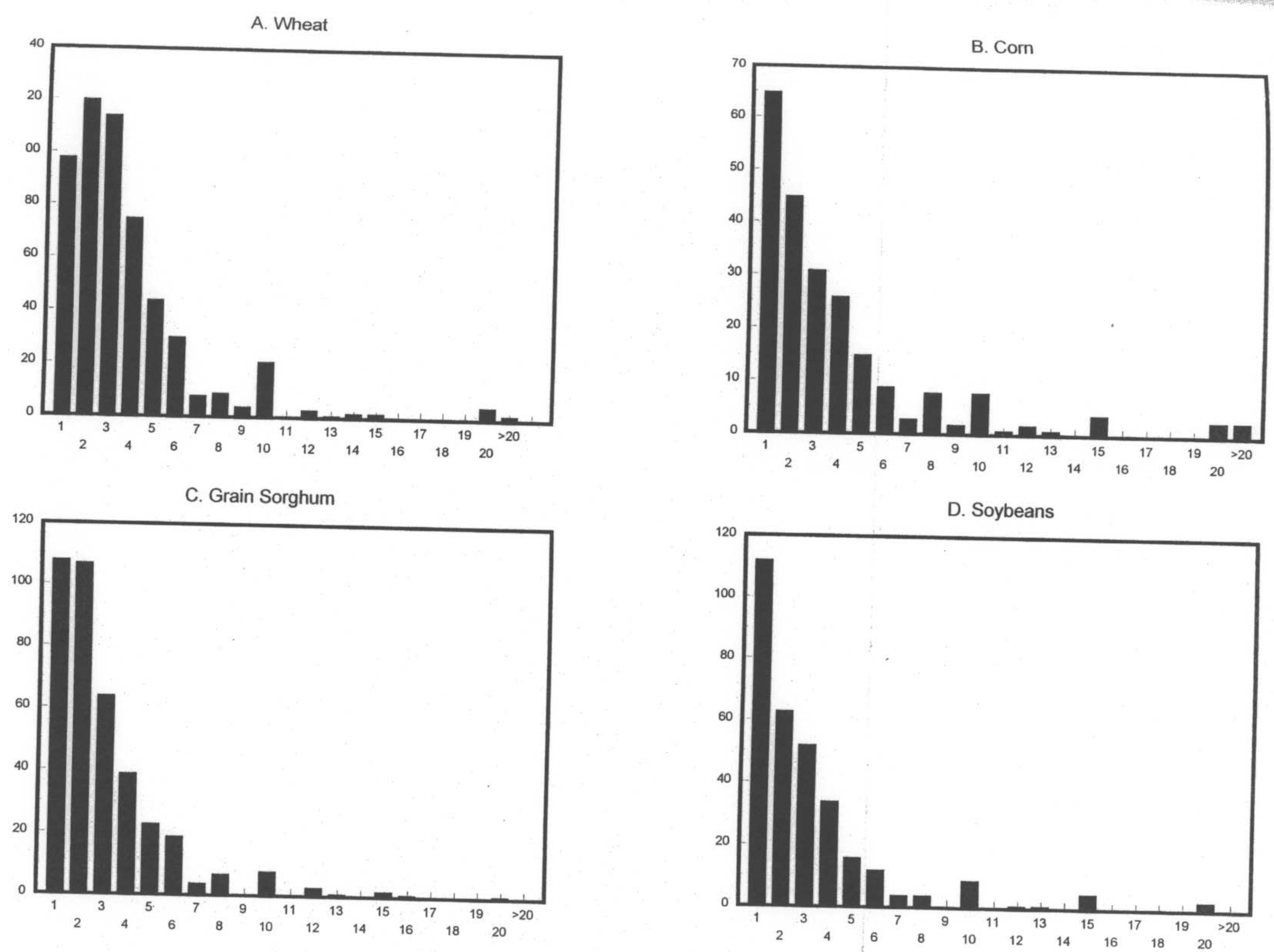

Figure 1. Frequency of Marketing by Kansas Crop Producers