SIMULATING FIRM SURVIVORSHIP - SUGGESTIONS FOR FINANCIAL SIMULATION RESEARCH

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Introduction

The purpose of this paper is to review the results of a financial simulation model which was directed toward estimating firm survivorship and other financial ends. In so doing some assessment is made of the usefulnesses and weaknesses of the simulation results with a view of improving the instruction of future models. The objective of the original research was to provide a useful and applied framework for studying financial issues related to firm entry and survivorship in Nebraska wheat farming.

The thrust of this research is in the framework of providing decision makers (firm managers or financial officers) with economic relationships to assist with decision making. Where several financial ends are involved (income, survivorship, net worth, and cash flow), we believe decision makers require knowledge of the economic trade-offs <u>before</u> decisions are made. Thus, a pre-specification of a "priority" of these ends by decision makers is very questionable. In making financial decisions, the settings are very "circumstance specific" heavily influenced by recent occurrences, exogeneous happenings and subjective interpretations. Hence, simulated results of financial choice can logically be useful to decision makers who find themselves in widely ranging situations requiring periodic decisions.

For this study survivorship of the firm is highlighted as a manifestation of risk. This is in contrast to the usual risk concern embodied in expected utility theory related to income variance. Firm survivorship relationships are not easily derived from the typical efficiency frontier analysis of income and income variance. Obviously, firm survivorship requires a financial definition, of which little is actually known. This becomes more apparent later in the paper.

Other objectives such as net income and growth in net worth appear as useful since net return flows may differ among production and investment activities over time. At this point, variability in income flows is not important apart from survivorship implications. That is, we assume that short-term borrowing for emergency purposes may be necessary for the firm to survive. Yet, the avoidance of short-term borrowing may be a goal of many firm managers. Perpetual short-term borrowing is quite another matter. In addition to the tendency of firm managers to avoid short-term borrowing, there may exist lender resistance to continual borrowing of this nature.

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Thus, cash flow is hypothesized to be a variable which is important to decisions facing firm operators. This becomes important, for example, to a scene where net worth is increasing but is accompanied by heavy short-term borrowing.

The occurrence of inflation adds several elements of risk in financial growth analysis. One is the issue of maintaining a firm's real financial wealth position in the face of a declining value of the dollar. This involves the investment of assets and the use of borrowed capital. There is risk relating to the general inflation rate which is of major importance to real discount rates. Real discount rates, in turn, are critical to land values which are important to the financial aspects of the farm firm.

Because a number of objectives are considered under a financial growth and risk emphasis, simulation has some advantages over other methods of analysis. Complex time related investment activities are easily examined with simulation while multi-period optimizing models of whole farm nature become large and costly to analyze particularly under risk elements. In this model particular attention is placed on alternative starting states, various financial choices, and distributions of outcomes because of price and yield risk.

The use of economic simulation models easily leads to a tendency to examine a host of "what if" questions. This is an advantage of simulation yet caution needs to be exercised in testing such questions. In other words, where economic relationships exist between variables, it can be a serious misrepresentation to allow a variable to independently range widely from other related variables. Simulation is particularly prone to such problems resulting from distortion of economic relationships between variables.

Model and Assumptions

The financial simulation model reflects the operation of an average sized dryland Nebraska Panhandle wheat farm (960 acres) over a projected 15-year period (1976-1990). Wheat prices and yields are variables reflecting the variable nature of wheat farming under a range of price and yield trends. The model was tested using 100 price-yield distributions for various decision variables and starting states. For those trials where the firm survived, the financial performance of the firm is measured for various objectives.

Financial Assumptions

The wheat farm started with $391,132 of assets at 65 percent owner equity ($254,236). No beginning short-term debt existed but $136,896 of long-term debt on the initial 960 acres was assumed. Machinery and operating inputs were inflated at an annual rate of 5 percent from 1976 levels. A starting land value of $375 per acre was assumed for 1976 and appreciated at a rate of four percent annually. Machinery was replaced according to a depreciation schedule with additional machinery purchased when expansion occurred.

Net cash flow was computed on an annual basis. Net cash flow was positive if gross income totally covered cash production expenses, income taxes, land principal payments, and consumption. Any excess cash was used to retire short-term debt. The short-term interest rate was eight percent. When short-term carryover debt was totally paid the residual was deposited in a savings account at five percent interest. The interest on real estate debt was seven percent.

Federal income tax was computed by the cash accounting method. The consumption allowance for the farm family was assumed to be $10,000. This allowance was increased five per cent annually.

Four land expansion variables were studied. These were (1) purchase, (2) share-rent, (3) a combination of purchase and share-rent, and (4) no expansion. Opportunity existed to purchase six 320 tracts in alternate years as long as the purchase did not result in owner equity falling below a 40 percent level. Under the share-rent alternative, the tracts could be share-rented in the same alternate years if owner equity was at least 40 percent with the operator receiving two-thirds of the yield and paying for two-thirds of the fertilizer. The combination option allowed the manager to purchase land if the net cash flow was positive from the initial year to each decision year and owner equity conditions were met. If a negative net cash flow occurred, the share-rent alternative for each decision year was engaged. Finally, an alternative of not expanding was investigated.

Survivorship is defined as the maintenance of an owner equity position in excess of 40 percent. The firm completely exhausted its external borrowing capacity and was considered illiquid at 40 percent owner equity from either borrowing for land or from short-term borrowing for meeting cash flow deficits. This illiquid position was also defined as an insolvent position for purposes of this study. The dependence on collateral as the only factor in determining borrowing capacity is critical to the definition of survivorship. In reality the lender faces many risk elements beside collateral in making decisions related to financing an operator who is in short-run distress or making long-term investments.

Price-Yield Assumptions

Two 15-year cyclical wheat price trends and two 15-year yield trends are shown in Table 1. Together they result in four 15-year price-yield combinations employed to test the decision variables. The basic assumptions for wheat prices centered on an initial price of $3.30 per bushel increasing at an annual rate of two percent. The initial yield level was set at 32 bushels increasing ¼ bushel per acre per year. The four price-yield combinations built around these basic assumptions are reflective of possible future cyclical price and yield trends. The relative favorability of each of the four price-yield combinations can be obtained by multiplying average price times average yield. Highest average gross income per acre occurred with price 2-yield 2 at $144.03. Second and third highest respectively were price 1-yield 2 at $132.54 and price 2-yield 1 at $123.90. Lowest average gross income occurred under price 1-yield 1 at $116.40.

Normal probability distributions were built around the cyclical price and yield trends shown in Table 1, to reflect risk elements. Standard deviations of 30¢ per bushel and 6 bushels per acre were employed. From the normal probability distributions built around the cyclical trends, one hundred price and yield values were randomly selected for each of the 15 years. These one hundred 15-year selections were maintained across each of the expansion and borrowing decision variables examined for each

Table 1. Structure of hypothetical 15-year projected price and yield models.

Simulation year	Price models: Basic projected price trend	Price models: Annual mean values of cyclical price models: Price model 1	Price models: Annual mean values of cyclical price models: Price model 2	Yield models: Basic projected price trend	Yield models: Annual mean values of cyclical yield models: Yield model 1	Yield models: Annual mean values of cyclical yield models: Yield model 2
	dollars per bushel			bushels per acre		
1	3.30	3.30	3.30	32.00	22.00	42.00
2	3.37	3.12	3.62	32.25	22.25	42.25
3	3.43	2.94	3.94	32.50	22.50	42.50
4	3.50	2.75	4.25	32.75	22.75	42.75
5	3.59	2.57	4.57	33.00	33.00	33.00
6	3.64	3.04	4.24	33.25	33.25	33.25
7	3.72	2.52	3.92	33.50	23.50	23.50
8	3.79	3.99	3.59	33.75	23.75	23.75
9	3.86	4.47	3.27	34.00	24.00	24.00
10	3.94	4.94	2.94	34.25	44.25	44.25
11	4.02	4.62	3.42	34.50	44.50	44.50
12	4.10	4.30	3.90	34.75	44.75	44.75
13	4.19	3.99	4.39	35.00	35.00	35.00
14	4.27	3.67	4.87	35.25	35.25	35.25
15	4.35	3.35	5.35	35.50	35.50	35.50
15 Yr. Ave.	3.79	3.64	3.97	33.75	30.95	36.42

price, yield combination. Odds of survival were measured by computing the percentage of trials out of 100 successfully maintaining an owner equity of 40 percent or more during the 15-year period.

Ending net worth, percent owner equity and total acreage as of year 15 were then averaged for the survivors of the 100 trials. A 15-year average of net farm income and corresponding coefficient of variation was also determined for survivors. Net farm income was defined as net cash income less depreciation with no wheat inventories maintained.

The simulation trials were tested for 1) starting equity, 2) expansion alternatives, 3) borrowing limits, and 4) land appreciation levels. A 65 percent equity level of the firm was used as the basic assumption of the study. In addition, both a 50 percent and 80 percent starting equity position were also investigated.

In examining borrowing limits, the firm was allowed to maintain owner equities of 40, 45, 50, 55, 60 and 65 percent. These increased safety margins were examined to study limits on expansion while hypothetically increasing survivorship.

In addition to the base annual increase in land values (4%), a zero increase and an eight percent annual increase were also tested.

Because of the large number of trials (three starting equities, four expansion alternatives, six borrowing limits thru land appreciation rates, four price-yield trends, and 100 price-yield distributions) some selection of variables was made.

Results

Starting Equity

The results for the starting equity trials are directly and easily interpreted. The effects of starting equity on survival, net worth, and net income are presented in Table 2 for the purchase expansion option and Table 3 for the share rent expansion option. For the purchase option, rates of firm survival are generally low. This indicates that under the assumptions of the study, risk elements restrict the chances of financial survival to very high starting equities when the firm expands by purchasing land. Interest costs on purchased land act to restrict income and, while net worth may be rising, the firm is unable to weather low income years because of its expansion policy. Obviously the higher the starting equity, the higher the survival rate.

Survival rates for the share rent option are much higher than for the purchase expansion alternative. The risk reducing effects of renting vs. buying land are well known and the results here substantiate this. Net incomes are higher for the share rent option compared to land purchase due to the high interest costs on purchased land.

The results achieved from the equity trials appear to present potential for applied use. The results raise the usual doubts about entry into agriculture through a land ownership route. Yet the model is useful for studying other paths such as renting or renting and purchasing land at later times while maintaining a high probability for survival. The situation where non-farm income is used to supplement the farming operation can easily be incorporated into the simulation model. Certainly there appears to be use for such results in advising young farmers or financial officers who are involved with beginning farmers.

Table 2. Growth, income and survival of the model farm as affected by alternative beginning equity positions under the purchase option with land appreciating at four per cent annually and required equity at a minimum of 40 per cent.

Price-Yield model	Beginning equity %	Rate of survival (year 15) %	Survivors net worth (year 15) $	Survivors ave. net farm income $	Survivors owner equity %	Survivors acreage (year 15) (acres)
Price 1-Yield 1	50% ($195,566)	0	--	--	--	--
	65% ($254,236)	1	491,511	9,899	43.0	1600
	80% ($312,906)	11	675,601	15,648	44.9	2153
Price 2-Yield 1	50% ($195,566)	2	526,836	15,531	50.6	1440
	65% ($254,236)	8	598,776	12,437	46.7	1800
	80% ($312,906)	17	892,649	24,903	50.5	2522
Price 1-Yield 2	50% ($195,566)	13	593,260	20,032	43.2	1945
	65% ($254,236)	23	782,235	26,762	46.3	2421
	80% ($312,906)	54	889,844	29,838	47.3	2684
Price 2-Yield 2	50% ($195,566)	14	815,012	32,573	50.9	2263
	65% ($254,236)	47	949,229	37,482	50.8	2655
	80% ($312,906)	83	1,047,546	39,800	52.9	2830

Table 3. Growth, income and survival of the model farm as affected by alternative beginning equity positions under the renting option with land appreciating at four per cent annually and required equity at a minimum 40 per cent.

Price-Yield model	Beginning equity %	Rate of survival (year 15) %	Survivors net worth (year 15) $	Survivors ave. net farm income $	Survivors owner equity %	Survivors acreage (year 15) (acres)
Price 1-Yield 1	50% ($195,566)	10	481,852	29,669	62.8	2880
	65% ($254,236)	73	535,354	29,460	69.8	2880
	80% ($312,906)	100	628,256	32,939	81.6	2880
Price 2-Yield 1	50% ($195,566)	68	565,669	32,421	73.8	2880
	65% ($254,236)	99	650,506	35,363	83.4	2880
	80% ($312,906)	100	736,895	41,097	93.4	2880
Price 1-Yield 2	50% ($195,566)	100	572,996	38,268	74.6	2880
	65% ($254,236)	100	681,483	43,706	87.2	2880
	80% ($312,906)	100	784,157	48,762	95.3	2880
Price 2-Yield 2	50% ($195,566)	100	715,282	48,734	88.1	2880
	65% ($254,236)	100	815,326	53,673	93.5	2880
	80% ($312,906)	100	912,169	58,413	96.7	2880

Expansion

The results of the expansion trials across the four price-yield trends are presented in Table 4. They indicate the general trade-off between growth and survival. No option among the purchase, share-rent or combination alternatives, demonstrated a consistently higher growth in net worth among the four price-yield combinations. Under the more favorable price-yield relationships, the purchase option showed greatest growth in net worth, while the share-rent and combination options experienced greater growth at lower prices and yields. Even when greater growth occurred through land purchase, net worth was only marginally higher compared to share-renting or the combination option. Moreover, such growth was realized at an extremely high risk of failure. The obvious advantage of a high risk purchase option might be accumulation of future wealth through land appreciation. However, in addition to low odds of survival, low relative levels of net farm income were experienced in the purchase option, requiring the substantial borrowing of short-term capital. The final resulting owner equity was approximately 50 percent or less, leaving the firm in a vulnerable position for future years. High interest costs on purchased land was the major reason for low income under the purchase option. The coefficient of variation indicates the variability of income to be relatively high under the purchase option.

Compared to purchasing, expansion through share-renting resulted in comparable growth but with higher rates of survival. The growth which occurred under the share-rent option was partially caused by the appreciation on initially owned land and also by relatively high income. Compared to the purchase alternative, this option avoided higher interest costs and land taxes, which combined with lower principal payments, resulted in an improved cash flow and ending owner equity position.

At higher price-yield levels, the combination option tended to be in an intermediate position between the purchase and share-rent options with regard to survivorship, growth and income. Under lower price-yield situations, the combination option yielded the greatest growth in net worth. The odds of survivorship with the combination option decline under more favorable price-yield combinations compared to less favorable prices and yields. This is because at less favorable price-yield combinations, the firm bypassed some purchase opportunities in favor of share-renting resulting in a more stable financial position.

A no-expansion option did not guarantee survival. Yet, it was only at the lowest price-yield level that survival could be considered low. Ending net worth was by far the lowest of all options. Inflating production costs reduced net farm income, which combined with a non-growing land base prevented significant growth.

At the two high price-yield combinations, the difficulty with a financial definition of insolvency causes difficulty. A purchase option is seen to lead to high ending net worth while resulting in low survival rates. The reason for the possible inconsistency is the absence of a liquidation feature to allow a firm which is in financial distress to liquidate assets to again satisfy an equity limit. Much more needs to be known regarding lender behavior in such circumstances before conclusive evidence on rapid purchased land expansion limits can be determined.

Table 4. Growth, income and survivorship of the model farm as affected by expansion policies with beginning equity at 65 per cent, land appreciating at four per cent annually, and required equity at a minimum of 40 per cent.

Price yield combination and expansion option	Rate of survival (year 15)	Survivors net worth (year 15)	Survivors ave. net farm income	Survivors coefficient of variation net farm income	Survivors owner equity	Survivors acreage (year 15)
	%	$	$	$	%	(acres)
Price 1-Yield 1						
Purchase	1	491,511	9,899	3.099	43.0	1,600
Share-rent	73	535,354	29,460	1.668	69.8	2,880
Combination	68	538,592	29,112	1.681	67.1	2,880
No expansion	37	344,646	4,586	4.886	47.3	960
Price 2-Yield 1						
Purchase	8	598,776	12,437	2.253	46.7	1,800
Share-rent	99	650,506	35,363	1.155	83.4	2,880
Combination	95	656,572	32,874	1.242	75.6	2,880
No expansion	85	405,137	8,064	2.136	55.7	960
Price 1-Yield 2						
Purchase	23	782,235	26,762	1.711	46.3	2,421
Share-rent	100	681,483	43,706	1.078	87.2	2,880
Combination	67	742,259	33,883	1.479	59.7	2,880
No expansion	100	471,002	15,369	1.488	64.7	960
Price 2-Yield 2						
Purchase	47	949,229	37,482	1.147	50.8	2,655
Share-rent	100	815,326	53,673	.723	93.5	2,880
Combination	66	925,029	39,748	1.095	58.2	2,880
No expansion	100	577,798	24,252	.866	79.4	960

Borrowing Limits

The results presented in Table 5 reflect trade-offs between growth (terminal net worth) and survival as borrowing for land purchases is reduced to more conservative self-imposed limits. More liberal borrowing limits were accompanied by a higher risk of failure, greater net worth and higher net farm income. Net farm income was reduced through more conservative borrowing limits because farm size growth was limited. More conservative borrowing also resulted in a higher percent owner equity after year 15, assuring greater financial safety for upcoming years. Unused borrowing reserves associated with more conservative self-imposed borrowing limits are valuable to the firm as a source of liquidity for meeting unexpected obligations and assuring survival.

Under higher price-yield situations, it was generally found that the payoffs for marginal reductions in borrowing are higher within a more liberal range of borrowing (40 to 50 percent required equity). That is, odds of survival are enhanced substantially with only moderate reductions in growth. Within more conservative ranges of borrowing (50 to 65 percent required equity), the risk of failure is reduced very little if any, with a substantial sacrifice in growth.

This essentially reflects the marginal value of liquidity as being quite high at initial modest amounts. Moving toward more conservative levels of borrowing, the marginal value of liquidity for assuring survival was found to decline quite rapidly. In fact, under stronger price-yield situations, the marginal value of liquidity was found to reach zero. Reduced borrowing served only to further retard growth, with few if any corresponding gains in survival.

The effects of the "safety margins" again underscore the need to carefully consider financial flexibility in defining insolvency. Low survival rates accompanied by high net worths at the 40 percent required equity level do not reflect a true picture of financial distress. Flexibility in machinery purchases, consumption, and liquidation of assets must be included before conclusive estimates of survival can be made.

Land Appreciation

Financial outcomes and risk of firm survival were examined at three selected annual rates of land appreciation (zero, four, and eight percent) over the 15-year period. Results presented in Table 6 reflect enhanced firm growth and better odds of survival at higher rates of land appreciation. For example, raising appreciation from four to eight percent increased the annual growth rate in net worth from 4.49 to 9.82 percent (Price 1-Yield 1), 5.88 to 12.93 percent (Price 2-Yield 1), 7.78 to 13.54 percent (Price 1-Yield 2), and 9.18 to 13.88 percent (Price 2-Yield 2). Likewise, the rate of survival increased from one to 11 percent (Price 1-Yield 1), eight to nine percent (Price 2-Yield 1), 23 to 76 percent (Price 1-Yield 2), and 47 to 86 percent (Price 2-Yield 2).

Table 5. Growth, income and survivorship of the model farm under the purchase option as affected by self-imposed borrowing limits with beginning equity at 65 per cent and land appreciating at four per cent annually.

Price-Yield model	Required equity %	Rate survival (year 15) %	Survivors coefficient of variation net farm income $	Survivors net worth (year 15) $	Survivors ave. net farm income $	Survivors owner equity %	Survivors acreage (year 15) (acres)
Price 1-Yield 1	40	1	3.099	491,511	9,899	43.0	1,600
	45	10	3.146	496,947	10,062	44.1	1,568
	50	15	3.601	440,499	7,911	46.2	1,301
	55	35	4.862	350,598	4,709	46.6	997
	60	37	4.886	344,646	4,586	47.3	960
	65	37	4.886	344,646	4,586	47.3	960
Price 2-Yield 1	40	8	2.253	598,776	12,437	46.7	1,800
	45	51	1.869	598,094	14.294	52.0	1,606
	50	73	2.009	526,100	11,759	53.3	1,355
	55	83	2.198	438,273	8,715	53.2	1,103
	60	83	2.144	410,681	8,130	55.0	987
	65	85	2.143	405,666	8,063	55.5	964
Price 1-Yield 2	40	23	1.711	782,235	26,762	46.3	2,421
	45	68	1.837	697,393	22,483	47.3	2,094
	50	93	1.740	649,923	21,124	50.8	1,806
	55	100	1.682	590,177	19.156	53.6	1,536
	60	100	1.675	523,927	16,587	56.6	1,264
	65	100	1.530	476,453	15,414	61.2	1,040
Price 2-Yield 2	40	47	1.147	949,229	37,482	50.8	2,655
	45	69	1.207	884,766	33,529	53.4	2,342
	50	97	1.145	856,320	33.187	57.7	2,108
	55	100	1.017	797,748	32,324	63.0	1.789
	60	100	0.978	696,643	28,154	67.1	1,440
	65	100	0.961	644,369	25,648	69.2	1,274

Table 6. Growth, income, and survival of the model farm as affected by alternative rates of land appreciation under the purchase option with beginning equity at 65 per cent and required equity at a minimum of 40 per cent.

Price yield combination and appreciation rate	Rate of survival (year 15)	Survivors net worth (year 15)	Annual rate of growth in net worth	Survivors coefficient of variation net farm income	Survivors 15-year ave. net farm income	Survivors 15-year ave. net cash flow	Survivors acreage (year 15)
	%	$	%	$	$	$	(acres)
Price 1-Yield 1							
0 percent	0	--	--	--	--	--	--
4 percent	1	491,511	4.49	3.099	9,899	-25,475	1,600
8 percent	11	1,036,491	9.82	6.099	- 6,206	-45,137	1,891
Price 2-Yield 1							
0 percent	1	430,795	3.58	.803	37,429	- 8,973	1,920
4 percent	8	598,776	5.88	2.253	12,437	-26,030	1,800
8 percent	9	1,574,340	12.93	14.008	2,905	-48,199	2,667
Price 1-Yield 2							
0 percent	8	387,563	2.85	1.056	36,509	- 8,624	2,000
4 percent	23	782,235	7.78	1.711	26,762	-23,548	2,421
8 percent	49	1,629,175	13.18	6.052	9,018	-46,639	2,795
Price 2-Yield 2							
0 percent	9	530,950	5.03	.728	50,967	181	2,347
4 percent	47	949,229	9.18	1.147	37,482	-15,142	2,655
8 percent	86	1,786,301	13.88	2.655	17,513	-36,676	2,876

Operation under successively higher rates of appreciation had two major impacts upon the model farm. The equity base for borrowing short-term capital to bridge cash flow deficits and facilitate survival during poor years was greatly expanded. Secondly, the model farm was able to borrow more capital for subsequent land purchases since its financial position was continually strengthened with increasing land values. Consequently, under higher appreciation rates the model farm was able to achieve substantial growth through greater inflation on both the original land base and on additionally purchased land. Appreciation on additional land provided an expanding equity base over and above appreciation on the original 960 acres for borrowing emergency short-term capital during poor years, thus enhancing survival even more. In recent years many producers have been observed to offer inflated real estate equity as collateral for refinancing purposes.

In terms of survival, results showed that higher cash outflows associated with higher land payments and taxes on inflated land values were more than compensated by the inflows of cash borrowed on the basis of inflated equity. The result was a greater capacity for the model farm to remain in business under higher rates of appreciation in spite of larger fixed obligations as land was purchased over time. Although payments for subsequent land purchases became larger under greater rates of appreciation, once incurred they remained fixed, unlike land values and the corresponding borrowing base which continued to rise over future years. The tendency of land values and the corresponding borrowing base to outpace the fixed land payments became even more pronounced at higher rates of appreciation.

Although the model farm accumulated substantial wealth given greater rates of land appreciation, huge levels of accumulated short-term debt revealed an unhealthy dimension of the firm's financial status. At higher rates of appreciation, net farm income was extremely low and contributed very little to growth in net worth. Low net farm income was largely the consequence of higher land taxes and interest from expanded long and short-term debt. Lower net farm income under higher rates of appreciation was generally insufficient for covering principal payments, income tax, and consumption needs as evidenced by huge average net cash flow deficits ranging to $48,199 under eight percent appreciation (Table 6). This basically shows the model farm in that situation was forced to borrow an average of $48,199 annually over the 15-year period to compensate for insufficient net farm income in covering annual cash obligations.

The issue of continued short run borrowing to meet cash flow deficits deserves further questioning in constructing financial simulation models. Not only is there lender resistance to long-term capital lending in the face of short-term deficits, a question arises how regularly lenders will continue to cover short-term deficits even though net worth of the firm is rising. Further, a goal of many farm firm operators is to minimize borrowing for short-term purposes. Given such a goal structure, it is not clear what levels of increased net worth would override the disutility of short-term borrowing. Finally, the relationship between net income per acre and land values must be carefully determined in financial simulation models and caution exhibited in departing from such relationships. A case can be made for examining short term or small disequilibria positions between land value and land income trends; however, wide and long-run differences between income and value are unacceptable except in unusual circumstances.

Conclusions

The results reported here have shown: 1) the benefits of share renting on reducing the risk of farm business failure, 2) the effect of starting equity position of the firm on growth and survivorship, 3) the importance of financial reserves in the form of borrowing capacity to survivorship, 4) trade-off relationships between the four objectives, net income, net worth, survival, and cash-flow, and 5) the importance of land appreciation rates on growth in the face of short-term cash deficits.

This research has shown the importance of two crucial financial assumptions to the usefulness of financial simulation models. In these cases little is presently known about financial behavior related to these assumptions. First, lender response to conditions of both infrequent and frequent short-term cash deficits of the firm is important to the financial decision hence results of financial simulation models. This is particularly true in circumstances where cash flow deficits are occurring while the firm's net worth is rapidly increasing. A second critical set of assumptions relate to the need to provide realistic financial flexibility alternatives when the model firm encounters financial distress. Without such flexibility, survival rates of the firm are underestimated. Such flexibility includes provision for postponement in machinery replacement and consumption expenditures and asset liquidation under severe financial stress. Thus, the specific conditions under which financial insolvency is defined is most important to firm financial simulation models.

The model used in this research defined borrowing capacity based on the total equity and total liabilities of the firm. Such an assumption rules out more detailed questions of the importance of different forms of assets and conversion of short-term to long-term liabilities under financial stress. Perhaps in the final analysis such detail is unnecessary to questions of eventual firm survivorship, however such detail may be useful for studying the importance of short-term financial strategies.

Finally, it is very important to stress the need to carefully define economic relationships in farm simulation models. Otherwise the ease in which simulation can address the tempting nature of "what if" questions can lead the researcher to pose interesting but perhaps irrelevant questions based upon unrealistic disequilibria conditions. It is important to study disequilibria but at the same time it is imperative that simulation models define realistic bounds relating to variable relationships.