AN ECONOMETRIC SIMULATION MODEL FOR ANALYZING THE USE OF FUNDS IN CORN BELT AGRICULTURE: AN APPLICATION OF PURE RANDOM COEFFICIENT TECHNIQUE

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ABSTRACT

The purpose of this study is to develop an econometric simulation model for analyzing the use of funds in Corn Belt agriculture. The Corn Belt Region, one of the major regions in U.S. agriculture, constitutes states such as Iowa, Illinois, Indiana, Missouri, and Ohio. A set of behavioral functions of the use funds in the region are specified to accomplish this task. Fixed expenditures, production expenditures, and land transfers are the major categories of the use of funds. Further, the behavioral equations are specified by a pure random coefficient technique and estimated by following Zellner's seemingly unrelated technique.

Based on the estimated behavioral functions and accounting identities, a simulation system of the use of funds is developed and an ex-post simulation is performed to test the validity of the model. To test its effectiveness, the model analyzes several farm policy alternatives on the use of funds, such as a 25 percent increase in prices paid indexes, a 50 percent increase in prices received indexes, and a 10 percent reduction in crop planted acres over the normal trend of these variables. An ex-ante simulation to the year 1995 is performed under the policy alternatives. Various farm financial indicators, such as production expenditures, fixed expenditures, farm debt, and credit demand are studied under these policy alternatives.

INTRODUCTION

During the past few decades, U.S. agriculture has become more than a family business. Farming has been commercialized to the extent of becoming an industry. Agricultural production and use of inputs have not only been diversified but also intensified. In addition to being an astute producer, a successful farmer has to be a good financial planner. He or she has to plan the allocation of available funds among different uses to maximize his or her objectives. Various production and other factors are involved in farmer's decision process of the allocation of funds. Few studies (1,3,4) have been nationally conducted to analyze the use of funds in U.S. agriculture. However, a regional study with a disaggregated analysis of the use funds will help to identify the exact nature of farm behavior in a region. The Corn Belt, one of the major agricultural regions, which constitutes states such as Illinois, Indiana, Iowa, Missouri, and Ohio, is selected for this study. The financial flows in the Corn Belt agriculture is higher than in any other regions. Between 1960-1982, net farm income has increased from $2.21 billion to $3.12 billion. More ever, farm production expenditures have jumped from $6.26 billion to $29.33 billion (13), a five-fold increase. An econometric simulation model of the use of funds in the Corn Belt with a provision for policy analysis will be of great use to the public and to policy-makers. The impact of government policies to a region such as the Corn Belt is captured in this study.

CONCEPTUAL FRAMEWORK

Farmer's decision to allocate the available (owned and borrowed) funds among different uses depends on various economic and noneconomic factors (11). Some of the major categories of use funds considered in this study are presented below.

Fixed or Capital Expenditures

1) tractor purchases, 2) other machinery purchases, 3) land and building improvements expenses (farm use only), 4) real estate transfer expenses (includes within farmers' transactions, as well as discontinuing farm operators).

Production Expenditures

1) Fertilizer and lime expenditures, 2) feed expenditures, 3) feeder livestock purchases, 4) seed expenditures, 5) pesticide expenditures, 6) fuel and oil expenditures, 7) labor expenditures, 8) land rents paid to nonoperating landowners, 9) interest paid on real estate and nonreal estate debt, 10) taxes paid on farm property, 11) repairs and maintenance of farm machinery and farm buildings, and 12) miscellaneous (marketing fees, insurance, machinery hire, and custom work, etc.).

Fixed expenditures are a long term concept. Few studies have projected some form of fixed expenditures (1,2) in U.S. agriculture. Production expenditures are a short term concept. Even though the terms of the two concepts are different, farmers allocate their available funds simultaneously in a given year. A set of behavioral functions (Appendix A) are specified to explain the use of funds behavior. Based on the behavioral functions a simulation model of the use of funds is developed (Appendix A).

STATISTICAL TECHNIQUE

Behavioral Function Estimation

Two steps are involved in estimating and simulating the specified model in Appendix A. First, the functional forms have to be estimated by appropriate statistical technique. The second step is the simulation of the estimated model. Since U.S. agriculture is undergoing structural changes, assuming fixed response coefficients may not be appropriate for explaining the behavioral relations. Random coefficient (8) may be a proper technique for the functional forms. According to the random coefficient inference, random coefficients or variation in coefficients can occur due to omitted variables, use of proxy variables, incorrect specification, aggregation of variables in the functional forms. Pure random coefficient model:

$$Y_t = XB_t + U_t \qquad (1)$$

$t = 1,2,\ldots, T$(time period)

$$B_t = B + e_t \qquad (2)$$

where: Y = dependent variable, B = mean response coefficient, B_t = response coefficient in time period t, e_t = error term for response coefficient, X = independent variable, and U_t = error term in the model specification. The equation (1) is assumed to follow the standard assumptions in Raj (8).

The estimation of random response coefficients can be done either by equation after equation or simultaneously for a block of equations. Zellner's seemingly unrelated (15) regression (SUR) estimator is applied to a system of equations when error terms across the equations are related to each other in a given period, which is true for equations like fixed expenses and production expenses. That is, some common factors like weather and economic conditions influence the expenditures on tractors, other machinery, and land and building improvements, in a given year. This will result in some kind of relationships among error terms across the equations in a given time period. A random coefficient model with SUR assumptions can be a proper statistical technique in explaining the phenomena.

The equation (1) can be rewritten to suit our specification

$$Y_{it} = \sum_{k=1}^{K} B_{ikt} X_{ikt} + U_{it} \qquad (3)$$

where $i = 1, 2,\ldots,M$ (equations), $k = 1,2,\ldots,K$ (variables), $t = 1,2,\ldots,T$ (time period).

The relevant assumptions of the model (3) are discussed in Raj (1982), Singh (1974). The functional form of the fixed expenditures, land price and production expenditures are estimated in three blocks. For simplicity and to reduce the computer cost, the mean response coefficients (B) are estimated and used in this study. The problems in estimating t statistics or a significance criteria of the estimates are discussed in Thamodaran (11).

DATA

Most of the data for this study are collected through personal contact with the United States Department of Agriculture (USDA) farm income division. As this study is a regional one, state data are required to get regional aggregate values. Invariably, most of the published materials have some kind of aggregate rather than state data. Relevant data of the five states are collected from published and unpublished sources for the years 1960-1980 (5,12,13, 14). Some of the variables, such as price indexes, do not vary across the regions, so national price indexes are used as proxies for regional price indexes. Following the common procedure in research studies, all the monetary variables are expressed in real terms by deflating nominal variables by gross national product (GNP) price deflator (1977= 100), except farm machinery expenditures which are deflated by machinery price index (1977 = 100).

ESTIMATED BEHAVIORAL FUNCTIONS

The estimated behavioral functions of the use funds (Appendix A), standard error of the estimate, weighted R-squares and weighted error sum of squares are presented below.

Fixed Expenditure Equations

```
TECB = -80.2 * IM - 2152.5 * FOIRT
       (74.6)      (1390.2)
     + 2557.1 * CPIRT + 4203.2 * SZRCB
      (3604.1)          (2238.7)
OMCB = -3206.7 * OM + 18155.5 * LPIR
       (3175.7)      (10589.6)
     + 423.0 * NFICB
      (228.1)
LBICB = -2047942.0 + 5009.6 * CPIRT
        (1026172.0) (5551.9)
      + 12249.9 * SZRCB
        (4188.9)
Weighted error sum of square = 10.2
Weighted R-square = 0.97
LPCB = 2249.9 DPCB + 13.3 NFIACB
       (943.6)       (2.3)
Weighted error of sum of square = 1.83
Weighted R-square = 0.93
```

Production Expenditure Equations

```
ENFCB = -830112.0 FPIR + 11.7 PACB
        (414944.0)       (6.3)
      + 77981.1 ENFRTCB
        (12239.6)
ELPCB = 2291801.0 - 987963.0 * FEPIR
        (541280.5)  (45573.8)
      + 0.034 * NLICB
        (0.022)
EFCB = 103.8 * NCHCB
       (8.1)
ESCB = -504869.0 + 6.9 * PACB
       (709334.4)(11.2)
     + 76590.8 * ESRTCB
       (33376.7)
EPCB = 1524.2 + 86767.2 * EPRTCB
       (2868.9)  (4393.2)
EFOCB = -1046951.0 + 10367601.0 * FOIR
         (361552.5)   (246792.8)
      + 4099.0 * SZRCB
        (1763.8)
ELCB = -209852.0 * LWMR + 12.5 * PACB
       (236798.2)         (3.2)
MSECB = 254001.0 * MSI + 3799.2 SZRCB
        (162897.0)       (322.7)
RMCB = 81814.6 * T
       (6376.2)
Weighted error sum of square = 51.84
Weighted R-square = .999
```

Fixed Expenditure Decisions

A dollar increase in the implicit rental rate (IM) of a 60 horsepower tractor with other variables at a given level is likely to reduce tractor purchasing expenditure by $80,200. On the other hand, a $1,000 increase in the lag average net farm income (NFICB) will boost other machinery purchases by $423. Farmland price variation in the Corn Belt is explained by proportional changes in the land price during the past and by net farm income per acre. If the farm sector in the Corn Belt experiences a net farm income increase of $1 per acre (NFIACB), this will boost the land price in the following year by $13.30 per acre.

Farm size is a significant variable in explaining tractor and land and building improvement equations. Operators of larger farms tend to economize the farm operation through mechanization. So, in the future as farm size increases, farmers tend to increase their mechanization.

The user cost of the 60-horsepower tractor and the user cost of other machinery imply that a farmer's decision to purchase farm machinery is not just a function of price but a function of many other factors, such as interest rates, investment tax credit, and depreciation (6). This indicates that farmer's evaluate their machinery purchases based on all these variables. So, any change in one of these variables may change the user cost of capital which will be reflected in the machinery purchase expenditures.

Production Expenditure Decisions

Crop-planted acres (PACB) are important factors in farmers' production expenditure decisions. Further, price indexes, such as fertilizer price index, feed price index, pesticide price index, labor wage index, and fuel and oil price index are significant in production expenditure equations. In short, farmer's production expenditure decisions are based mainly on the input prices and the crop planted acres variables.

SIMULATION

The simulation model consists of a set of equations with endogenous and exogenous variables. Simulation of a model is performed to suit the objectives of the study. Some of the usual analysis in simulation are testing and evaluation of the model, historical policy analysis, and forecasting. This study tests and evaluates the model and provides forecasts.

Ex-post Simulation or Historical Simulaton

By simulating the model during the period for which historical data for all variables are available, a comparison of actual endogenous variables to the simulated series is made. In this study, the actual values of the exogenous variables are substituted in the estimated model to get the estimated endogenous variables for years 1960 to 1980. Various statistical tests are developed to test or evaluate the relative closeness of the endogenous variables to the original data series. Some of the statistical tests are a) root mean square percent error, and b) Theil's inequality coefficient (7).

The values of the indicators (a and b) are estimated by performing a dynamic simulation of the model between the years 1960-1980. SAS/ETS (1982) package is used to perform the simulation.

Forecasting Simulation

Forecasting involves a simulation of the model forward in time. The objective of the study is to simulate the model to the year 1995. Before a forecast is made, the exogenous variables of the model have to be projected to the time periods in the study. SAS/ETS Proc forecast (1982) procedure is used to project the exogenous variables. Two model forms are used in projecting the exogenous variables. Simple linear time trend and quadratic time trend forms are used. The actual and predicted values of the exogenous variables are plotted for the two forms (linear and quadratic) between the years 1960-1980. Based on the R-square, t-statistic of the coefficients and the nature of the plot, a particular equation form is chosen to project the exogenous variable (11). As a policy analyst, one can expect alternative paths for few policy variables (exogenous variables) or some changes in the parameters in the model. Keeping this in mind, three simulation scenarios are developed for this study.

Base-run Simulation - The predicted values of the exogenous variables from one of the two functional forms (linear or quadratic) are plugged into the model to get the simulation series (1981-1995) of the endogenous variables. This scenario is assumed to be the expected standard path of the future use of funds. Other policy scenario outputs are compared to these results.

Prices Paid Indexes Scenario - The predicted time trend values of the input price indexes (between the years 1981-1995) are increased by 25 percent and the effect of this change reflected in the endogenous variables is compared with the base-run results. The other exogenous variables are assumed to follow the projected path in the base-run simulation. The indexes analyzed in this scenario are fertilizer price index, feed price index, feeder livestock price index, pesticide price index, fuel and oil price index, user cost of a 60-horsepower tractor, and user cost of a moldboard plow. All these indexes are changed at the same rate in the simulation run.

Prices Received Indexes Scenario - Farmers' reactions to favorable output prices are analyzed in this scenario. Crop and livestock price indexes are considered in this scenario. The prices received indexes are assumed to increase 50 percent higher than the base-run projections.

Crop Planted Acreage Scenario - Over the years, government programs have been directed at crop planted acreage adjustments. These programs are used as a technique for crop supply control. The effect of these acreage changes is not only reflected in the farm output supply but also in various farm production expenditures. In this scenario, projected crop planted acreage of the base run simulation is reduced by 10 percent.

SIMULATION RESULTS AND DISCUSSIONS

The results of the dynamic simulation of the four scenarios (base-run, prices paid indexes, prices received indexes, crop planted acres) are presented in Tables I-IV. Based on the ex-post simulation results presented in Thamodaran (11), the percentage root mean square error of the endogenous variables in the model is less than 14 percent, and Theil's inequality coefficient is close to zero. So, the predictive performance of the model is as good as it possibly could be.

Base-run Simulation

The base-run simulation (Table I) depicts a normal situation of the Corn Belt agriculture. Production and fixed expenditures are projected to climb steadily in the future. However, machinery expenditures fall gradually with some fluctuations. The Corn Belt region, one of the heavily mechanized regions may not require large machinery investment to meet the future needs. Between 1984-1995, production expenditures are expected to rise to the tune of 1.2 percent, and the fixed expenditures by 6.9 percent. A significant increase is expected in the land and building improvements (fixed expenditures-machinery expenditures). During the last decade, farmers have relied substantially on external financing to finance the capital flows. Outstanding nonreal estate debt in the Corn Belt will rise by $6.59 billion (34.4 percent) between 1984-1995. Increasing trend in the production as well as the fixed expenditures with moderate external financing could be the main reason for the dramatic increase in the nonreal estate debt. From a long term perspective, real estate debt increases by $16.38 billion between 1984-1995. At present, major portions of real estate sales are credit financed. So, it is not surprising to expect huge real estate debt. Credit demand (real and nonreal estate) situations seem to be promising for the financial institutions. Between 1984-1995, nonreal estate credit demand is expected to increase by $2.37 billion (55.5 percent increase), real estate credit demand is likely to skyrocket $4.07 billion (121.6 percent increase). Out of the huge real estate credit demand, financing institutions cover 40 to 50 percent of the needs. But, the role of seller-financed (credit demand - institution-financed) real estate transfer is on the rise.

Prices Paid Indexes Simulation

Farmer's response to changing input prices are analyzed by comparing the base-run (Table I) and the prices paid indexes simulation (Table II). A 25 percent increase in the prices paid indexes reduces the production, the machinery, and the fixed expenditures. A comparison of 1984 value of both the simulations reveals that the reduction of the production expenditures is $660 million (3.3 percent), the machinery expenditures is $480 million (13.7 percent), and the fixed expenditures is $480 million (9.7 percent). The trend in reduction of the expenditures remain relatively close to the above levels in other years. The implication of these reductions are that the farmers adjust their fixed investment dramatically to unfavorable price changes. However, farmers are reluctant to adjust their production expenditures dramatically to an unfavorable price changes.

Prices Received Indexes Simulation

Prices received indexes simulation (Table III) reveal the farmer's response to changes in crop and livestock prices. An increase in farm product prices is expected to positively influence farm expenditures. A comparison with the base-run simulation in 1984, shows that a 50 percent increase in prices received indexes will increase the production expenditures by $1.01 billion (5.1 percent), machinery expenditures by $1.48 billion (29.6 percent). In a concluding note, changes in the farm product prices have greater influence on the farm machinery investment decisions than on the production expenditures decisions.

Crop Planted Acres Simulation

This simulation projects the impact of a 10 percent reduction in crop planted acres in the Corn Belt. A comparison is made between the base-run and the crop planted acres simulation (Table IV) to analyze the impacts. In 1984, a hypothetical 10 percent reduction in the crop planted acres could reduce the production expenditures by $670 million (3.4 percent) in the Corn Belt. In short, the reduction in the production expenditures is significant but not proportional to the acreage reduction.

CONCLUSION

Average farm size and user cost of machinery have significant influence on the farmers' fixed expenditure decisions. Price indexes and crop planted acres are determinant factors in the production expenditures decisions. Farm fixed and production expenditures are projected to increase steadily in the future. While, farm machinery purchases in the Corn Belt are projected to fall with some fluctuations. Real estate and nonreal estate debt are projected to increase in the future. However, the rate of increase in real estate debt is higher than in nonreal estate debt. A change in input or output prices is expected to have a significant impact on the fixed expenditures rather than on the production expenditures. Crop acreage reduction programs reduce the production expenditures, significantly, but not porportionately. From a policy perspective, policies aimed at influencing farm size, planted acres, inputoutput prices have significant impact on the farm expenditure decisions in the Corn Belt Region.

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APPENDIX A

STRUCTURE OF THE CORN BELT USE OF FUNDS MODEL.

Fixed Expenditure Equations

TECB = f(IM, SZRCB, FOIRT, CPIRT)
OMCB = f(OM, LPIR, NFICB)
LBICB = f(CPIRT, SZRCB)
LPCB = f(DPCB, NFIACB)

Production Expenditure Equations

ENFCB = f(FPIR, PACB, ENFRTCB)
ELPCB = f(FEPIR, NLICB)
EFCB = f(NCHCB)
ESCB = f(PACB, ESRTCB)
EPCB = F(EPRTCB)
EFOCB = f(FOIR, SZRCB)
ELCB = f(LWMR, PACB)
MSECB = f(MSI, SZRCB)
RMCB = f(T)

Identities of the Model

TMECB = TECB + OMCB
TFECB = TMECB + LBICB
RTECB = LPCB * RSCB
RVCB = LPCB * LFCB
INRDCB = ONRDCB * R
IRDCB = ORDCB * RR
RTXCB = RVCB * TXA
TPECB = ENFCB + ELPCB + EFCB + ESCB + EPCB + EFOCB + ELCB + MSECB + RMCB + INRDCB + IRDCB + RTXCB
NRDCB = (TPECB * PB) + TFECB (1-1F)
ONRDCB = [lag (ONRDCB) * PNRCB] + NRDCB
RRDCB = [RTECB * CF]
ORDCB = [lag (ORDCB) * PRRCB] + RRDCB
RRSFCB = RRDCB * SF
RRIFCB = RRDCB - RRSFCB

Table 1-A. Variables description in the Corn Belt regional model

Variables	Description
EFCB	Expenditure on feed in the Corn Belt Region ($1000)
EFOCB	Expenditure on fuel and oil for farm use in the Corn Belt Region ($1000)
ELPCB	Expenditure on feeder livestock purchase in the Corn Belt Region ($1000)
ELCB	Expenditure on hired labor in the Corn Belt Region ($1000)
ENFCB	Expenditure on fertilizer and lime in the Corn Belt Region ($1000)
EPCB	Expenditure on pesticide in the Corn Belt Region ($1000)
ESCB	Expenditure on seed in the Corn Belt Region ($1000)
INRDCB	Interest paid on the nonreal estate debt in the Corn Belt Region ($1000)
IRDCB	Interest paid on the real estate debt in the Corn Belt Region ($1000)
LBICB	Land improvements and farm building construction expenditure in the Corn Belt Region ($1000)
LPCB	Land price in the Corn Belt Region ($)
NRDCB	Nonreal estate credit demand in the Corn Belt Region ($1000)
OMCB	Other farm machinery purchase expenditure in the Corn Belt Region ($1000)
ONRDCB	Outstanding nonreal estate debt in the Corn Belt Region ($1000)
ORDCB	Outstanding real estate debt in the Corn Belt Region ($1000)
RRDCB	Real estate credit demand in the Corn Belt Region ($1000)
RRIFCB	Real estate credit demand financed by institutions in the Corn Belt Region ($1000)
RRSFCB	Real estate credit demand seller-financed in the Corn Belt Region ($1000)
RMCB	Repairs and maintenance of farm machinery in the Corn Belt Region ($1000)
RTECB	Real estate transfer expenditure in the Corn Belt Region ($1000)
RTXCB	Real estate tax paid by farmers in the Corn Belt Region ($1000)
TECB	Farm tractor purchase expenditure in the Corn Belt Region ($1000)
TMECB	Total machinery (farm use) expenditure in the Corn Belt Region ($1000)
TFECB	Total fixed expenditure in the Corn Belt Region ($1000)
TPECB	Total production expenditure in the Corn Belt Region ($1000)

Exogenous

CF	Proportion of the real estate transfer credit financed
CPIRT	National crop price index deflated by GNP price deflator
DPCB	Relative change in farmland price in the Corn Belt Region
ENFRTCB	Lagged (one year) average fertilizer real expenditure per planted acre in the Corn Belt Region
ESRTCB	Lagged (one year) average pesticide real expenditure per planted acre in the Corn Belt Region
ERSTCB	Lagged (one year) averge seed real expenditure per planted acre in the Corn Belt Region
FEPIR	Ratio between national feed price index and livestock price index
FOIR	National fuel and oil price index and ratio between prices received by farmers index
FOIRT	National fuel and oil price index deflated by GNP price deflator
FPIR	Ratio between national fertilizer price index and national crop price index
IF	Proportion of the nonreal estate expenditure self-financed
IM	Implicit rental rate for user cost of a 60 horsepower tractor ($)
LFCB	Land in farms in Corn Belt Region (1000 acres)
LPIR	National livestock price index deflated by GNP price deflator
LWMR	Ratio between national farm labor wage index and farm machinery price index
MSI	Ratio between national prices paid index to prices received index by farmers
NCHCB	Total number of cattle and calves raised in the Corn Belt Region ($1000)
NFIACB	Lagged two years moving average of net farm income per acre in the Corn Belt Region ($)
NFICB	Lagged two years moving average of net farm income in the Corn Belt Region ($/million)
NLICB	Lagged (one year) net receipts from livestock production in the Corn Belt Region ($1000)
OM	Implicit rental rate or user cost of a moldboard plow ($)
PACB	Planted acres under major crops in the Corn Belt Region (1000 acres)
PB	Proportion of production expenditure to be credit-financed
PNR	Proportion of principal amount of nonreal estate debt repaid in a year
PRR	Proportion of the principal amount of real estate debt repaid in a year
R	Interest rate paid on nonreal estate debt ($/$)
RR	Interest rate paid on real estate debt ($/$)
RSCB	Acres of real estate offered for sale (1000 acres)
SF	Proportion of real estate credit seller-financed
TXA	Dollars of real estate tax levied on real estate value ($/$)
SZRCB	Lagged (one year) farm size in the Corn Belt Region (acres)
T	Time trend (1,2,3,...T)

Table I - Farm Capital Flow Projections - Corn Belt (Base-run Simulation)

	in 1977 dollars			in current dollars				
Years	Total production expenditures	Total machinery expenditures	Total fixed expenditures	Outstanding nonreal estate debt	Outstanding real estate debt	Nonreal estate credit demand	Real estate credit demand	Real estate credit demand institution-financed
	(amounts in billions)							
1981	18.74	3.63	5.00	16.81	20.33	4.03	2.70	1.76
1982	19.22	3.55	4.98	17.67	21.07	4.01	2.88	1.86
1983	19.57	3.54	4.93	18.41	21.79	4.12	2.99	1.91
1984	19.87	3.54	4.99	19.10	22.53	4.28	3.13	1.98
1985	20.10	3.47	4.98	19.70	23.35	4.39	3.35	2.09
1986	20.37	3.56	5.12	20.37	24.34	4.66	3.64	2.25
1987	20.71	3.56	5.14	21.01	25.48	4.85	3.97	2.42
1988	21.07	3.53	5.14	21.59	26.75	5.02	4.30	2.59
1989	21.43	3.54	5.18	22.19	28.13	5.24	4.62	2.74
1990	21.79	3.49	5.17	22.75	29.61	5.43	4.96	2.91
1991	22.13	3.50	5.22	23.33	31.20	5.67	5.34	3.08
1992	22.48	3.51	5.27	23.94	32.93	5.93	5.76	3.28
1993	22.85	3.49	5.29	24.52	34.79	6.16	6.22	3.48
1994	23.24	3.49	5.32	25.12	36.79	6.42	6.70	3.69
1995	23.65	3.46	5.34	25.69	38.91	6.65	7.20	3.90

Table II - Farm Capital Flow Projections - Corn Belt (Prices Paid Indexes Simulation)

Years	in 1977 dollars: Total production expenditures	Total machinery expenditures	Total fixed expenditures	in current dollars: Outstanding nonreal estate debt	Outstanding real estate debt	Nonreal estate credit demand	Real estate credit demand	Real estate credit demand institution-financed
				(amounts in billions)				
1981	18.59	3.14	4.51	16.43	20.33	3.65	2.70	1.76
1982	18.86	3.04	4.39	16.96	21.07	3.61	2.88	1.86
1983	19.04	3.04	4.43	17.44	21.79	3.71	2.99	1.91
1984	19.21	3.06	4.51	17.92	22.53	3.88	3.13	1.98
1985	19.34	2.96	4.47	18.32	23.35	3.96	3.35	2.09
1986	19.53	3.06	4.61	18.82	24.34	4.22	3.64	2.25
1987	19.82	3.05	4.63	19.30	25.48	4.37	3.97	2.42
1988	20.13	2.99	4.60	19.74	26.75	4.51	4.30	2.59
1989	20.47	3.00	4.64	20.20	28.13	4.71	4.62	2.74
1990	20.82	2.94	4.62	20.64	29.61	4.86	4.96	2.91
1991	21.16	2.94	4.66	21.10	31.20	5.08	5.34	3.08
1992	21.52	2.95	4.71	21.60	32.93	5.31	5.76	3.28
1993	21.92	2.91	4.71	22.07	34.79	5.51	6.22	3.48
1994	22.34	2.91	4.74	22.56	36.79	5.73	6.70	3.69
1995	22.79	2.87	4.74	23.02	38.91	5.93	7.20	3.90

Table III - Farm Capital Flow - Corn Belt (Prices Received Indexes Simulation)

Years	in 1977 dollars: Total production expenditures	Total machinery expenditures	Total fixed expenditures	in current dollars: Outstanding nonreal estate debt	Outstanding real estate debt	Nonreal estate credit demand	Real estate credit demand	Real estate credit institution-financed
				(amounts in billions)				
1981	18.93	4.82	6.44	17.90	20.33	5.12	2.70	1.76
1982	19.75	4.75	6.36	19.69	21.07	5.14	2.88	1.86
1983	20.37	4.75	6.39	21.20	21.79	5.28	2.99	1.91
1984	20.88	4.76	6.47	22.55	22.53	5.48	3.13	1.98
1985	21.29	4.69	6.46	23.71	23.35	5.64	3.35	2.09
1986	21.69	4.79	6.60	24.86	24.34	5.95	3.64	2.25
1987	22.13	4.80	6.64	25.91	25.48	6.20	3.97	2.42
1988	22.55	4.77	6.64	26.87	26.75	6.42	4.30	2.59
1989	22.96	4.79	6.69	27.80	28.13	6.71	4.62	2.74
1990	23.35	4.75	6.69	28.65	29.61	6.95	4.96	2.91
1991	23.70	4.76	6.75	29.50	31.20	7.26	5.34	3.08
1992	24.04	4.78	6.81	30.36	32.93	7.59	5.76	3.28
1993	24.39	4.77	6.83	31.17	34.79	7.89	6.22	3.48
1994	24.74	4.78	6.87	31.98	36.79	8.21	6.70	3.69
1995	25.10	4.76	6.89	32.75	38.91	8.52	7.20	3.90

Table IV - Farm Capital Flow Projections - Corn Belt (Crop Planted Acres Simulation)

Years	in 1977 dollars: Total production expenditures	Total machinery expenditures	Total fixed expenditures	in current dollars: Outstanding nonreal estate debt	Outstanding real estate debt	Nonreal estate credit demand	Real estate credit demand	Real estate credit institution-financed
				(amounts in billions)				
1981	18.46	3.63	5.00	16.81	20.33	4.02	2.70	1.76
1982	18.79	3.55	4.91	17.67	21.07	4.01	2.88	1.86
1983	19.01	3.54	4.93	18.40	21.79	4.11	2.99	1.91
1984	19.20	3.54	4.99	19.08	22.53	4.27	3.13	1.98
1985	19.33	3.47	4.98	19.68	23.35	4.38	3.35	2.09
1986	19.52	3.56	5.12	20.34	24.34	4.65	3.64	2.25
1987	19.79	3.56	5.14	20.97	25.48	4.84	3.97	2.42
1988	20.09	3.53	5.14	21.55	26.75	5.00	4.30	2.59
1989	20.42	3.54	5.18	22.14	28.13	5.23	4.62	2.74
1990	20.74	3.49	5.17	22.70	29.61	5.41	4.96	2.91
1991	21.06	3.50	5.22	23.27	31.20	5.66	5.34	3.08
1992	21.40	3.51	5.27	23.88	32.93	5.92	5.76	3.28
1993	21.76	3.49	5.29	24.46	34.79	6.14	6.22	3.48
1994	22.15	3.49	5.32	25.05	36.79	6.40	6.70	3.69
1995	22.57	3.46	5.34	25.62	38.91	6.64	7.20	3.90