

# **Rental Premiums for Share Versus Cash Leases**

Peter J. Barry, Cesar L. Escalante, and LeeAnn E. Moss

Peter J. Barry is a professor of agricultural finance in the Department of Agricultural and Consumer Economics at the University of Illinois at Urbana-Champaign. Cesar L. Escalante is an assistant professor in the Department of Agricultural and Applied Economics at the University of Georgia. LeeAnn E. Moss is an assistant professor in the Department of Agricultural, Environmental, and Development Economics at The Ohio State University.

2002 Annual Meeting of the American Agricultural Economics Association  
Long Beach, CA, July 28-31, 2002.

*Copyright 2002 by Peter J. Barry, Cesar L. Escalante and LeeAnn E. Moss. All rights reserved.  
Readers may make verbatim copies of this document for non-commercial purposes by any  
means, provided that this copyright notice appears on all such copies.*

## **Rental Premiums for Share Versus Cash Leases**

The long-standing practice of share leasing for farmland, especially in Mid-Western U.S. agriculture, is increasingly giving way to cash leasing and to combinations of cash and share leasing (Reiss; Barry et al.; Barry). According to the 2001 Agricultural Economics and Land Ownership Survey, cash payments instead of or in addition to crop shares characterized about 59% of farmland leases in Illinois during 1999, up from 37% in 1988 (National Agricultural Statistics Service). The drivers of change primarily involve risk, income, managerial control, (especially when multiple landowners are involved), and land value issues facing farmers, landowners, and professional farm managers who represent the land owners (Sotomayor, Barry, and Ellinger). These changes may strongly influence the risk and financial positions of the respective leasing parties.

Compared to fixed cash leases, share leases offer farmers the opportunity to allocate yield risks and perhaps management responsibilities to land owners in the same proportion that crops and operating costs are shared. At the same time, however, the allocation of returns in the relationship would need to compensate the landowner for these inputs. The possible existence of a risk premium is comparable to the long-standing search for risk premia in equity and commodity markets (Kockerhaphkota; Williams). Other studies (e.g., Dasgupta, Knight and Love; Cheung; Allen and Leuck) conclude that risk is of secondary importance in leasing arrangements relative to transactions cost and property rights. Little if any empirical evidence is available, however, about the potential spread between rent levels on cash versus share leases. The availability of such information would assist in evaluating the equitable terms and incentive characteristics of leasing arrangements and elucidate the risk management dimensions of share leases.

The goals of this study are to empirically estimate the rental spread between cash and share leases in Illinois and to determine how these spreads are related to risks and other farm characteristics. A conceptual framework demonstrating the key relationships is established in the next section. Data from the Illinois Farm Business Farm Management Association are used in the empirical analysis. The estimated spreads represent the rent paid by farmers and received by landowners, although the available data confine the analysis to the farmer's side of the transaction. The article concludes by discussing the implications of the findings.

### **Conceptual Framework**

The theoretical basis for a farmer's valuation of crop share versus cash leases can be demonstrated by expressing the expected utility from leasing under each rental arrangement. The goal is to suggest key attributes from the farmer's perspective that could influence the properties of the rental spread, and thus serve as the basis for empirical testing. The demonstration can be aided by utilizing the mean-variance approach in which the farmer's utility is modeled by the negative exponential  $U(n) = 1 - e^{-2In}$  where  $n$  is the net return from leased land and  $\bar{e}$  is the degree of absolute risk aversion (Meyer; Robison and Barry). As Freund has shown, under normality, the utility expression is equivalent to maximizing

$$1) \quad E[U(n)] = E(n) - \frac{1}{2} \bar{e} S_n^2$$

where in this case  $E(n)$  and  $S_n^2$  are the expected return and variance, respectively, from leasing.<sup>1</sup>

Let the farmer's expected net income ( $\bar{n}$ ) (returns to labor, capital and management) under either cash or share leasing be the expected value of production ( $\bar{y}$ ) minus land rent, operating costs ( $oc$ ) and transaction or agency costs ( $a_c, a_s$ ) for the two leasing options (Barry et al.):

$$2) \quad \bar{n} = \bar{y} - ps\bar{y} - (1-p)r - p(1-s)oc - (1-p)oc - pa_s - (1-p)a_c$$

where  $p = 1.0$  for a share lease and  $p = 0.0$  for a cash lease;  $s$  is the landlord share ( $0 \leq s \leq 1$ ); and  $r$  is the fixed cash rent. Transaction costs and agency costs are closely related, and as such will be referred to as agency costs.

Under risk,  $\bar{n}$  and  $\mathbf{s}_n^2$  are the expected value and variance of net income, and  $\bar{y}$  and  $\mathbf{s}_y^2$  are the expectation and variance of the value of farm production – the farmer's primary sources of risk. In a share lease, the variance of the farmer's net income is reduced in proportion to the share rent, yielding net income variance of <sup>2</sup>

$$3) \quad \mathbf{s}_n^2 = (1-s)^2 \mathbf{s}_y^2$$

Substituting 2) and 3) into 1), the farmer's expected utility condition under share leasing is

$$4) \quad E[U(n)] = (1-s)(\bar{y} - oc) - a_s - \frac{1}{2}(1-s)^2 \mathbf{s}_y^2$$

For cash leasing, the variance of the farmer's net returns is

$$5) \quad \mathbf{s}_n^2 = \mathbf{s}_y^2$$

Substituting 2) and 5) into 1) for cash leasing, the farmer's expected utility is

$$6) \quad E[U(n)] = \bar{y} - r - oc - a_c - \frac{1}{2} \mathbf{s}_y^2$$

The level of cash rent that yields equal expected utility between a share lease and a cash lease is found by setting equations 4) and 6) equal to each other and solving for r:

$$7) \quad r = s(\bar{y} - oc) + a_s - a_c - \frac{1}{2} \mathbf{s}_y^2 [s(2 - s)]$$

The observed rental spread then is the difference between the share rent and the expected utility-equivalent cash rent (see the appendix for the derivation details and for a parallel characterization of the landowner's rental spread):

$$8) \quad s(\bar{y} - oc) - r = a_c - a_s + \frac{1}{2} \mathbf{s}_y^2 [s(2 - s)]$$

Inspection of 8) indicates that the rental spread may directly reflect the farmer's level of risk aversion, the variability of crop returns, the magnitude of the shares, and the levels of agency costs. From the farmer's viewpoint, higher levels of risk aversion are associated with higher rental spreads, and thus lower bids on cash rents relative to existing share rents. Less risk averse farmers will offer higher bids on cash leases relative to share leases. Greater variability of returns on farmland is associated with greater rental spreads, and thus lower bids on cash rents relative to existing share rents. Similarly, a larger positive (negative) difference between the agency costs on cash versus share leases would increase (decrease) the rental spread. Thus, farmers who perceive less variability in returns, achieve lower than average anticipated variability due to other risk management practices, or who experience higher agency costs on share leasing would bid higher cash rents relative to expected share rents.

The potential magnitude of the rental spreads is illustrated in Table 1 for a range of numerical values of the spread determinants in equation 8). The risk aversion coefficient is bounded by the values observed by Babcock, Choi and Feinerman for a gamble (rent per acre) size of approximately \$100, with three equally spaced intervals within the boundaries. The landowners' shares are the commonly observed 1/2 and 1/3 levels in Illinois, standard deviations are \$10, \$20, \$30, and \$40 (Barry, Escalante, and Bard), and for simplicity the agency costs on cash and share leases are assumed to be equal. For the 1/2 share, rental spreads in the \$2 to \$10 range fall within the more plausible ranges of the risk aversion and variability measures. For this illustration, the degree of sensitivity of the rental spreads appears greater across the risk attitude and variability ranges than for the two share levels. To the extent that the farmer's agency and other costs on share leases exceed those of cash leases, the rental spreads in Table 1 would decline.

### **Empirical Analysis**

The empirical analysis first determines measures of the rental spreads for Illinois grain farms and then utilizes logit regression to test how positive and negative spreads are influenced by measures or proxies of the variables in equation 8) and by other structural characteristics. Farm level data from 1995 to 1998 from the Illinois FBFM Association are used in the analysis. Revisions in 1994 to the FBFM accounting and reporting format to emphasize the compilation and reporting of operator data rather than whole farm data now allow direct measurement of per acre cash rents and share rents paid by farmers to landlords. These rental payment measurements were not identifiable prior to 1995. Inconsistencies over time, however, in the balance sheet certifications of individual FBFM operator data in multiple operator farms (i.e., partnerships) require the use of single operator farms only in the

econometric portion of the study's analysis. This specification reduced the number of farm observations by about 20 per year.

The data are reported by FBFM in terms of each farm's tillable acres and the "operator acres", thus reflecting whatever sharing levels ( $1/2 - 1/2$ ,  $2/3 - 2/3$ ) are employed in the operator's lease contracts. For example, two acres leased under a  $1/2-1/2$  crop share lease are equivalent to 1 operator acre. The per acre values of farm production, including government payments and variable costs attributed as share rent to the landlord, are determined by calculating the operator's crop returns and variable costs in proportion to total farm acres relative to operator acres, and dividing the difference between these increments by the number of share leased acres.<sup>3,4</sup> Cash rent per acre is calculated by dividing a farm's total cash rent paid by the number of cash rented acres.

The calculated share rent is then compared to the farm's average cash rent paid on cash leased acres to determine the rental spread. If the share and cash rents averaged \$121.43 and \$115 per acres, respectively, then the rental spread would be \$6.43 per acres, or 5.59% of the cash rent value (see Footnote 4).

The descriptive and econometric analyses employ two different measurement approaches to determine the rental spreads. In the descriptive portion, the rental spread is measured as the difference between the mean share rent and the mean cash rent for all balance sheet-certified single-operator FBFM farms for the 1995-1998 period. These farms totaled 1,598, 1,805, 1,879, and 1,914 for 1995 to 1998, respectively. The spread measurement approach in the regression analysis is based on those farms that utilize both types of leases (255). Constraining the data in this latter fashion implies a clearer opportunity for the farmer to choose between the leasing arrangements and may reflect more

accurately and realistically the influence of the independent variables on the rental spread.

Further adjustments in measuring spreads in the descriptive case reflect the different arrangements in the sharing of operating costs. Previous surveys and studies (Bullen; Reiss; Reiss and Koenig) indicate consistent sharing of the costs of fertilizer, pesticides, seed, and other crop expenses between farmers and landlords in Illinois. Inconsistencies arise, however, in the cost sharing of drying, storing, and insuring crops. Sharing of these costs incurs in some cases and not in others, but neither condition is observable in the FBFM data. Accordingly, the rental spreads are measured with and without the sharing of these latter expenses.

To ensure that cash rent payments are not unduly influenced by family and personal relationships between the leasing parties, the cash rent values are constrained to exceed \$10 per acre.<sup>5</sup> Rental levels below this amount are excluded from the analysis. Finally, the regressions are run for the data set as a whole, and for the three classes of farms that differ materially from each other in terms of soil productivity.

### **Descriptive Results**

Table 2 reports the per acre averages of cash rents, share rents, and rental spreads for the 1995 to 1998 period for each of three farm classes: 1) North and Central Illinois grain farms with high soil ratings (86 to 100); 2) North and Central Illinois grain farms with low soil ratings (below 86); and 3) Southern Illinois grain farms.<sup>6</sup> These classes distinguish among farms that differ in soil productivity and potential yield variability, with Southern Illinois farms having the lowest soil quality and highest yield variability (Barry, Escalante, and Bard). Moreover, the Southern Illinois region is characterized by the 1/3 - 2/3 share lease, while the 50-50 share lease predominates in North and Central Illinois.

The unadjusted rental spreads average \$3.39, \$2.25, and -\$2.63 per acre for the highest to lowest soil quality classes, respectively.<sup>7</sup> The average adjusted rental spreads, reflecting the non-sharing of drying, storage, and crop insurance costs, are reduced to -\$9.55, -\$8.71, and -\$8.65 per acre, respectively. As indicated by the coefficients of variation, the rental spreads vary substantially from year-to-year, reflecting large swings in farm income that would affect the values of share rent. The years from 1995-1997 were considered strong net farm income years in Illinois, while 1998 was a comparatively low income year (FBFM). Accordingly, the annual average unadjusted share lease premiums for North and Central, high soil quality farms were \$8.64, \$32.00, \$8.90, and -\$35.98 for the 1995 to 1998 years, respectively.

### **Regression Analysis**

The regression analysis is intended to explore the influence of several key variables on the rental spreads for those FBFM farms that engage concurrently in both cash and share leasing. Most of these variables arise directly from those in equation 8) while others related specifically to key risk factors and control practices that have been suggested as important to farmers. The general form of the regression model is

$$RS_i = b_0 + \sum_{k=1}^K b_k X_{k,i} + e_i$$

where  $RS_i$  is the rental spread,  $X_1$ - $X_4$  are variables arising directly from the conceptual model,  $X_5$ - $X_6$  are financial variables, and  $X_7$ - $X_9$  are risk control practices. Specifically,  $X_1$  is income variability,  $X_2$  is the farmer's age (a risk aversion proxy),  $X_3$  is cash rent per acre, and  $X_4$  is the cash-share acres ratio

(a proxy for agency costs). Variables  $X_5$  and  $X_6$  represent net worth and the debt-to-asset ratio, respectively. Risk control practices included in the model are soil rating ( $X_7$ ), machinery investment per acre ( $X_8$ ), and insurance expense per acre ( $X_9$ ). Mean values calculated over the four year sample period are used for the dependent variable and the explanatory variables, except for the income risk variable. Plausible, anticipated relationships between the rental spreads and the respective variables are considered in the next section.

### **Model Relationships**

Greater income variability, measured by the coefficient of variation of the farmer's net income over the 1995-1998 period, could be associated with a larger rental spread reflecting the risk-reducing attribute of share leases. The farmer's age could serve as a proxy for the level of risk aversion, where older ages are associated with lower spreads.

Table 3 suggests the inclusion of the level of cash rent as an explanatory variable in the model. Mean values of the independent variables for spread classes ranging from -\$50.00 per acre to above \$50.00 per acre are reported. One feature is the inverse relationship between the rental spreads and the mean cash rents. Apparently, a willingness to pay a high cash rent is a dominant factor affecting the rental spreads. The level of cash rent, thus, is included as one of the independent variables.

While no direct measures of agency costs are available, the cash-share acres ratio could reflect the relative agency costs of the two lease types (e.g., lower agency costs on cash leases are associated with a higher cash-share ratio and a lower rental spread). Alternatively, greater reliance on cash relative to share leases could increase the rental spread, reflecting the greater risk exposure of cash leasing for the farmer.

Several authors have investigated the role of net worth and the debt-to-asset ratio on the choice among cash and share leases (Sotomayor, Ellinger, and Barry; Bierlen, Parsch and Dixon), although their effects on rental spreads remains an empirically unanswered question. Greater net worth could have an ambiguous relationship to the rental spread. On the one hand, greater net worth could indicate a greater financial capacity to pay a higher rental spread. Alternatively, greater net worth could reflect an expanded risk carrying capacity, thus supporting a lower spread. Higher debt-to-asset ratios could also have ambiguous relationships. On the one hand, the accompanying increases in financial risk would help to explain larger spreads, thus reflecting the risk reduction in the sharing arrangement. Alternatively, greater leverage may support a farmer's quest for business growth and a tendency to make higher bids on cash leases to control additional acreage.

Soil productivity may also have an ambiguous relationship with the rental spread. More productive soils provide greater income sharing potential, especially in North and Central Illinois where share leasing has been more extensive than cash leasing (Lattz, Cagley, and Raab). Alternatively, more productive soils may be viewed as risk reducing, thus allowing lower rental spreads (Barry, Escalante, and Bard).

Finally, investments in greater machinery capacity by farmers could indicate a greater response capacity to production risks, and thus a linkage to lower rental spreads. Alternatively, this investment could provide an incentive to bid a higher cash rent in order to spread fixed machinery costs over a larger acreage. The risk-reducing effects of crop insurance and other forms of insurance could reduce the need for share leasing, and thus reduce the rental spread.

## Estimation Procedure

The estimation process uses a binomial logistic model involving a discrete dichotomous dependent variable and continuous explanatory variables (Greene). Evaluations of discrete choice typically consider a version of the following generalized model:

$$10) \quad y_i = \begin{cases} 1 & \text{if } \sum_{k=1}^K \mathbf{b}_k x_k + \mathbf{e} \\ 0 & \text{otherwise} \end{cases}$$

where  $y_i$  is the discrete choice indicator and  $\beta$  is a vector of coefficients for the matrix of  $x_i$  parameters representing characteristics hypothesized to influence choice.

Logistic regression applies maximum likelihood estimation after transforming the dependent variable into a logit variable (the natural log of the odds of the dependent variable occurring or not). In this way, the probability of a certain event occurring (i.e., positive rental spreads) is determined by calculating changes in the log odds of the dependent variable.

The specification of the logit equation is expressed as:

$$prob(y = 1) = \frac{e^{b_j x_i}}{1 + \sum_{k=1}^J e^{b_k x_i}} \text{ for } j = 1 \text{ to } J$$

which represents the probability of an event occurring. For a non-event, the probability is 1 minus the event probability. In this study the “event” variable takes an ordered value of 1 when a farm experiences a positive rental spread and a value of 0 if the rental spread is less than or equal to 0. This approach avoids the possibility of simultaneity bias associated with using the rental spread itself as the

dependent variable. In the latter case, cash rent would be both a component of the dependent variable and an independent variable.

The logit coefficients are used to estimate the odds that the dependent variable equals 1. For the dichotomous case, a coefficient value of  $b_1$  indicates that a unit increase in the independent variable yields a  $b_1$  increase in the log odds of the dependent variable.

A backward elimination procedure is applied. By setting the retention confidence level to 20%, variables with low significance can be eliminated. The estimation results are discussed in the next section.

### **Regression Results**

The regression results reported in Table 4 are organized by all farms, regional and soil quality categorizations, and for unadjusted versus adjusted rental premiums. For each category, results are reported for those variables passing the backward elimination procedure. Reported data include the parameter values, standard errors of the estimates, and the log odds ratios.

The regression results reported in Table 4 are largely consistent with the potential relationships among the mean values suggested in Table 2.<sup>8</sup> The most uniform results across all farms and farm classes are the negative and highly significant relationship of the level of cash rent to the rental spread. Rental spreads tend to be negative when cash rents are high. Net worth is also positively and significantly related to the rental spread for all farms and the North Central farms. The positive relationship suggests a greater financial capacity to pay a higher share value or less willingness to pay a high cash rent. Soil productivity is also positively and significantly related to the rental spread in several of the models.

The log odds ratio provides implications for the directional relationships between unit changes in the values of the explanatory variables and the percent increase in the odds of the event (dependent variable equals 1) happening. For example, in the All Farms model based on unadjusted premiums, a unit increase in soil rating will increase the odds of realizing positive rental spreads by about 13% (log odds ratio of 1.130), while each additional dollar of cash rent will decrease the odds of obtaining positive spreads by about 6.8% (log odds ratio of 0.932) with less than a 50/50 chance of occurring relative to the likelihood of obtaining negative rental spreads.

In general, the regression results indicate that rental spreads tend to be negative (or lower) when cash rents are high on more productive soils and for farmers with relatively high net worths. Age, the cash/share combinations, and machinery investments show low incidences of significance, while none of the other independent variables yielded significant results.

### **Discussion and Implications**

These descriptive and regression results indicate that non-risk factors likely are the primary determinants of the magnitude and sign of the rental spread. The trends toward higher cash rent levels on larger farms may indicate that higher cash rent is a bidding strategy to control additional leased acreage and perhaps to avoid management sharing with multiple landlords (Barry, Sotomayor, and Moss). Expansion of farm size may be more important than soil productivity in negotiating higher cash rents, due to potential size economies and under utilized machinery investments. Variables associated with income risk, financial risk (the debt-to-asset ratio), and insurance did not yield consistent significant results.

These conditions suggest that many farmers engaged in cash leasing may be missing an effective risk-reducing opportunity. Under a 50-50 crop share lease, for example, the higher soil productivity farmers in North and Central Illinois can transfer half of their variability of net income (see Equation 3) to the land owner relative to cash leasing, while increasing their rental expense, on average, by only 2.71%.<sup>9</sup> Sizeable reductions in risk may, thus, occur relative to modest reductions in expected returns.

In contrast, land owners must be willing to accept these return levels on share leases in return for carrying their shares of the income variability. While landlord data are unavailable for this study, other surveys of farmers and professional farm managers indicate that avoidance of risk is a major determinant of land-owner preferences for cash leasing (Barry, Sotomayor, and Moss). Some land owners apparently prefer to shift to cash leases than to seek higher share levels. At the same time, anecdotal evidence from professional managers, lenders, and farmers suggests that landowners likely are older, wealthier, and more diversified (especially between farm and non-farm investments), thus enhancing their risk carrying capacities. The institutional nature of some land owners (pension funds, banks, religious organizations, and insurance and trust companies) also suggests larger size, greater diversity, and expanded risk carrying capacities. Engaging professional managers to select and monitor farm operators and to assist with risk management, production decisions, and marketing alternatives may also help to stabilize the land owner's returns.

These results could also reflect the effects of possible inequities in share levels due to rigidities in the traditional sharing arrangements (1/2-1/2 in North and Central Illinois, and 1/3-2/3 in Southern Illinois). The 50-50 crop share lease is an equal, yet not necessarily equitable approach to allocating returns to farmers and land owners. It may over compensate land owners with low quality soil and

under compensate those with high quality soil. Such inequities could explain the negative average rental spreads in Southern Illinois. It is doubtful that land owners in Southern Illinois are risk seeking rather than risk averse, although the negative average spreads suggest this possibility.

Timing and liquidity issues may also arise in determining the preferences and rental spreads for share and cash leases. Under share leases, the land owner is obligated to pay his or her share of variable costs. Under cash leases, the farmer must bear all of the operating expenses and often pay part of the cash rent in advance. Additionally, the land owner may require a higher cash rent for late or split payments (e.g., half Spring, half Fall) to compensate for the time value of money. Rental spreads may also reflect alternative management sharing arrangements, the personal relationship between the farmer and land owner, the land owner's obligation for paying social security taxes on share income but not cash rent income, election of use value of farm land in estate transfers, and combinations of cash and share rent. However, the FBFM data do not reflect these potential effects.

Finally, the influences of agency and transactions cost could not be directly addressed in the context of the available data. Moreover, the cash/share ratio was not significant for the unadjusted spread model and its positive significance for the adjusted spread model suggests a risk response rather than an agency response. By promoting incentive alignment between the contracting parties, the share lease could reduce the land owner's monitoring requirements, that would otherwise be higher under share leasing, and promote efficient resource use. Under such conditions, the land owner would benefit from reduced agency costs by more than the apparently small rental spread, and the farmer may be burdened by more than the spread he pays would suggest. Alternatively, the high agency costs of sharing management under share leasing with multiple landowners as farm size increase could favor cash

leasing. These possible relationships warrant further study.

## Footnotes

1. While the assumption of normality is for expositional purposes, numerous studies have demonstrated the conditions underlying the use of the mean-variance model (e.g. Myer; Robison and Meyers; Tsiang).
2. See Footnote 2 of Barry et al. (2000) for a derivation.
3. Under share rental arrangements in Illinois, government payments generally are shared between the operator and the landlord in the same proportion that crops are shared.
4. To illustrate the share rent calculations, consider a farm with 1,000 tillable acres, 700 “operator acres,” 60 percent of total acres under crop share leases, 20 percent under cash leases, operator crop returns of \$250,000 and operator crop expenses of \$80,000. The ratio of operator acres to total acres is  $0.70 = 700/1000$ . Crop returns for the entire farm then are  $\$357,143 = \$250,000/0.70$ . The value of the landlord’s share is the difference between the farm and operator crop returns, or  $\$107,143 = \$357,143 - \$250,000$ . Similarly, crop expenses for the entire farm are  $\$114,286 = \$80,000/0.70$ , and the landlord’s share of crop expenses is  $\$34,286 = \$114,286 - \$80,000$ . The net value of the share rent paid to the landlord is the difference between his/her values of crop returns and expenses, or  $\$72,857 = \$107,143 - \$34,286$ . The net value of share rent per acre is  $\$72,857$  divided by 600 share leased acres. The result is a share rent per acre of  $\$121.43 = \$72,857/600$ .
5. The \$10 figure is subjectively determined based on discussions with FBFM staff.

6. Each farm participating in the FBFM System receives a soil productivity rating. The rating is an average index representing the inherent productivity of all tillable land on the farm. Individual soil types in Illinois are assigned an index, for a base level of management, ranging downward from 100. These indices compiled for hundreds of soil types in Illinois, are calculated by relating estimated crop yields for each soil type to benchmark average yields for nine of the more productive soils in the state. Compared to other regions of the U.S., land quality in Illinois is relatively homogeneous, although significant variations occur within regions of the state.
7. Statistical tests indicate that all means except the unadjusted premium for the South are significantly different from zero at the 95% level and among the pairings of regional means, only the pairs of unadjusted premiums between the North Central High and South and between the North Central Low and South differed significantly.
8. Diagnostic tests performed on the data sets for both estimating equations indicate the absence of heteroscedasticity problems.
9. From Table 1, dividing the unadjusted share lease premium by the cash rent level (i.e.,  $3.39/125.05$ ) yields 0.0271.

## References

- Allen, D. W. and D. Leuck. "Risk Preferences and the Economics of Contracts." Journal of the American Society of Farm Managers and Rural Appraisers, 85 (1995): 447-451.
- Babcock, B. A. E. K. Choi and E. Feinerman. "Risk and Probability Premiums for CARA Utility Functions." Journal of Agricultural and Resource Economics, 18 (July 1993): 17-24.
- Baron, D. "Agricultural Leasing in the Cornbelt: Some Recent Trends" Journal of the American Society of Farm Managers and Rural Appraisers, 46 (April 1982): 28-33.
- Barry, P. J., N. L. Sotomayor, and L. M. Moss. "Professional Farm Managers Views on leasing Contracts and land Control: An Illinois Perspective," Journal of the American Society of Farm Managers and Rural Appraisers, 62 (1998-99): 15-19.
- Barry, P. J., L. M. Moss, N. L. Sotomayor, and C. L. Escalante. "Lease Pricing for Farm Real Estate," Review of Agricultural Economics, 22 (Spring/Summer 2000): 2-16.
- Barry, P. J., C. L. Escalante, and S. Bard. "Economic Risk and the Structural Characteristics of Farm Businesses," Agricultural Finance Review, 61 (Spring 2001): 73-86.
- Bierlen, R., L. Parsch, and B. Dixon. "How Cropland Contract Type and Term Decisions are Made: Evidence From an Arkansas Tenant Survey." International Food and Agribusiness Management Review, 2 (1999): 103-121.
- Bullen, G. Farmers Leasing Practices in Illinois, Extension Service, University of Illinois, 1999.
- Cheung, S. N. The Theory of Tenancy. Chicago, IL: University of Chicago Press, 1969.

- Dasgupta, S., T. O. Knight, and H. A. Love. "Evolution of Agricultural Land Leasing Models: A Survey of the Literature." Review of Agricultural Economics, 21 (Spring/Summer 1999): 148-176.
- Greene, W. Econometric Analysis, 3<sup>rd</sup> ed. Prentice Hall, Englewood Cliffs, N.J. 1993.
- Kocherlakota, N. R. "The Equity Premium: It's Still a Puzzle." Journal of Economic Literature, 34 (March 1996): 42-71.
- Lattz, D. H., C. E. Cagley, and D. D. Raab. Summary of Illinois Farm Business Records, College of Agricultural, Consumer, and Environmental Sciences, University of Illinois, 1998.
- Meyer, J. "Two Moment Decision Models and Expected Utility Maximization," American Economic Review, 77 (1987): 421-430.
- Raskin, R. and M. Cochrane. "Interpretations and Transformations of Scale for the Pratt-Arrow Absolute Risk Aversion Coefficient: Implications for Generalized Stochastic Dominance." Western Journal of Agricultural Economics, 11 (December 1986): 211-220.
- Reiss, F. J. "Farm Tenancy Arrangements in the U.S.A.," Journal of the American Society of Farm Managers and Rural Appraisers, 48 (October 1984): 16-24.
- Reiss, F. J. and C. J. Koenig. "Farm Leasing Practices in South-Eastern Illinois Counties," Department of Agricultural Economics, University of Illinois, July 1980.
- Robison, L. J. and P. J. Barry. The Competitive Firm's Response to Risk, McGraw-Hill, New York, 1986.

- Robison, L. J. and R.G. Myers. "Ordering Risky Choices," A Comprehensive Assessment of the Role of Risk in U.S. Agriculture, R. E. Just and R. D. Pope, eds. Kluwer Academic Publishers, Boston, 2002.
- Scott, J. T. "Leasing Practices," Illinois Agriculture, Agribusiness, and the Rural Economy, Department of Agricultural Economics, University of Illinois, 1994.
- Sotomayor, N. L., P. N. Ellinger, and P. J. Barry. "Choice Among Leasing Contracts," Agricultural Finance Review, 60 (2000): 71-84.
- Tsiang, S. C. "The Rationale of the Mean-Standard Deviation Analysis, Skewness Preference, and the Demand for Money." American Economic Review, 62 (1972): 354-371.
- U.S. Department of Agriculture, Illinois Agricultural Statistics Service, Illinois Annual Summary, online at <http://www.agr.state.il.us/agstats/website/reports.htm> (various years).
- Williams, J. C. "Commodity Futures and Options." Handbook of Agricultural Economics, ed. B. L. Gardner and G. C. Rausser. Amsterdam: Elsevier, 2001.

**Table 1. Illustrative Rental Spreads <sup>1</sup>**

Share Level(s)	Risk Aversion Coefficient ( $\ddot{\epsilon}$ )			
	.0002	.01553	.03087	.04620
s = 1/2	----- \$ -----			
<u>Variability (<math>\delta_y</math>)</u>				
10	0.01	0.58	1.16	1.73
20	0.03	2.33	4.63	6.93
30	0.07	5.24	10.42	15.59
40	0.12	9.32	18.52	27.72
s = 1/3				
<u>Variability (<math>\delta_y</math>)</u>				
10	0.01	0.42	0.86	1.28
20	0.02	1.72	3.43	5.13
30	0.05	3.88	7.71	11.54
40	0.09	6.90	13.71	20.52

<sup>1</sup>Calculated from equation 8 assuming agency costs on cash and share leases are equal.

**Table 2. Descriptive Results for Rental Values, 1995-1998**

	North & Central Illinois High Soil Rating			North & Central Illinois Low Soil Rating			Southern Illinois		
	Mean	S.D.	C.V.	Mean	S.D.	C.V.	Mean	S.D.	C.V.
	\$ per acre								
Cash rent	125.05	4.40	0.04	107.33	3.21	0.03	76.41	1.78	0.02
Unadjusted share rent	128.44	27.52	0.21	109.59	18.58	0.17	73.78	19.41	0.26
Adjusted share rent	115.50	25.66	0.22	98.63	19.19	0.19	67.76	19.53	0.29
Unadjusted share lease rental spread	3.39	28.44	8.39	2.25	19.85	8.82	-2.63	18.67	-7.10
Adjusted rental spread	-9.55	26.64	-2.79	-8.71	17.56	-2.02	-8.65	18.87	-2.18

S.D. is standard deviation  
C.V. is coefficient of variation

**Table 3. Mean Values of Explanatory Variables Categorized by Unadjusted Rental Spreads, 1995-1998**

Rental Spread	No. of Farms	Size (Acres)	Soil Rating	Age (Years)	Net Worth (\$)	Debt-Asset Ratio	Mach. Inv./ Acre (\$)	Insur. Exp./Acre (\$)	Income Risk (C.V.)	Cash Rent/ Acre (\$)	Cash/ Share Acres Ratio
Below - \$50	10	1,413	77	49	780,892	0.2951	240.28	9.54	1.14	152.09	.095
-\$49 to -\$25	31	905	76	49	541,437	0.4387	241.57	10.20	2.70	116.09	1.03
-\$24 to \$0	95	832	77	47	457,289	0.4367	269.31	10.00	2.01	110.43	1.19
\$1 to \$25	68	864	78	48	592,433	0.3126	325.60	10.31	1.82	98.16	1.42
\$26 to \$50	44	812	83	49	713,540	0.3689	307.28	11.20	0.60	97.10	1.29
Over \$50	7	1,049	89	44	935,601	0.3102	437.70	13.94	-19.57	88.87	0.94
<b>TOTAL FARMS</b>	255										

**Table 4. Maximum Likelihood Estimates of Rental Spread Relationships Under Binary Logistic Regression**

Model Name <sup>1</sup> Explanatory Variables	Unadjusted Rental Premiums			Adjusted Rental Premiums		
	Parameter	Standard Errors	Log Odds	Parameter	Standard Errors	Log Odds
<b>ALL FARMS</b>		<b>72.375***</b>			<b>69.018***</b>	
Intercept	-2.8105***	1.0448		-1.7134	1.2878	
Net Worth	0.0000008**	0.0000004	1.000	0.0000013***	0.0000004	1.000
Age				-0.0407**	0.0174	0.960
Soil Rating	0.1222***	0.0204	1.130	0.1244***	0.0210	1.132
Debt-to-Asset Ratio	-0.9782	0.7491	0.376			
Machinery Inv./Acre	0.00148	0.000984	1.001			
Cash-Share Acres Ratio				0.1592**	0.0805	1.173
Cash Rent per Acre	-0.0706***	0.0105	0.932	-0.0749***	0.0111	0.928
<b>NC-HIGH SOIL RATING</b>		<b>38.893***</b>			<b>38.389***</b>	
Intercept	10.3774***	2.4404		4.5889	7.5436	
Net Worth	0.000001**	0.0000005	1.000	0.0000012**	0.0000006	1.000
Age				-0.0566*	0.0342	0.945
Income Risk				-0.5511	0.3753	0.576
Soil Rating				0.1058	0.0806	1.112
Machinery Inv./Acre	0.00331*	0.00183	1.003			
Cash-Share Acres Ratio				0.1587	0.1201	1.172
Cash Rent per Acre	-0.0983***	0.0209	0.906	-0.1047***	0.0229	0.901
<b>NC - LOW SOIL RATING</b>		<b>33.833***</b>			<b>36.282***</b>	
Intercept	-1.1082	2.2213		-1.8398	2.3011	
Net Worth	0.000002***	0.0000009	1.000	0.000003***	0.0000009	1.000
Soil Rating	0.1405***	0.0476	1.151	0.1605***	0.0504	1.174
Debt-to-Asset Ratio	-1.6339	1.0549	0.195	-1.9465*	1.1884	0.143
Cash-Share Acres Ratio				0.3510**	0.1460	0.143
Cash Rent per Acre	-0.0969***	0.0230	0.908	-0.1187***	0.0265	0.888
<b>SOUTH REGION</b>		<b>7.078***</b>			<b>8.140***</b>	
Intercept	2.1707*	1.2363		-14.7179**	6.7654	
Soil Rating				0.2881**	0.1212	1.334
Debt-to-Asset Ratio				5.0506**	2.4269	156.115
Cash Rent per Acre	-0.0450***	0.0178	0.956	-0.0884***	0.0353	0.915

<sup>1</sup>Across each model name is a score statistic that will indicate the model's explanatory power. Asterisks denote the score statistics' significance at 90% (\*), 95% (\*\*) and 99% (\*\*\*) confidence level.

<sup>2</sup>Single, double and triple asterisks denote significance of the parameter estimates at 90%, 95%, and 99% confidence levels.

## Appendix

Equation 7) is obtained by setting equations 4) and 6) equal to each other and solving for r:

$$A1) \quad (1-s)(\bar{y}) - a_s - \frac{1}{2} s^2 \sigma_y^2 = \bar{y} - r - oc - a_c - \frac{1}{2} s^2 \sigma_y^2$$

By canceling similar terms and adding and subtracting terms from both sides, the expression for r is

$$A2) \quad r = s(\bar{y} - oc) + a_s - a_c - \frac{1}{2} s^2 \sigma_y^2 [s(2-s)]$$

Similar expressions can be derived for the landowner. His/her expected net income from the leasing alternatives is

$$A3) \quad \bar{n} = (1-p)(r) + p(s\bar{y}) - p(s)(oc) - pa_s - (1-p)a_c$$

The expected utility from share leasing is

$$A4) \quad E[U(n)] = s(\bar{y} - oc) - a_s - \frac{1}{2} s^2 \sigma_y^2$$

and from cash leasing is

$$A5) \quad E[U(n)] = r - a_c$$

where  $\bar{\epsilon}_1$  is the land owner's level of risk aversion. Equating A4) and A5), and solving for the rental spread yields

A6) 
$$s(\bar{y} - oc) - r = a_s - a_c - \frac{I_l}{2} s^2 \sigma_y^2$$

The condition under which the farmer and landlord would have the same rental spread would be found by equating equation 8) in the text to equation A6. Again assuming that  $a_s = a_c$  and that expected variability is the same for the two parties, this condition is

$$\frac{I}{I_l} = \frac{s}{2 - s}$$

For  $s = 1/2$ , equal spreads would occur if the landlord's risk aversion measure is one third

(=  $.5/(2-.5)$ ) that of the farmer's. Otherwise, differences in risk attitudes and agency costs between the farmer and land owner would need to be negotiated in order to reach a rental decision.