Forecast Errors and Farm Firm Growth

Ebenezer F. Kolajo, Neil R. Martin, Jr., and Gregory D. Hanson

Abstract. *Researchers should be wary of the expectations framework and optimization method employed when drawing conclusions about the likely production behavior of farmers The article compares the predictive accuracy of two expectational schemes, supply-based expectations (SBE) and adaptive expectations (ADE), and two modeling approaches, multiperiod linear programming (MPLP) and recursive strategic linear programming (RSLP) Estimated costs of expectational error were sensitive to expectational assumptions and modeling methods Unanticipated annual revenue gains for the model farm ranged as high as $75,000 for the SBE scheme with the MPLP model, and shortfalls ranged as high as $52,000 for the ADE scheme with the RSLP model The magnitude of unanticipated gains and shortfalls increased disproportionately with greater use of debt financing*

Keywords. *Expectational error, mathematical programming, financial leverage, farm growth*

Profit expectations in farming tend to be stochastic To the extent that forecast errors reduce profits, prediction is an indirect factor of production Farm firms are likely to acquire additional "outlook" information so long as its marginal value exceeds its acquisition costs In this article, we compare the predictive accuracy of alternative expectational schemes We analyze the cost of expectational errors in relation to alternative modeling approaches for optimizing growth in the net worth of a 600-acre representative Alabama farm raising cotton/soybeans/wheat

Analysts can better understand the costs associated with input misallocation due to forecast error by reflecting on the developments in U S. agriculture from the mid-seventies to the mideighties Demand for agricultural inputs dramatically increased in the seventies in response to several years of high incomes Land prices in nominal terms rose by 234 percent, machinery purchases by 192 percent, and farm debt by 181 percent during 1972-79 Investors expected that the high cost of agriculture could be funded through continued stability or by increases in commodity prices. Compared with 1973-76, however, nominal corn, wheat, and soybean prices in 1987 where 20–40 percent lower The price decline in real terms was approximately 60–70 percent, although the fall in prices was partly offset by increases in Government payments to farmers

The effect of forecast error in the seventies and early eighties cannot be measured precisely However, long-run financial consequences can be viewed in the light of agricultural loan writeoffs of approximatley $11 billion during 1984–86 They are estimated to reach $16–18 billion by the end of the eighties *(3)* [1] Accumulated forecast errors in the past decade were characterized by higher than optimal investment, high borrowing rates, and high cost structure that contributed to record high expenditures for farm programs

The beef sector in 1985 is a recent example of the adverse effects of forecast error Because of weaker than anticipated prices in the first quarter, producers resorted to a longer feeding period, thereby increasing the weight equivalent to 897,000 slaughter steers and heifers during the first 9 months of 1985 (*13*, May 1985) The U S Department of Agriculture (USDA) outlook for Choice steer slaughter prices for the third quarter of 1985 ranged from $64-$68 per hundredweight (*13*, May 1985) The actual price of $58 per hundredweight *(11)* was about $6 less than initially projected for 1985 Given the inelastic demand for red meat, the lower price was directly related to the increased supply of heavyweight cattle The production-related reduction in price of $6 per hundredweight affected the 21,457,000 steers and heifers slaughtered during the first 9 months of 1985 Thus, the expected loss (that is, the negative price reaction) associated with the decision to market heavyweight cattle may have been as much as $60 per head, or $1 3 billion This estimate would increase to the extent that the value of the heavyweight gain was less than the cost of production specifically associated with that gain The financial impact was recognizable almost immediately. Average cash income declined by $25,000, and debt increased by $16,000 for the typical commercial-sized beef producer with sales greater than $40,000 in 1985 *(16)*

This illustration shows that, if resource demand is adjusted to respond to expectations that are not fully realized, output is likely to be suboptimal The costs of expectational error are determined by the net differ-

Kolajo is a research associate and Martin is a professor in the Department of Agricultural Economics and Rural Sociology, Auburn University, Hanson is an agricultural economist with the Agriculture and Rural Economy Division, ERS

[1] Italicized numbers in parentheses refer to items in the References at the end of this article

ence between optimal and realized incomes Economists can use a farm-level evaluation of economic losses due to errors in forecasts in examining the value of information to decisionmaking

Effect of Credit Constraints in Expectational Errors

External financing is typically required by commercial-sized producers But interest expenses in agriculture increased from less than 5 percent of total cash expenses in 1957 to an estimated 15 percent in 1987 Interest expenses are now at the same level as the sum of important manufactured inputs, such as fertilizers, fuels and oils, electricity, and pesticides *(12)* The rapid increase in the use of debt and the corresponding increase in the cost of servicing debt were associated with severe farm financial stress in the mideighties Although financial stress stabilized or lessened in the Midwest and Northern Plains in 1986, financial conditions worsened in the Southeast and Delta States *(16)*

Credit can be used to increase profits However, if the rate of return on assets is less than the rate of interest on borrowed funds, the use of financial leverage tends to lower net income As the ratios of debt to total assets increase, the difference between the rate of return on assets and the interest rate "magnifies" farm profits or losses Thus, if price expectations are not realized, farm losses that are translated into additional indebtedness may eventually cause an operator to lose control of the farm The risk of income shortfalls associated with financial decisions became more likely in the mideighties when prices of both commodities and long-term assets were declining

Theoretical Considerations

As Shackle noted, "decision is choice, but not choice in face of perfect foreknowledge, not choice in face of complete ignorance Decision, therefore, is choice in face of bounded uncertainty" (*9*, p 5) Expectations are the foundation of economic decisions, that is, production and investment decisions derive from the decisionmaker's expectations of future outcomes

The extent by which intended and executed plans deviate from actual outcomes may be expressed in terms of unanticipated net revenue gains or shortfalls Unanticipated revenue shortfalls can be viewed as missed opportunities resulting from unrealized expenditures Unanticipated revenue gains occur when expectations are exceeded Although both revenue gains and shortfalls have opportunity costs, large shortfalls can threaten the financial survival of farm firms with high debt-to-asset ratios

Larger than anticipated profits represent lost profit opportunities. This paradox can be explained as follows If market prices exceed the expected price, the marginal physical product of fertilizer, for example, will exceed the ratio of input to output prices Less than optimal use of inputs can lead to the loss of a firm's competitive edge, as fixed resources are gradually bid away by other firms that more nearly equate marginal factor cost (MFC) with marginal value product (MVP) Land prices, in particular, can be bid up rapidly by the more efficient firms during periods of farm profitability

Unanticipated revenue shortfalls often cause borrowing to increase The interest rate premium for loans (that is, above the interest rate on savings) increases the adverse consequences of shortfalls in income. Higher financing costs or a tightening of credit can increase cost structure If asset restructuring (especially in the case of asset-downsizing) is required, loss of size economies could further reduce longrun competitiveness

Denoting expectational error by L, we can express net revenue gain or shortfall in terms of output Y, realized or actual price per unit P, the amount of input x_1, and input price per unit w_1.

$$L = f(Y, P, x_1, w_1) \quad (1)$$

L can be represented in terms of net revenue changes induced by changes in input-output relations

$$L = P\Delta Y - w_1\Delta x_1 \quad (2)$$

where Δx_1 and ΔY, respectively, denote changes in input and output levels induced by the decisionmakers' expectations of future outcomes. Equation 2 assumes a simplistic evaluation of L given that input and output change and that w_1 and P are known Although partly determined by P, L is not generally known during the planning period The more relevant change-causing price may then be termed the planning price, P_e. Thus, one source of expectational error is the divergence between P and P_e

For ease of exposition, assume one product, one variable input in combination with fixed inputs, and a given production function with fixed technology. Planned output fully adjusts to the planning price, that is, there is a corresponding quantity adjustment path to each planning price *(18)* Figure 1 uses the concept of a production function to illustrate expectational error by distinguishing among consequent total value products (TVP) Actual TVP differs from the notional TVP (that is, total physical product multiplied by the planning price P) Figure 1 assumes that a change in output is motivated by a change in expected output price A "negative" notional TVP (pessimistic price outlook) could be associated with reducing variable input costs (for exam-

ple, by reducing the number of sprayings for leaf spot in peanut production), whereas a "positive" notional TVP could increase input use (for example, spraying).

Expected prices exceeding actual prices reduce profits (triangle BCD in fig 1) The optimistic, but unfulfilled, price expectation (P+) increased input use, thus, MFC exceeded MVP However, anticipation of the low price (P−) and corresponding contraction of input use dropped MFC below MVP (P*) The triangle ABE represents the lost profit opportunity associated with pessimistic, but overfulfilled, price expectations

Procedure

We estimated opportunity costs resulting from expectational errors from income streams based on (1) actual prices and yields and (2) expected prices and yields The actual income streams were developed from the "historic" price and yield data of a typical crop farm in north Alabama over an 8-year period (1978–85) After scaling for the relative productivity of the typical farm, we assumed expected yields followed a 5-year moving average of the Colbert County yield data for 1973–85 *(1)* Enterprise budgets were developed from the farm's production records The formula for calculating the expected annual yield for each enterprise can be expressed as

$$Y_t^* = \alpha\,(1/n \sum_{i=1}^{n} Y_{t-1})\quad t = 1, 2, \ldots, 8 \qquad (3)$$

where Y_t^* represents the expected annual yield per acre in year t, Y_t represents the actual yield per acre in t, n =5, and α is the scaled productivity adjustment factor Year-to-year variability in actual yields exhibited greater dispersion than within-year differences between actual and expected yields *(7)*

To reflect the effect of alternative price expectations on incomes, we assumed two expectational schemes supply-based expectations (SBE) and adaptive expectations (ADE) We formulated the SBE by using the fundamental approach to price forecasting in commodity markets, which was based on the applied supply and demand paradigm *(2)* We considered supply variables, such as intended plantings, harvested acres, yields, beginning stocks, and production level vis-a-vis demand variables, including domestic use of ouput, exports, ending stocks, and carryover of unused output, in estimating expected prices under the SBE scheme. This information is synthesized from USDA's annual estimates of aggregate crop production and use *(15)*

The ADE approach is a variant of Nerlovian adaptive expectations Expected net returns per acre in year t were expressed in terms of the expected yield per acre (Yt*), the actual price received in the previous year (Pt-1), and estimated production costs in the current year Expectations based on returns per acre maximize the expected value of producer surplus *(5)* The ADE scheme is a conservative approach to estimating planning prices Although ADE may be conceived as a naive approach, because the search cost of information is minimized, it acknowledges learning from experience as superior Table 1 shows actual and expected returns received and estimated

The representative farm we analyzed produces cotton, soybeans, corn, and wheat The farm operator was

Table 1—Net returns per acre under supply-based expectation (SBE) and adaptive expectation (ADE) schemes for modeled enterprises, 1978–85

Item	Cotton[1]			Soybeans			Corn			Wheat		
	Actual	SBE	ADE	Actual	SBE	ADE	Actual	SBE	ADE	Actual	SBE	ADE
	Dollars per acre											
1978	80 68	160 53	127 53	74 94	111 21	116 61	89 26	81 16	81 16	60 07	62 07	34 07
1979	149 47	182 37	221 37	217 98	108 02	111 92	135 39	82 89	90 09	182 61	84 07	73 57
1980	168 62	156 03	100 83	51 27	114 67	117 37	53 59	88 19	113 39	96 76	79 67	110 47
1981	280 73	131 55	128 75	117 86	130 67	103 07	197 93	116 87	158 87	97 30	97 15	61 55
1982	197 64	62 82	47 43	157 00	98 94	92 34	146 92	69 42	82 72	4 85	64 03	39 23
1983	176 76	152 06	10 46	116 12	68 68	54 64	201 85	61 45	51 85	94 30	78 98	35 32
1984	22 11	24 33	136 08	46 45	85 70	105 41	162 53	59 74	114 81	91 42	57 42	44 22
1985	284 84	225 78	91 53	41 74	77 58	94 38	173 06	49 74	59 34	27 38	83 42	68 22
Average	170 11	136 93	108 00	102 92	99 43	99 47	145 07	76 18	94 03	80 62	75 85	58 33
Standard deviation	89 87	64 71	63 20	62 04	20 81	20 37	51 67	21 05	34 44	55 81	13 48	26 02
	Percent											
C V[2]	52 83	47 25	58 52	60 28	20 93	20 48	35 62	27 63	36 63	69 23	17 77	44 61

[1]Expected net returns for cotton were generated under the assumptions that cottonseed yield was 1 6 times the pounds of lint and that seed prices were equivalent to the State's season average prices Gross income from cotton is thus an addition of incomes from both seed and lint
[2]C V means coefficient of variation

assumed to own 600 acres of land at the beginning of the planning period plus a sizeable complement of machinery, valued at $402,951 [2] The farm operator was assumed to have no initial outstanding debt With no cash on hand at the beginning of the year, the farmer initiated the farming operation through financing Average annual effective interest rates on current operating expenses were used for short-term loans *(18)* We analyzed the trajectories of farm firm growth for low, medium, and high financial leverage This procedure permitted alternative upper limits to debt financing of 25, 40, and 70 percent of the farm asset value Survival was described as the ability to meet cash obligations without liquidating capital assets The overall measure of a farm's well-being was indicated by its growth in net worth

Given the assumption that any amount of land could be purchased at prevailing market prices, farm growth at the extensive margin was limited only by maximum feasible debt-to-asset ratio assumptions We used historical land values per acre in Alabama *(14)* and effective annual interest rates on new farm loans provided by the Federal Land Bank of Jackson, MS, to determine land purchase and mortgage financing terms

We applied two modeling approaches to this analysis, namely a conventional multiperiod linear programming (MPLP) model and a recursive strategic linear programming (RSLP) model The conventional MPLP model derives optimal solutions over an entire planning period The RSLP model is a sequential, optimizing procedure that incorporates the outcome from current-year decisions into the subsequent year's planning process The models are distinguished by their treatment of information In the MPLP framework a unitary elasticity of expectations is assumed, whereas in the RSLP model expectations are revised annually (as more information becomes available) We used the following procedure (1) selected an optimization method, for example, MPLP, (2) ran the model with known net returns per acre, and (3) ran the model again with net returns estimates based on producer expectations, for example, SBE Changes in profits (in effect, changes in net worth) could then be compared between the two model runs [3] The analysis of managerial decisionmaking within a framework of alternative expectational schemes shows the importance of information processing

Given the MPLP and RSLP optimization techniques and the alternative credit constraints discussed earlier, the implications of expectational (forecast) errors on farm firm decisions are analyzed below

Annual Cost of Expectational Errors

A plausible way of quantifying expectational errors in monetary terms is to subtract the net revenue generated from a specified farm plan under a given expectational scheme from that of the optimum farm plan with known prices The net revenue difference thus obtained represents the cost of expectational errors A positive difference (that is, when the monetary outcome is larger than anticipated outcome) represents the cost of unrealized opportunities (area ABE in fig 1) A negative difference (that is, the monetary outcome is less than anticipated) indicates a sustained loss (area BCD) in fig 1) Marginal economic analysis would suggest that too few inputs were allocated in the former situation and too many inputs were allocated in the latter

Tables 2 and 3 show revenue differences obtained under the SBE and ADE schemes with respect to both MPLP and RSLP models and alternative leverage conditions In all situations analyzed, the extent of overshooting or undershooting realizable returns increased as the debt-to-asset ratio increased Negative entries signify a shortage in cash-flow compared with the expected level Several large negative entries would correspond to extreme cash-flow difficulties and possible farm failure However, one can view the presence of (both) large positive and negative entries (tables 2 and 3) as constraining farm growth

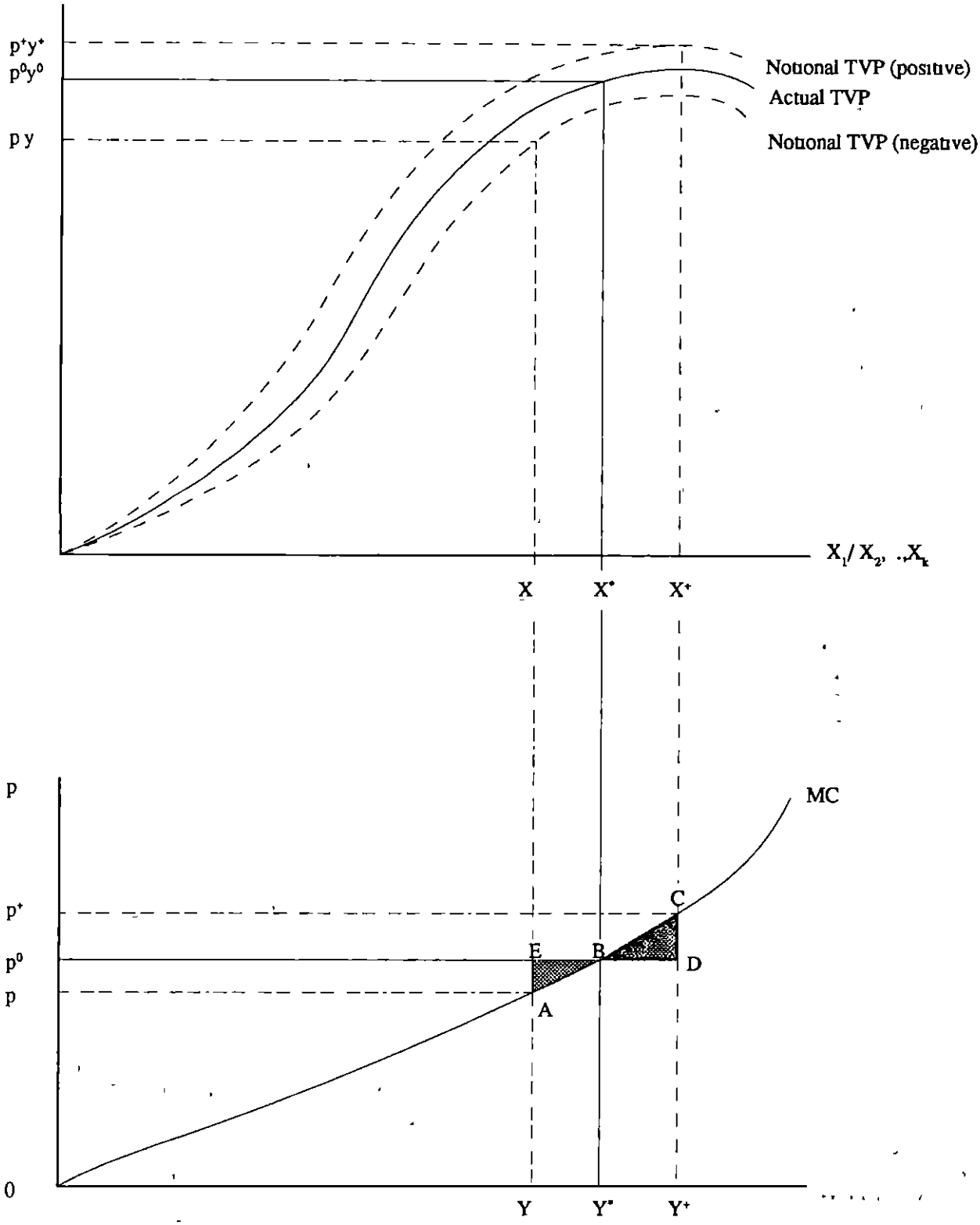
The MPLP model results generally indicated greater income shortfalls and gains than did the RSLP model results In both approaches, the cost of errors increased as debt-to-asset ratios increased. Average shortfalls were greater in the ADE scheme One cannot infer from the results that the cost of expectational errors increased or decreased over the years analyzed across financial leverages and modeling techniques The size of average gains and shortfalls increased with the use of financial leverage, but the pattern was nonsystematic and nonproportional However, enterprise organizations

[2] The farm's beginning assets included $316,200 in land and $86,751 in machinery, for a total *asset value* of $402,951 We assumed that the tractors and machinery could handle timely operations over a 5-year period Specialized harvesting equipment could handle only 200 acres of cotton annually for 8 years and 400 acres of soybeans, corn, wheat, or a combination of the three (not exceeding 400 acres) in the first 5 years, while machinery capacity declined by 50 percent in subsequent years For business accounting purposes, straight line depreciation was assumed The accelerated cost recovery system applied to tax depreciation Other tax features (prior to 1986) included the progressive income tax, the social security self-employment tax, the investment tax credit, the Alabama income tax, and the alternative minimum income tax Consumption expense in the first year of the model was based on a minimum of $10,000 per year plus 25 percent of the aftertax expected annual income This amount was adjusted by the average inflation rates for food and services *(17)*

[3] Kolajo has discussed technical details concerning similarities and differences between the MPLP and RSLP models *(7)* that are beyond the scope of this article

Figure 1

Effects of expectational errors in input use and profit potential



TVP = Total value product

The top chart indicates alternative total revenue functions resulting from different output price expectations
The bottom chart shows the opportunity loss (triangle ABE) and sustained loss (triangle BCD) due to underutilization and overutilization of inputs, respectively

Table 2—Expectational errors associated with supply-based expectations and alternative models and credit constraints, 1978–85[1]

Year	MPLP model results			RSLP model results		
	Low leverage	Medium leverage	High leverage	Low leverage	Medium leverage	High leverage
	Dollars[2]					
1978	-30,478	-30,478	-30,478	-47,910	-47,910	-47,910
1979	-21,680	56,181	71,010	-14,242	- 3,859	22,928
1980	-20,955	-40,018	-65,588	3,813	- 2,124	-13,991
1981	- 9,838	-12,400	-18,703	34,260	55,145	129,585
1982	44,590	56,202	84,768	38,552	45,809	75,652
1983	28,134	39,532	57,347	16,718	19,643	32,184
1984	-22,738	-30,588	-49,756	-26,062	-28,816	-51,143
1985	45,366	57,180	86,242	41,585	48,969	81,398
Average shortfall	-21,138	-28,371	-41,131	-29,405	-20,677	-37,681
Average gain	39,363	52,274	74,842	26,986	42,392	68,349

[1] Alternative models used are multiperiod linear programming (MPLP) and recursive strategic linear programming (RSLP), while credit constraints are represented by low, medium, and high leverage

[2] Unanticipated gains and shortfalls are associated with positive and negative dollar amounts that indicate unrealized opportunities and sustained losses, respectively, resulting from price and yield forecasting errors of enterprise organizations Researchers obtain both gains and shortfalls by subtracting realized net income from optimum net income, given the enterprise organizations chosen

Table 3—Expectational errors associated with adaptive expectations and alternative models and credit constraints, 1978–85[1]

Year	MPLP model results			RSLP model results		
	Low leverage	Medium leverage	High leverage	Low leverage	Medium leverage	High leverage
	Dollars[2]					
1978	-25,002	-25,002	-25,002	-26,038	-26,038	-26,038
1979	71,486	58,801	83,938	17,403	-42,125	-79,378
1980	-51,029	-60,283	-81,832	-50,038	-57,705	-89,698
1981	30,154	35,623	48,356	29,998	34,099	53,004
1982	49,917	58,970	80,049	49,659	56,448	87,744
1983	43,097	50,844	71,378	28,773	36,642	64,984
1984	16,841	25,031	42,168	15,708	-21,238	2,990
1985	-23,175	-27,101	-46,229	-10,568	3,237	-71,432
Average shortfall	-33,069	-37,462	-51,021	-28,881	-36,777	-66,637
Average gain	42,299	45,854	65,178	28,308	32,607	52,181

[1] Alternative models used are multiperiod linear programming (MPLP) and recursive strategic linear programming (RSLP), while credit constraints are represented by low, medium, and high leverage

[2] Unanticipated gains and shortfalls are associated with positive and negative dollar amounts that indicate unrealized opportunities and sustained losses resulting from price and yield forecasting errors of enterprise organizations Researchers obtain both gains and shortfalls by subtracting realized net income from optimum net income, given the enterprise organizations chosen

under the ADE scheme were more diversified than those under the SBE scheme

Farm Growth Under SBE and ADE Schemes

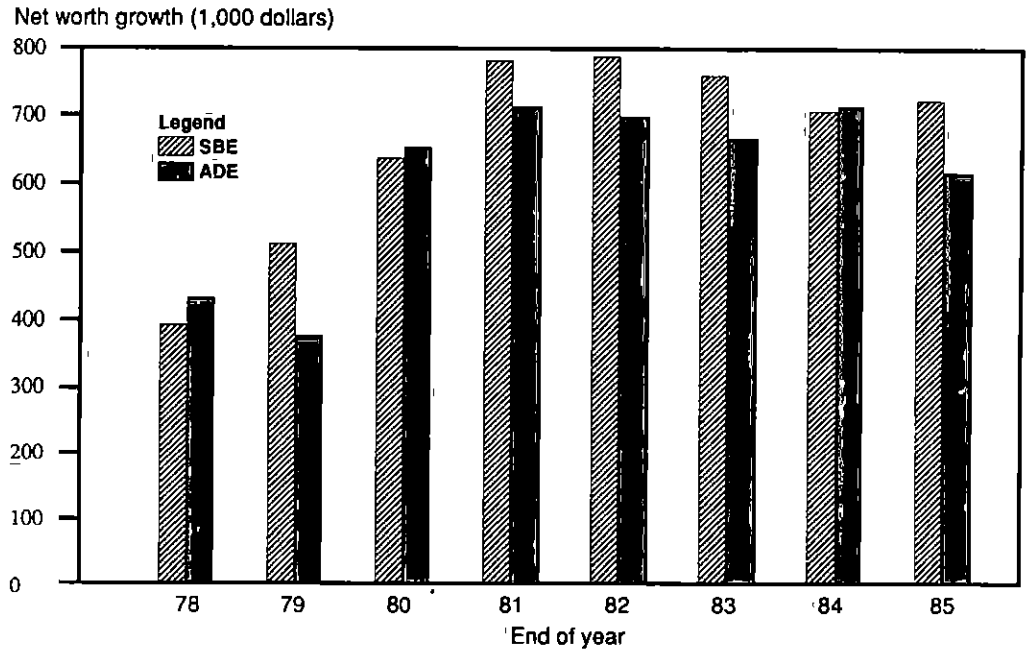
We analyzed farm growth, measured in terms of cumulative net worth, under the supply-based expectational (SBE) scheme and the adaptive expectational (ADE) scheme with respect to alternative leverage conditions Figures 2 and 3 highlight the trajectories of farm growth described with the RSLP model [4]

RSLP model results indicate that, as the farm business became increasingly leveraged, a disparity developed between the effects of SBE and ADE schemes on farm growth (figs. 2 and 3). Using the net worth criterion, we discovered that farm growth under the SBE scheme generally lagged behind the ADE scheme in the low-leverage situations However, at the end of the planning period, the net worth of $672,788 in the SBE scheme exceeded that in the ADE scheme by more than $122,000 For most years, the SBE scheme generated higher net worth than the ADE scheme, particularly as the debt-to-asset ratio increased The ending net worth with the SBE scheme in both medium- and high-leverage situations exceeded its ADE counterparts by more than $100,000 The disparity of these results indi-

[4] Although the MPLP model indicates a faster rate of growth than the RSLP model, similar qualitative inferences can be drawn from both In a quantitative sense, however, the results are different

Figure 2

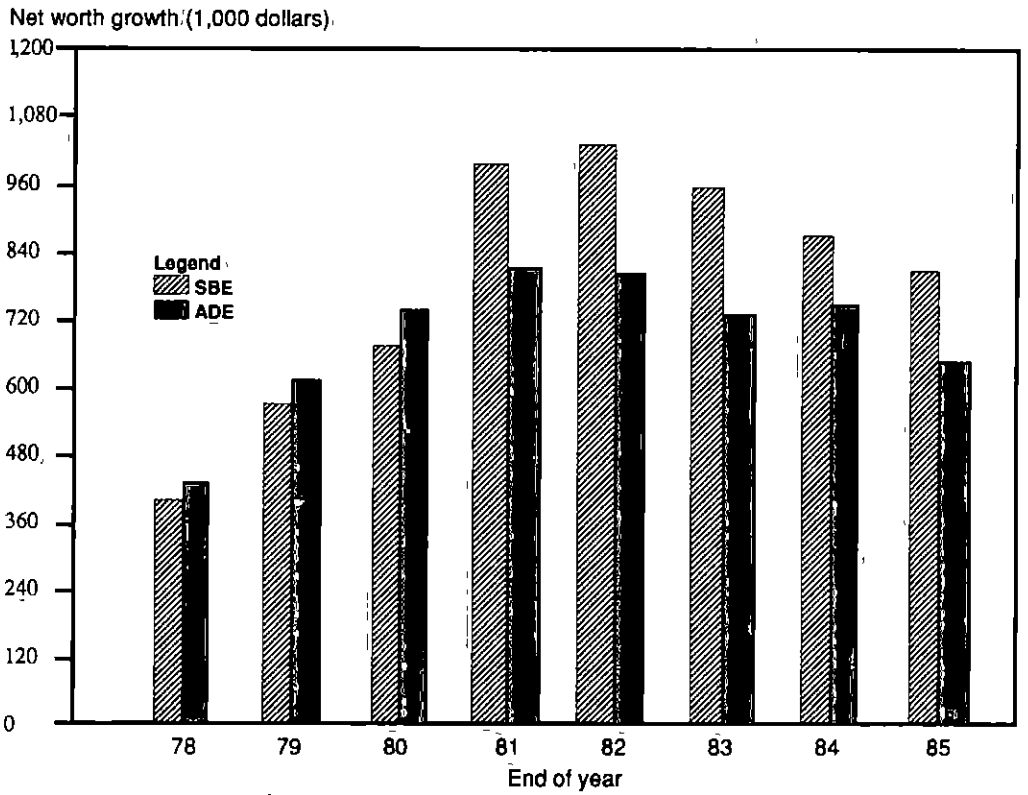
Net worth growth with medium leverage - RSLP model results



RLSP = Recursive strategic linear programming

Figure 3

Net worth growth with high leverage - RSLP model results



RLSP = Recursive strategic linear programming

cates the importance of the accuracy of economic forecasts The growth paths of several farms with size and enterprise attributes similar to the model farm were more characteristic of the ADE scheme (*6*)

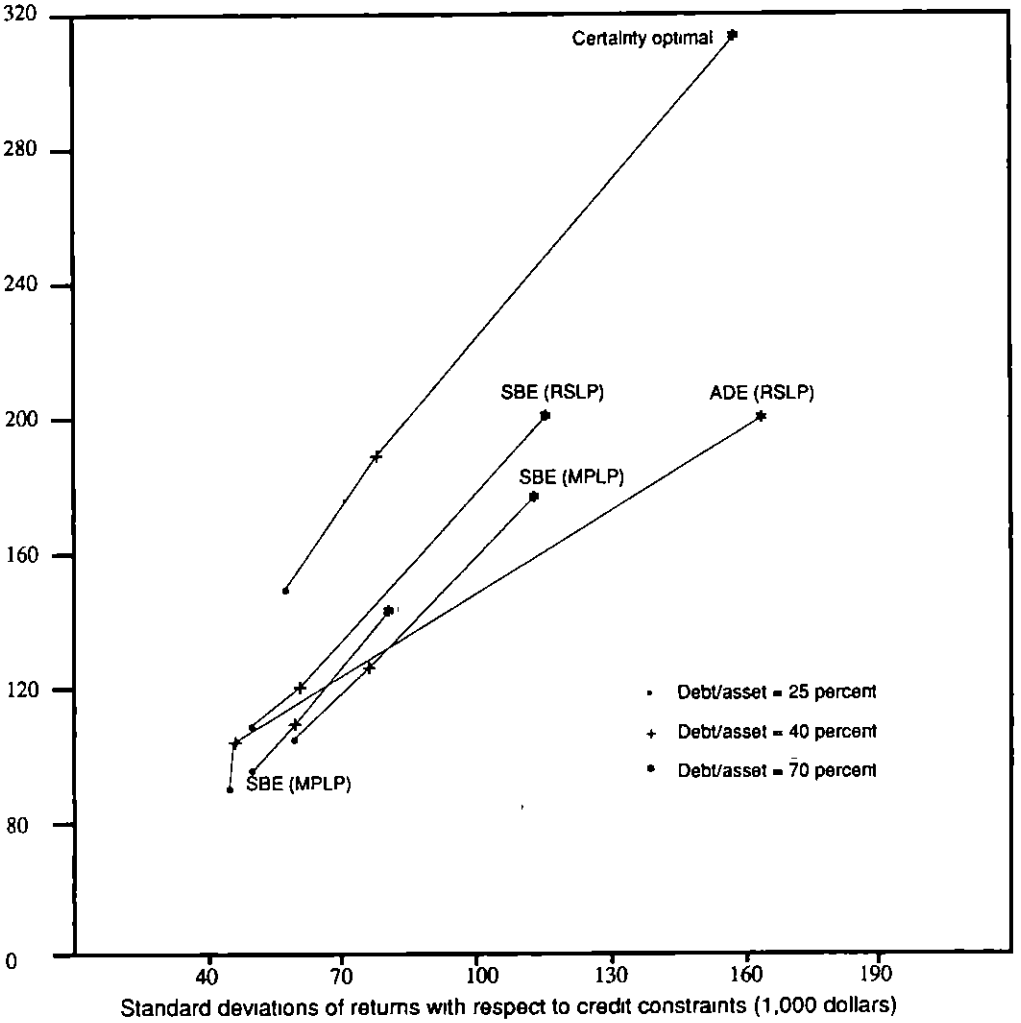
Analysis of Income Dispersions

Theoretically optimal plans were derived on an *ex post facto* basis from actual yields and prices received by the farmer Using the theoretically optimal plans as the target, we can derive differences between "certainty incomes" and incomes obtained in the presence of expectational errors The mean incomes derived for the optimal (certainty) plans, the SBE scheme, and the ADE scheme were plotted against the standard deviations of the annual returns This exercise was conducted for each alternative credit constraint and modeling approach (fig 4)

The certainty optimal plans have less risk for any mean than do the corresponding expectational schemes The three points identified on each curve correspond with alternative debt-to-asset ratios Each curve represents the locus of expected net returns and the associated standard deviations of such income with respect to debt-to-asset ratios The certainty optimal plans conform to Tisdell's claim that, under perfect knowledge, price

Figure 4

Expected net returns and standard deviations with respect to alternative credit constraints



Note Single value expectations (certainty optimal), supply based expectations (SBE) adaptive expectations (ADE), multiperiod linear programming (MPLP) model, and recursive strategic linear programming (RSLP) model

instability (as exhibited by the variances of actual prices received (*7*) is often associated with greater expected returns than in the case of stable farm prices (*10*) Expected return-risk plans with the SBE scheme and the RSLP model approximated the certainty optimal plans better than the remaining combinations With both models, the ADE scheme was associated with low-return/low-risk strategies. A disproportionate level of risk (compared with income) corresponded to the ADE (RSLP) scheme when the debt-to-asset ratio exceeded 40 percent The MPLP model tended to underestimate the range of income variability relative to expected returns under alternative plans

Implications

Substantial uncertainty about agricultural yields and prices often makes it difficult for farmers to formulate expectations However, the nature of these expectations influences the size of the farm, the organization of the enterprises, the combination of resources employed, and the portfolio of assets held Because expectations often deviate from realizations, farmers' decisions are inherently associated with errors

Given the same initial assets and resources, our model results show that farm growth may follow divergent paths, depending both on the nature of a farmer's expectations and on the level of financial risk undertaken When supply-based expectations (SBE) and adaptive expectations (ADE) were applied to production and price data of a crop farm in north Alabama, the cost of errors associated with SBE was lower The SBE scheme also supported a faster rate of farm growth in most instances Formulating production plans based on past prices and yields, however, was associated with risk-adverse behavior

From a modeling perspective, the MPLP model generated a greater cost of expectational errors when evaluated in terms of unanticipated revenue gains and shortfalls When the SBE scheme was assumed, unanticipated revenue gains for the MPLP model ranged from $39,363 to $74,842, for the RSLP model, gains ranged from $26,986 to $68,349 Under the SBE expectational scheme, unanticipated revenue shortfalls ranged from $21,138 to $41,131 with the MPLP model and ranged from $20,677 to $37,681 with the RSLP model Under the ADE scheme, unanticipated gains ranged from $42,299 to $65,178 with the MPLP model and from $28,308 to $52,181 with the RSLP models Unanticipated losses ranged from $33,069 to $51,021 with the MPLP model and from $28,881 to $66,637 with the RSLP model Both unanticipated gains and losses increased disproportionately as debt-to-asset ratios increased

As Havlicek and Seagraves (*4*) have noted, an analysis of costs associated with making the wrong decision provides a logical framework for assessing the benefits to research Forecast errors can be transmitted from the researcher to the farmer by recommendations derived from a particular modeling technique Thus, the choice of model and the assumptions incorporated into the model may constitute a source of errors For example, generalizations of the results under the ADE scheme often suggest a pessimistic prospect The MPLP model, as shown by the expected return vis-à-vis risk, may also understate the extent of income variability associated with increasing financial leverage This situation is less likely with the RSLP model, which updates information over time Thus, our main conclusion is methodological and may be useful to USDA's representative farm model research project and to similar modeling efforts in the land-grant universities

We have shown the importance of information mangement in farm growth processes We have demonstrated that the formation of expectations is a crucial element in micromodeling firm-level responses to technical and socioeconomic changes

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