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ECONOMICS AND MARKETING

Financial Viability and Profitability in the Texas High Plains After the FAIR Act

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INTERPRETIVE SUMMARY

Production agriculture faces an inordinate amount and variety of risks, from production uncertainty related to weather, diseases, and insects to price uncertainty. The enactment of the Federal Agricultural Improvement and Reform (FAIR) Act of 1996 represents a significant change in government programs and potentially exposes cotton producers to increasing levels of risk and uncertainty with regard to prices and farm income levels. The FAIR Act reduces support payments to farms through 2002, at which time payments will terminate, while allowing planting flexibility through the elimination of crop bases and set-aside requirements. These farm program changes increase the importance of cotton producers to evaluate the levels of risk within their operations.

The total risk a business faces is represented by the interaction of business and financial risks. Business risk is derived from production and price uncertainty, while financial risk is derived from the financial obligations associated with debt financing. Therefore, if factors affecting business risk (i.e. increasing price variability) change, a farm operation may need to make adjustments in the level of financial risk (i.e. reduce debt) to stay within a total risk constraint for the business.

This study evaluated the ability of two farms in the Texas High Plains region to accommodate increasing levels of risk associated with declining support payments and potential increases in price variability associated with the enactment of the FAIR Act. The selected farms represent typical farming situations in that region. The first farm (Farm 1) consisted of 1,926 total acres, of which 1,489 were planted to cotton in 1997. The second farm (Farm 2) consisted of 551 total acres, of which 360 were planted to cotton in 1997. Farm 1 is a relatively large farm with a combination of owned and leased land, while Farm 2 is a smaller operation made up entirely of leased land.

Both operations produce cotton as the primary crop, with other crops contributing to rotational requirements. Farm income represents the primary source of family income in both operations. Financial and production information for each farm for the 1997 crop year was analyzed using the Farm Level Income and Policy Simulation Model to project future financial viability under decreasing levels of government program payments and increasing variability of cotton prices. The model simulated farm financial performance during the period 1996 through 2005. Simulations were run for different debt structures as measured by the debt-to-asset ratio (25%, 55%, and 70%), with increasing cotton price variability during the time period and termination of government program payments in 2002.

The results indicated that Farm 1 was in a strong financial position to withstand the loss of government program payments and increasing cotton price variability. While the loss of government payments affected net farm income after 2002, Farm 1 remained profitable throughout the time horizon, with the probability of survival of 100% under all debt structures analyzed and a 0% probability of decreasing net worth. Farm 1 exhibited good profitability across all debt structures with return-on-assets in the 30% range. The cash cost-to-receipts ratio averaged approximately 55.0% for all debt structures, which indicates a high operating efficiency and is a strong indicator of profitability.

The results for Farm 2 indicated potential financial problems after the end of government payments. Net farm income peaked in 2002, then declined following the end of government payments by 52% under the 25% debt structure and 63%

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under the 70% debt structure. Farm 2's probability of survival was 75% under the 25% debt structure, but only 34% under the 70% debt structure. Farm 2's current debt structure of 38% only indicated a 60% probability of survival through the 10-year time horizon. Farm 2's cash cost-to-receipts ratio averaged 75% to 80%, indicating a low level of operating efficiency that contributed to profitability problems during the time horizon.

The results of this study show that a profitable farm, primarily due to a high operating efficiency, can survive increasing levels of business risk associated with the termination of government payments and increased cotton price variability. However, farms with low operating efficiency and profitability are at high risk, especially under high debt structures.

ABSTRACT

The Federal Agricultural Improvement and Reform (FAIR) Act of 1996 reduces government program payments to farms through 2002, at which time payments will terminate. This change in U.S. agricultural policy potentially exposes cotton producers to increasing levels of risk and uncertainty with regard to prices, which increases the importance of risk management. This study evaluated the ability of two cotton farms in the Texas High Plains region to accommodate increasing levels of risk associated with declining price support payments and potential increases in price variability associated with the enactment of the FAIR Act. The Farm Level Income and Policy Simulation Model was used to project future financial viability of each farm under decreasing levels of government program payments and increasing variability of cotton prices. Results of the simulation indicated that one farm could remain profitable (probability of survival of 100% across all debt structure levels) despite rising levels of debt and uncertainty. The other farm's probability of survival was only 60% at its current debt structure of 38%, and its probability of survival decreased to 49% with a debt structure of 55%. Operating efficiency was a primary factor influencing the difference in the probability of survival between the two producers.

Production agriculture faces an inordinate amount and variety of risks. Crop and livestock performance depends on biological processes that are affected by weather, diseases, insects, weeds, feed conversion, and soil fertility. Production uncertainty is associated with these biological processes. Because the demand for agricultural products is relatively inelastic, small changes in supply result in disproportionately larger changes in prices. Farmers, unlike most industrial producers, are price takers, meaning they are forced to accept these large price fluctuations, resulting in high farm income variability (Browne et al., 1992).

Recent changes in federal agricultural programs have increased the importance of risk evaluation for many farming operations. The Federal Agriculture Improvement and Reform Act of 1996 ended traditional price supports and implemented a fixed, but declining, 7-year series of transition payments ending in 2002. Although the FAIR Act reduces government price supports to farmers with time, it provides a greater degree of planting flexibility by eliminating crop bases and set-aside requirements. This concept, known as “Freedom to Farm,” allows farmers to shift production to different crops and to determine a desired cropping mix, yet leaves farmers relying solely on market forces.

Gabriel and Baker (1980) specify the total risk for a firm as an interaction of business risk and financial risk. Business risk is that derived from the uncertainty due to the nature of the enterprise. Price variability, production variability, and various internal factors influence business risk in agriculture. Financial risk is the added variability of net cash flows resulting from the financial obligations associated with debt financing. The interaction of business and financial risk may necessitate risk balancing, which refers to the need to adjust financial risk as business risk changes so that one can stay within a total risk constraint for the business.

Declining farm income support levels under the FAIR Act, which potentially could result in increased farm income volatility, may increase the level of business risk. Therefore, farmers may find it necessary to alter their farms’ financial structure to maintain an acceptable level of total risk. In order to make informed decisions concerning changes in debt structures, farmers must be aware of their farms’ ability to survive, given their current debt structures, as risk increases.

The objective of this study was to evaluate the ability of farms in the Texas High Plains region to accommodate increasing levels of risk associated with declining price support payments and increased price variability associated with the enactment of the FAIR Act. Specific objectives of this research project were to: (1) select specific farms and analyze their financial structure; (2) estimate the additional risk as the farm's dependence upon price supports decreases; (3) apply the financial structure of the farm to a simulation model that incorporates an increasing level of risk; and (4) analyze the farm's financial viability and profitability based on the simulation.

Smith et al. (1996) used the Farm Level Income and Policy Simulation Model to evaluate the farm level economic impacts of implementing the FAIR Act during the 1996–2002 planning horizon. Producer panels assembled 71 representative farms for different regions of the U.S., which were then analyzed under the provisions of the FAIR Act. The analyses found that seven of the 10 representative upland cotton farms experienced growth in real equity during the study period. However, the study projected declining net cash farm incomes for all 10 farms during the planning horizon, suggesting potential financial stress. Additionally, variable cash expenses for cotton production during the 1996-to-2002 period increased by 13%, subjecting cotton farms to more of a price-cost squeeze than other crops simulated.

Ray et al. (1998) used the Policy Analysis System to analyze the price variability of corn, wheat, soybeans, and cotton during the 1998-to-2006 period following the enactment of the FAIR Act compared to the 1986-to-1996 period. Higher price variability was projected for corn, wheat, and soybeans prices, but no significant change in cotton price variability was projected.

Knutson et al. (1998) estimated farm-level impacts of the FAIR Act on representative farms using the Farm Level Income and Policy Simulation Model. The analysis for the period 1997-to-2005 assumed increased price variability—as measured by the coefficient of variation—of 92% for corn and grain sorghum, 57% for wheat, 45% for soybeans, and 17% for cotton. While the probability of cash flow deficits for cotton farms marginally improves versus the 1986-to-1996 period, the probability of cash flow deficits is substantially higher than for grain and oil seed operations.

Haynes and Johnson (1997) evaluated the economic impact of plant stress on crops grown in the region and the potential impact of biotechnological advances relating to plant stress reduction on farm profitability and financial viability. They found that the representative farms were only profitable and viable at lower levels of debt, and that the return-on-assets for the representative farms was less than return-on-equity, indicating the cost of debt was higher than returns-on-assets.

These previous studies evaluated farm level impacts of the FAIR Act using representative farms constructed from information obtained from producer panels or census data or both. The analyses presented in this study were based on actual farm financial and production information obtained for specific farms.

MATERIALS AND METHODS

Standardized Performance Analysis is a financial management tool designed to assist producers with farm and ranch financial and production analysis (McGrann et al., 1996). The methodology consolidates farm financial statements and production information into a financial analysis of a total farming operation and enterprises within the operation.

The Standardized Performance Analysis–Multiple Enterprise computer program facilitates the development of accrual adjusted farm financial statements and financial measures for liquidity, solvency, profitability, repayment capacity, and financial efficiency following the Farm Financial Standards Guidelines (McGrann et al., 1996; Clark, et al., 1998). The program was used to analyze cotton-producing farms in the region for the 1995, 1996 and 1997 crop years. These analyses were compiled into a database made up of 20 producers with approximately 200 sub-enterprise observations for irrigated and dryland cotton.

Financial and production information for the 1997 crop year was obtained from two cotton farms in the Texas High Plains Region. The computer program, using financial information from the balance sheets, income statements, and cash flow statements, analyzed the financial structure of the selected farms and generated financial ratios for each farm. The financial ratios were used to evaluate the financial structure of the farms, which represented different situations with respect to farm sizes and baseline capital structures.

Farm 1, in Lubbock County, consists of 779.4 total hectares, of which 77% was planted to cotton in 1997,with the remainder in milo and wheat. The farm is a sole proprietorship with 102.4 hectares owned and 676.6 hectares crop-share leased. The baseline debt structure (long-term debt to long-term assets) for the farm was 27%.

Farm 2, also in Lubbock County, consists of 223.0 total hectares, of which 65% was planted to cotton in 1997, with the remainder in milo and wheat. All the land in this farm was leased under a crop-share agreement. The baseline debt structure was 38%.

The selected farms represent two types of farming situations seen in their region. One is relatively large, with a combination of owned and leased land, the other, smaller, made up totally of leased land. Both operations produce cotton as the primary crop, with other crops contributing to rotational requirements. Each operation relies on farm income as the primary source of family living. For each, therefore, family living withdrawals are estimated to be a minimum of $40,000 per year.

The crop-share lease agreement typical for this region is based on a 75%–25% crop-share for the tenant and landlord, respectively. The landlord pays a proportional share of certain production expenses and shares government payments with the tenant on a proportional basis.

The Farm Level Income and Policy Simulation Model is a recursive programming-simulation model that is capable of simulating the production, marketing, financial growth and decay, machinery depreciation and replacement, and family consumption functions for a farm operation (Richardson and Nixon, 1986). Information necessary for input into The model includes financial, production, farm program, and enterprise budget information for each farm, as well as projected market prices and market price variability.

The model consists of a complex set of accounting equations to keep track of the annual production and marketing activities for each crop produced on a farm. The simulation program plants and harvests the crops using each crop's budget information and the farm's crop mix. Once a crop is produced and marketed, the program calculates variable expenses such as the production, harvesting, and marketing costs for each crop based on acreage planted and harvested, crop yield, and inflation rates. Fixed cash costs are computed based on their initial values, then adjusted for inflation. Cash receipts for selling each crop are adjusted for share rental arrangements and then added to the operator's share of farm program payments to calculate total receipts.

The annual financial activities of a farm are simulated using standard financial equations to amortize simple-interest loans. Net cash farm income is obtained by subtracting all cash expenses from all cash receipts. Farm machinery is updated annually by calculating each item's depreciation and replacing items that have outlived their specified economic life. The farm's ending cash balance for each year is obtained by subtracting principal payments, family living withdrawals, income taxes, and self-employment taxes from net cash farm income and the beginning cash balance.

The year-end cash balance is added to the updated value of land, machinery, and livestock to calculate the farm's total assets. The updated liabilities of the farm are calculated after making the annual payments for land and machinery loan payments. If the farm experienced a cash flow deficit, long-term liabilities are increased to refinance the deficit. The annual planning horizon is simulated recursively so that the ending financial situation for year one is the beginning situation for the next year (Richardson and Nixon, 1986).

Simulations representing low (25%), medium (55%), and high (70%) debt structures for each farm were performed in the model for the 10--year time horizon 1996 to 2005. Crop mix and acreage were held at the 1997 levels for each farm. Crop prices for the time horizon (1996–2005) were based on FAPRI's January 1998 Baseline (FAPRI, 1998), with the1996 and 1997 prices being the actual prices for those years. Farm program payments scheduled under the FAIR Act were included through 2002 and discontinued thereafter. The variability of cotton prices was assumed to increase incrementally each year up to an increase of 25% in the coefficient of variation of the price of cotton to reflect an increase in income risk as farm program payments are phased out. Financial viability and profitability measures were compiled for each debt situation for each farm.

The model generates several measures of the financial viability and profitability of the farms during a 10-year simulation period. These include: (1) the probability of farm survival — regarded as the probability that a farm will remain solvent—defined as the probability that the equity-to-assets ratio remains greater than 25%—throughout the 10-year period; (2) the probability of decreasing real equity—defined as the probability of decreasing equity for the farm during the 10-year time horizon, after adjusting for inflation; (3) average annual net farm income—defined as net cash farm income minus depreciation, with net cash farm income defined as gross receipts minus all cash production cost, including interest; (4) average annual cash costs-to-receipts ratio—defined as the ratio of cash costs to cash receipts; (5) return-on-assets—defined as net income divided by average total assets; and (6) return-on-equity—defined as net income divided by average total equity.

RESULTS AND DISCUSSION

This section reports the results of the 10-year simulations for Farms 1 and 2, then compares the results of the two farms. A summary of average simulation results for each farm at the three levels of long-term debt structure is presented in Tables 1 and 2. Figures 1 through 3 show specific profitability and viability measures for each farm across the years of the analysis.

Farm 1 Results

The simulation results for Farm 1 indicate an ability to increase net farm income through 2002, as shown in Fig. 1, with net farm income peaking at about $255,000. Following the end of government payments in 2002, net farm income decreases 14% and levels off at about $220,000 in 2005. The level of profitability exhibited by Farm 1 is reflected in the probability of survival, which remains at 100% across the range of debt structures, as shown in Fig. 2. The results also indicate a low probability of decreasing net worth across debt structures. The debt level of Farm 1 exhibits no substantial relationship to the long-term economic performance of the farm. Farm 1's current debt-to-asset ratio of 27% indicates a 100% probability of survival during the 10-year planning horizon.

Table 1. Summarization of financial viability and farm profitability measures for Farm 1.

Calculated data, 1996-2005	Long-term debt structure		
	25%	55%	70%
Probability of survival	100%	100%	100%
Probability of decreasing net worth	0%	0%	0%
Annual net farm income (avg) 1996-2005	$212,200	$209,787	$208,569
Annual cash costs-to-receipts ratio	55.0%	55.5%	55.8%
Annual return-to-assets ratio (avg) 1996-2005	29.7%	30.3%	30.7%

Table 2. Summarization of financial viability and farm profitability measures for Farm 2.

Calculated data, 1996-2005	Long-term debt structure		
	25%	55%	70%
Probability of survival	75%	49%	34%
Probability of decreasing real net worth	60%	68%	74%
Annual net farm income (avg.)	$36,178	$29,765	$26,374
Annual cash costs-to-receipts ratio (avg.)	74.6%	78.5%	80.5%
Annual return-to-assets ratio (avg.)	22.4%	23.6%	23.9%
Annual return-to-equity ratio (avg.)	23.5%	0.31%	---†

† Return to equity calculated by the Farm Level Income and Policy Simulation Model (FLIPSIM) under the 0.70 debt structure was distorted by the necessity to sell assets to maintain the required level of equity and therefore is not reported.

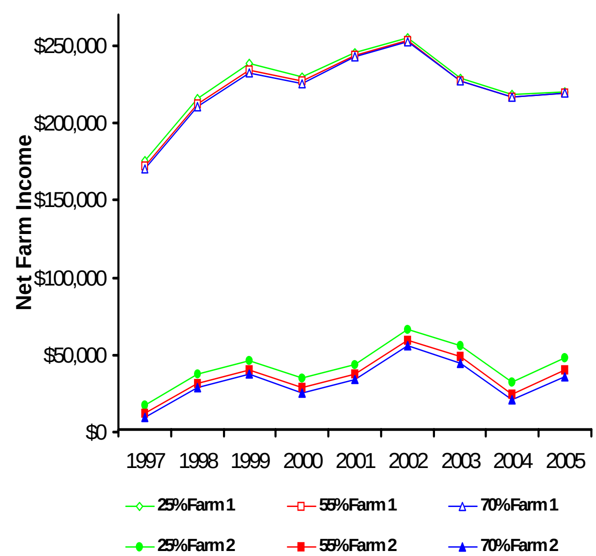

Figure 1. Annual net farm income at specified debt structures for Farm 1 and Farm 2.

The expected annual cash costs-to-receipts ratio for Farm 1 during the planning horizon is shown in Fig. 3. The ratio declined during the initial years of the planning horizon, but leveled off from 1999

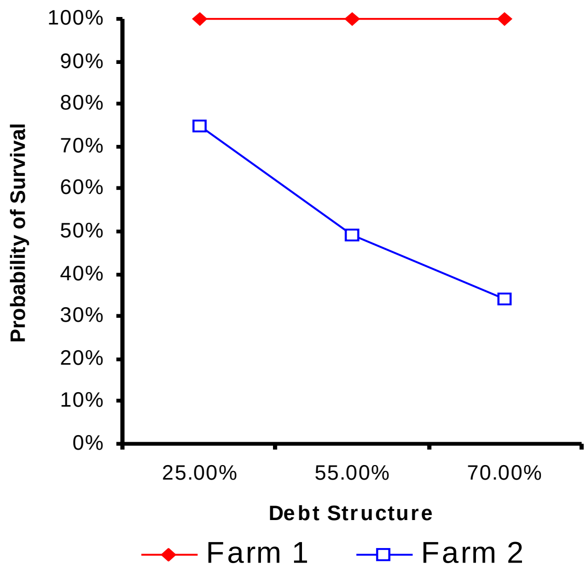

Figure 2. Probability of survival for Farm 1 and Farm 2 as debt structure increases.

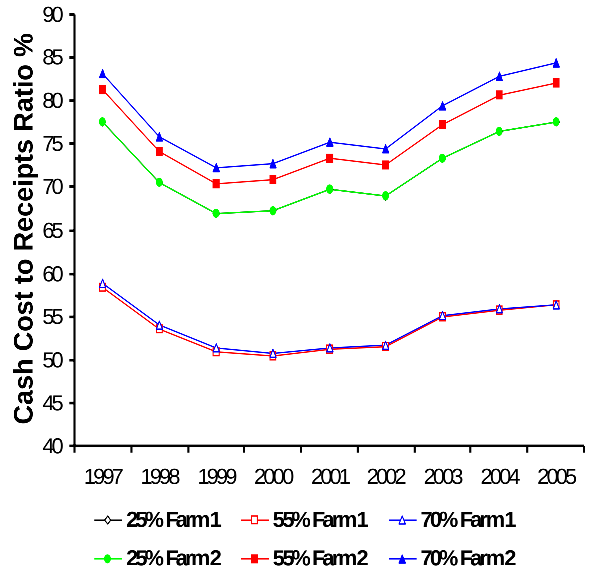

Figure 3. Annual cash cost-to-receipts ratios for Farm 1 and Farm 2 at specified debt structures.

through 2002 at about 51%, and increased in 2003 when government payments were terminated. The debt structure of the farm appears to exert minimal influence upon the cash cost-to-receipts ratio.

The return-on-assets and return-on-equity for Farm 1 are summarized in Table 1 for the three debt structures analyzed. Farm 1 has good profitability with return-on-assets in the 30% range. The return-to-equity being greater than return-to-assets indicates that debt is being used profitability within the farm business. The financial measures shown for Farm 1 demonstrate that the various debt structures evaluated in the simulations had little affect on the probability of survival, the probability of decreasing net worth, the level of net farm income, or the cash costs-to-receipts ratio. Farm 1 appears to be in a strong financial position to withstand the loss of government payments. While net farm income was impacted by the loss of government payments, Farm 1's profitability and risk-bearing ability appear to remain strong.

Farm 2 Results

The simulation results for Farm 2 indicate an ability to increase net farm income through 2002 as shown in Fig. 1, with net farm income peaking at about $66,000 under the 25% debt structure and $56,000 under the 70% debt structure. However, following the end of government payments net farm income decreases sharply in 2003 and 2004. The change in net farm income from 2002 to 2004 indicates a 52% decline for the 25% debt structure and 63% decline for the 70% debt structure. The results indicate a greater than 60% probability of decreasing net worth across all debt structures as shown in Table 2, with a positive relationship between the probability of decreasing net worth and debt level.

The debt level of Farm 2 shows a negative relationship to the long-term economic performance of the farm. Figure 2 presents the probability of survival for Farm 2 at varying levels of debt. The probability of survival during the 10-year period demonstrates an inverse relationship to the beginning debt structure. At a relatively low debt structure of 25% debt-to-assets ratio, the farm's probability of survival is 75%. However, as the debt-to-assets ratio increases to 70%, the probability of remaining solvent drops to 34%. The current debt-to-assets ratio for Farm 2 is 38%, indicating a probability of survival of slightly above 60% during the next 10 years. The 75% probability of survival at the 25% debt-to-assets ratio indicates that this farm may have structural problems with regard to profitability, which are magnified at higher debt levels.

The cash costs-to-receipts ratios for Farm 2 are shown in Fig. 3. While the cash cost-to-receipts ratio declines in the initial years of the planning horizon it increases following the termination of government payments in 2002. Overall the ratio for Farmer 2 is high and indicates an area within the farming operation that could be improved to increase profitability.

The return-on-assets and return-on-equity for Farm 2 are summarized in Table 2 for the three debt structures. Farm 2 exhibited good profitability, with return-on-assets in the 23% range. However, the return-on-equity for Farm 2 declined as the use of debt increased. The return-on-equity under the 55% debt structure was only 0.31% compared with return-on-assets of 23.6%, indicating that debt was not being used profitability. The return-on-equity was not reported under the 70% debt structure because of the necessity to sell assets to maintain a minimum level of equity, therefore distorting the calculations for return-on-equity.

The financial measures shown for Farm 2 demonstrate that the various debt structures evaluated in the simulations had a negative impact on the probability of survival, the probability of decreasing net worth, the level of net farm income, and return-on-equity. Farm 2 appears to be in a financial position that makes the operation vulnerable, especially after the loss of government payments in 2002.

Comparison of Farms 1 and 2

Although the level of financial performance for Farm 2 is highly contingent on the debt structure of the farm, Farm 1 remains profitable regardless of the level of debt. A comparison of the simulation results of the two farms is needed in order to draw meaningful conclusions regarding the true relationship between debt structure and probability of survival. A notable difference exists in the cash costs-to-receipts ratio for the two farms as shown by Fig. 3. The average annual cash costs-to-receipts ratios are considerably lower for Farm 1 compared with Farm 2, indicating that Farm 1 has a higher operating efficiency. The higher level of operating efficiency allows Farm 1 to maintain profitability at higher levels of debt. Farm 2's lower operating efficiency restricted profitability and reduced this farm's ability to survive under the higher debt levels.

CONCLUSIONS

The results of this study show that under the provisions of the FAIR Act, with the termination of government program payments in 2002 and the assumption of increasing price variability, a farm that is profitable primarily due to a high operating efficiency can continue to perform profitably while assuming higher levels of debt. However a farm that is unprofitable due to a weaker operating efficiency significantly decreases its probability of survival as the debt level increases.

The implication is that the level of both farm profitability and debt contribute significantly in determining the farm's probability of survival, with a positive relationship existing between farm profitability and its probability of survival, and an inverse relationship between the debt level and the probability of survival. Therefore, the risk constraint for a highly profitable farm allows a significant increase in the financial risk to the farm without adversely affecting the farm's probability of survival. However, the risk constraint for a marginally profitable farm requires that the farm minimize its financial risk by minimizing its use of financial capital.

Economies of size may be the primary factor affecting each farms level of operating efficiency. In short, small farms may need to expand. In this study Farm 1, with 779.4 hectares, exhibited a high operating efficiency, while Farm 2, with only 223 hectares, had a lower operating efficiency. However, if expansion of an operation requires assuming a significant amount of additional debt, the effects of altering the debt structure must also be considered. If an increase in profitability from expansion decreases business risk enough to compensate for the greater financial risk associated with the additional debt, the farm should expand. If an increase in profitability from expansion does not decrease business risk enough to compensate for the additional financial risk, the farm should not expand.

An additional factor influencing the decision of farms to expand is the ability of the farm operation to generate sufficient income to meet family living requirements. In the analysis presented here both farms relied on farm income as the primary source of family living. One factor in Farm 2's decreased probability of survival is the level of family living withdrawals that are taken out of the operation each year.

The farms in this study realized adverse trends in various profitability measures such as a decrease in net farm income and an increase in the cash costs-to-receipts ratio after the year 2002 with the elimination of the government farm program payments. The elimination of government program payments represents an exogenous shock that potentially increases the business risk of the farm through decreased farm income and increased price variability. As the business risk to the farm increases, farmers may need to evaluate their level of financial risk and possibly lower debt levels to comply with the farm's total risk constraint.

The total risk constraint for a highly profitable farm may allow a significant increase in the financial risk for the farm without adversely affecting the farm's probability of survival. The total risk constraint for a marginally profitable farm requires that the farm minimize its financial risk by minimizing its use of financed capital.Further studies should seek to define the level of profitability necessary for cotton farms to assume additional risk without adversely affecting the probability of survival. This will allow farms with various levels of profitability to ration their capital in such a way as to maximize their probability of survival.

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