Economic Risk and the Structural Characteristics of Farm Businesses

Peter J. Barry, Cesar L. Escalante and Sharon K. Bard

Peter J. Barry is a professor; Cesar L. Escalante and Sharon K. Bard are research associates;
Department of Agricultural and Consumer Economics, University of Illinois

2000 American Agricultural Economics Association (AAEA) Annual Meeting

Abstract

This study uses farm-level data from the Illinois Farm Business Farm Management Association to determine whether the variability of net farm income is significantly influenced by farm size, financial structure, and other structural characteristics of farm businesses. The econometric results indicate that under a cross-sectional model the relative variability of real net farm income is not significantly influenced by farm size, measured either by acreage or value of farm production. However, under a time series cross section model, periodic variations in farm size, along with differences in the relative crop price received, crop yield, degree of enterprise diversification and geographic location, can significantly influence changes in farm income variability.

Keywords: risk, income variability, farm size, financial structure

Economic Risk and the Structural Characteristics of Farm Businesses

Risk analysis in agriculture has a long history of conceptual and empirical work focusing on the measurement of risk, the identification of farmers' risk attitudes, and the effectiveness of various risk management practices (Barry; Harwood et al.; Hardaker, Huirne, and Anderson). Public programs that assist farmers in responding to risk also are important to risk analyses. Recently, the changes in agricultural policy enacted in the 1996 U.S. Farm Bill have further increased the importance of risk and risk management in agriculture.

Most observers expected the Farm Bill's decoupling of production and price supports to result in greater variability of commodity prices and farm incomes, especially after the culmination of the seven years of transition payments established by the 1996 legislation. Not surprisingly, the agricultural cycle has continued. After several years of strong farm income, 1998-99 brought significant downturns in prices for many commodities, in part reflecting high production and large carry-over stocks resulting from the "freedom to farm" attributes of the Farm Bill.

How these economic risks are distributed across farms with different business and structural characteristics are important, yet largely unanswered questions. Purdy, Langemeier, and Featherstone, for example, explored how the specialization, size, and other characteristics of Kansas farms influence the level and variability of these farms' returns on equity. Their findings indicate that the variance of the return on equity is not significantly influenced by total acres operated, but does respond significantly to various degrees of enterprise diversification. Similarly, Schurle and Tholstrup find that business risk (measured by the ratio of the variance of farm income to assets squared) is significantly related to farm size (measured as capital managed), age of operator, farm enterprise, location, and government payments. A more extensive information base is needed, however, to identify structural characteristics of farms that influence their vulnerability to agricultural risks.

This study uses farm-level data from the Illinois Farm Business Farm Management Association to determine whether the variability of net farm income is significantly influenced by farm size and other structural characteristics. The following sections formulate the empirical model, discuss the data base and related risk measures, report the descriptive and econometric results, and consider their implications.

Conceptual Framework

Economic risk for farm businesses is expressed in this study by the variability of real net farm income, using the coefficient of variation (the standard deviation divided by the mean) as the specific risk measure. As a relative measure, the coefficient of variation allows comparisons of income variability across sizes of farms and other business characteristics. In contrast, the magnitude of the variance or standard deviation alone would differ considerably with farm size and other business characteristics. The coefficient of variation of real net farm income, thus, serves as the dependent variable in this analysis.

The independent variables and their anticipated relationships to economic risk are as follows:

- Farm size

  Differences in farm size may be related to the level of economic risk through economies of scale, improvements in production efficiencies and attainment of higher output prices or lower input prices. While testing these specific relationships is beyond the scope of the study, the relevant hypothesis here is that the level of economic risk declines as farm size increases.

- Farm type

The level of economic risk may differ among farm types due to differences in the continuity of production and the frequency of market transactions associated with each type, inherent price instabilities, influences of government programs, differences in production variabilities, and other related factors. Dairy farms, for example, are believed to have relatively low income variability over time, followed by crop farms and then beef and hog farms.

The dominant farm type reflected in the Illinois FBFM Association's data is crop farms that primarily produce corn and soybeans. Hog farms also are represented extensively in the data base, while beef and dairy farms have relatively low representation.

- Tenure

Leasing of farm real estate is wide-spread and extensive in Illinois. Most crop farms rely heavily on leasing to control their real estate base. FBFM data for 1998 indicate that the average ratio of leased acres to total acres operated is 0.81. The dominant rental arrangement is share leasing (70% of leased acres), with cash leasing and combinations of cash and share leasing comprising the balance (Barry, Sotomayor, and Moss).

Share leasing allocates production and market risks between farmers and land owners. In contrast, farmers incur all of the production and price risks under cash leasing. Different tenure positions and leasing arrangements may, thus, materially influence the variability of net farm income.

- Location

  Illinois has several distinct production regions, with soil productivity exhibiting the largest differences between the Southern, Western, and North-Central regions of the state. Prior studies (e.g., Pflueger and Barry) have indicated that production variability, measured by coefficients of variation on crop yields, differs considerably among these regions. The Southern region is expected to contribute the most and the North-Central region the least to variation in net farm income. Accounting for this geographic variability will further generalize the tested relationship between economic risk and farm size.

- Financial structure

  Farm financial structure may be measured by the debt-to-asset ratio (a stock measure of leverage) derived from a farm's balance sheet or the ratio of interest paid to asset returns (a flow measure of leverage) derived from a farm's income statement. Finance theory suggests that different financial structures and the related financial risks may substantially influence the variability of returns to equity and the stability of farm equity. In particular, increases in the debt-to-asset ratio or the interest-paid-to-asset-returns ratio will increase the variability of net farm income. Thus, farm financial structure is a potentially significant determinant of the variability of farm income.

- Life cycle

Farm businesses often exhibit life cycle performance that parallels the life cycle of the farm operator. The establishment and growth phases may be characterized by expansions in farm size, improvements in management and production efficiency, and heightened financial and economic performance (e.g., Tauer). In contrast, the later phases of the life cycle are characterized by downsizing of operations, less intense management, and perhaps diminished business performance. Similarly, vulnerability to economic risk may be greater at the early and later stages of the life cycle, although the farm's financial capacity to bear risk likely is greater in the latter case.

- Soil productivity

The income generating capacity for crop operations is directly related to soil productivity. More productive soil generates higher yields, and thus contributes positively to economic performance. Similarly, more stable yields generally are expected from more productive soils.

- Relative Prices and Yields

Attainment of higher commodity prices and yields by farmers, relative to average values, may also could influence economic risk. While some of the yield variability of farms is captured by the region and soil productivity variables, a measure of relative crop yields could reflect the effects on output of weather, pest infestations, or other events. Similarly, a relative price index could reflect steps that producers have taken to achieve higher prices for their crops, and to mitigate the likelihood of lower prices.

Data Sources and Considerations

The FBFM data experience a rigorous certification process by field staff to ensure that data errors are minimal and that the data are as accurate and reliable as possible. Certification is applied to both annual balance sheets and income statements, although the number of farms with certified income statements generally exceeds the number of farms with certified balance sheets. Moreover, the number of farms with continuous certification is much smaller that the total number of FBFM members due to periodic certification problems. The result is a tradeoff between the number of farms and length of the data base. That is, the number of farmers with certified, complete financial information declines significantly as the length of the historic time period increases.

This study focused on farmers with certified income statements, yielding a total of 213 farms[1] with complete data over the 1980-1996 period. The time series of net farm income and value of farm production data are converted to real values, with 1996 as the base year, using the GDP implicit price deflator as the inflation index. The variables discussed above were reflected in the following measures.

- Dependent variable: Coefficient of variation of real net farm income (CV).
- Farm size: Measured by average values of acres and value of farm production for each farm, in separate regression analyses (ACRE, VFP).
- Tenure: Measured as the ratio of owned acres to total acres operated (TENURE).
- Location: Measured by separate regression equations for the Southern, Western, and North-Central regions (LOC).[2]
- Financial structure: Measured as the average over time of the ratio of interest paid

to returns on assets (INTRAT).

- Life cycle: Measured by the farmer's age (AGE) and age-squared to reflect possible non-linearities in the life cycle relationship.
- Soil productivity: Measured by the soil productivity rating (SOIL) received by each farm participating in the FBFM system. The rating is an average index based on the productivity of all tillable land on the farm. Individual soil types in Illinois are assigned an index, for a basic level of management, ranging downward from 100. These indexes, compiled for hundreds of soil types in Illinois, are calculated by relating estimated crop yields for each soil type to benchmark average yields for nine of the more productive soils in the state.
- Price index: Measured for corn, soybeans, and wheat as the weighted sum of the ratio of the crop prices received by each farmer to the state average price received during a specific marketing year (derived using FBFM farm data), where the weights are the percentage of farmland planted to a specific crop relative to the total acreage planted to corn, soybeans, and wheat (PRICE).
- Yield index: Measured for corn, soybeans, and wheat as the weighted sum of the ratio of the farm's yields to the county average annual yield (National Agricultural Statistics Services), where the weights are the percentage of farmland planted to a specific crop relative to the total acreage planted to corn, soybeans, and wheat (YIELD).
- Enterprise diversification index: Since farms generally do not settle within a particular farm type consistently over the entire sample period, developing subsets

of farms based on farm types will result in unbalanced data sets that could hinder the econometric analysis of such disaggregated farm type models. In lieu of this approach, a diversification index will be introduced to capture the farm's mix of enterprises. This index is calculated based on the concept of an Herfindahl index of market concentration by determining the sum of the squares of the shares of crop and livestock sales. A low index indicates a more diversified mix of farm revenues while an index of 1 suggests specialization in one of the two enterprises considered.

The estimating equation employed in the analysis, thus, has the following form

CV = f (ACRE or VFP, TENURE, LOC, INTRAT, SOIL, AGE, AGE-SQUARED, PRICE, YIELD, DIVER)

where the variables are defined above.

Several other considerations influence the measurement of economic risks and their relationships to the other variables. Many Illinois farmers (especially smaller farms) rely heavily on non-farm income from employment and/or investments to augment farm income and stabilize their overall financial position. Measures of non-farm income, however, are not available for most farms in the Illinois FBFM data base. Thus, the analysis focuses on the economic risks associated with farm income alone.

Most Illinois crop farmers have elected to participate in the federal government's farm programs. A 17-year historic time period for farmers producing grains, thus, will include government payments as a part of the farm's gross returns. These payments reflect a time period during which farm programs, including supply management, price supports and deficiency payments, were an important part of agriculture's economic environment. To a large degree, these government payments tended to stabilize farm income.

In the future, government payments could play a substantially different role in the economic environment of agriculture and as a part of the risk management program of commercial scale farms. In this environment, measuring income variability when government payments were active may understate farm income variability in an environment characterized by diminished farm programs and greater reliance on market conditions for commodity prices and farm incomes. Because government payments are not separately reported in the FBFM data base, this analysis derives measures of variability of net farm income that include the effects of government payments.

Historically-based measures of farm income variability also reflect the filtering and buffering effects of various practices farmers may utilize in managing risks – that is, absorbing risk within the business, transferring risk to other parties, or building the capacity to bear risks more effectively. Production methods for managing risk include enterprise diversification, preventative practices against disease and infestations, excess resource capacities, and enhanced operational efficiencies. Market responses to risk include commodity contracts, frequency of transactions, hedging and options, and cooperative pooling. Leverage levels, financial asset reserves, credit reserves, leasing strategies, and various types of insurance are financial options for responding to risk.

Use of some of these responses (e.g., enterprises, leverage, financial reserves) is evident in the FBFM data, although many of the responses are difficult to detect. Market responses to risk are especially difficult to identify, although evidence suggests that many farmers implement marketing responses in a similar manner (Hambleton and Bullen). That is, many farmers will contract for commodity sales several times during the year and participate in available government programs, but refrain from using hedging and options. Insurance also is utilized by many farmers. Share leasing arrangements predominate, although cash leasing is increasing. Despite the use of variety of risk management tools, the income variability measures and the independent variables from the database may not distinguish among these alternatives. The results of the analysis, thus, apply to groups of farms in which various methods of managing risk are utilized to varying degrees.

Descriptive Results

Tables 1 and 2 report mean values of the respective variables over the seventeen period from 1980 to 1996. In these summaries the farms are categorized by levels of coefficient of variation (CV) of real net farm income, tillable acres, real value of farm production, and geographic location. Table 1 indicates an irregular pattern of mean farm sizes as the coefficient of variation increases, although the mean values of tillable acres and value of farm production are highest in the lowest CV class, and farm size tends to increase steadily across the lowest five CV classes. No clear patterns are evident between CV classes and the other independent variables.

A clearer, more consistent pattern in the relationships between CV and size can be discerned in Table 2 when tillable acres and value of farm production are the respective classification criteria. Higher CV values are associated with smaller farm sizes in both classification criteria. The age variable also exhibits the same negative relationship with both farm size measures. The results in Table 2 clearly indicate that location is strongly related to income variability. The Southern region has the highest mean values for CV, tillable acres and the enterprise diversification index, and the lowest mean values for soil productivity, crop yield index and the farm operator's age. In contrast, the North-Central region has the lowest mean CV, and the highest mean values for VFP, soil rating, farm operator's age, and the measures of relative prices and yields. Also evident in Table 2 are tendencies for farms with higher VFPs to have relatively higher crop yields, and for relative crop yields and prices to differ materially among the regions of the state.

Econometric Analysis

An initial empirical analysis was based on a cross-sectional data of 17-year mean values of the variables calculated for 213 farms with complete farm data from 1980 to 1996. The analysis utilized ordinary least squares regression to determine whether economic risk is significantly influenced by farm size (measured by acreage and the real value of farm production) and the other structural and demographic variables. The regressions were employed at several levels of aggregation for farm types and regions. The size variables are highly insignificant for all the regressions. The coefficient estimates for the size variable have mostly negative signs, but the general absence of statistical significance is a compelling result. Leverage is a significant variable in more than half of the models. The tenure, yield and price variables also have high incidences of significance, although these results are concentrated in less than half of the models.

The reliability of these results, however, becomes questionable due to the lack of consistency in the significance across all models.[3] These poor econometric results suggest the inadequacy of a purely cross-sectional estimating model in explaining variations in farm income variability.

Thus, the estimating equation is re-formulated to account, not only for the cross-sectional sources of farm income variability, but also to consider intertemporal sources of income risk. A re-defined income risk measure is introduced by calculating moving three year coefficient of variation of net farm income for each farm. This new dependent variable is regressed against a panel data of moving three year average values for the explanatory variables.

Moreover, the tenure and soil rating variables were dropped from the estimating equation due to their high correlations with each other as well as with the two size measures, age and the relative yields and prices measures.[4] The remaining variables form the basis of a time series cross section (TSCS) regression again employed at several levels of regional aggregation.[5] Diagnostic procedures in SAS conducted on the panel data revealed the absence of serious multi-collinearity[6] and heteroscedasticity problems. The absence of autocorrelation, however, could not be definitely ruled out given the inconclusive results of the Durbin-Watson tests. Owing to the overlapping data used in the calculation of the variables under the moving three year average approach, it is therefore valid to expect the presence of this abnormality in the data set.

The Parks method in SAS which is appropriate for TSCS regression of data with autocorrelated disturbances is used in this analysis. The method estimates a covariance matrix under a two-stage procedure that leads to the estimation of the model regression parameters by generalized least squares (GLS).

A summary of the regression results is provided in Tables 3 and 4, in which farm size is measured by acres and VFP, respectively. The first column “All Farms” reports the results for all farms in the data base. Subsequent columns report results when the data are classified by regions.

The F statistics of all models are significant at the 99% confidence level. Moreover, the models' high multiple coefficients of determination (R^2) indicate the model's adequate explanatory power.

The size variables are now highly significant for all regressions, contrary to initial results using cross-sectional data. This shift in significance could suggest that the size effect on changes in farm income variability could have been enhanced more by periodic variations in an individual farm's size over a period of time. The coefficient estimates for both size variables remain consistently negative in accordance with these variables' expected inverse relationship with farm income variability.

The leverage variable (INTRAT) is insignificant in most models, except for the Western Farms model. This variable is usually positively related to the variability of net farm income, except for farms in the North Central region.

The coefficient estimates for the yield variable are negative and significant in all models. The negative signs suggest that high income variability is associated with farms having lower relative yields.

The age-related variables both have significant estimates in all models. The coefficient estimates of the linear and quadratic terms of this variable are usually positively and negatively signed, respectively, expect for farms in the North Central region. The contrasting signs of their coefficients, however, make it difficult to discern their systematic influence on income variability.

The coefficient estimates for the crop price variable are negative and significant for all farms combined and for farms in the Western region. The negative sign suggests that farmers' attainment of higher crop prices , on average, reduces their vulnerability to variability in net farm income. This variable is also a significant regressor in the Southern farms model but its coefficient estimate is positively signed.

Finally, a higher level of enterprise diversification is associated with less income variability for all farms combined as well as for farms in the Southern region. This positive relationship, however, is not supported by the results based on the North Central and Western regional models whose farms are highly specialized in grain and livestock production, respectively. It therefore seems that the effectiveness of the risk-reducing effect of enterprise diversification could be weakened and curtailed by benefits of comparative advantage that highly specialized farms concentrated in a certain geographic region have built up and enjoyed.

Implications

The statistical evidence compiled in this analysis of Illinois farms supports the existence of a significant relationship between the relative variability of real net farm income and farm size, measured either by acreage or value of farm production. While initial econometric results based on cross-sectional values support the absence of a size effect on income variability presented by Purdy, Langemeier, and Featherstone, subsequent analysis that considers periodic variations in the farm size variables establishes the presence of size significance.

The econometric results indicate that variability of net farm income is significantly influenced by the other structural and demographic variables. Differences in relative crop price and yield, farm operators' ages, degree of enterprise diversification and geographic region are associated with differences in income variability. In general, these results suggest that policy analyses and other considerations of the distributional effects of, and response to, variability of real income for commercial scale family farms likely can concentrate on structural variables as well as farm size.

Illinois is an effective experimental base for this type of analysis because of the presence of the FBFM System and because of state-wide differences in production conditions and enterprise concentrations. Soil productivity in Illinois, however, is relatively high on average. In addition, the several thousand farmers who are members of the FBFM Association tend to have above average financial performance, and are more representative of commercial scale family farms than of very small, limited resource farms or large, integrated and industrialized operations. Further analyses of other geographic regions, farm types, and market structures of agricultural businesses are needed to broaden the perspective on the relationships among income variability, farm size, and other structural variables.

Footnotes

1. There are actually 286 farms with continuous certification over the 17-year period but only 213 farms had complete age information for farm operators.
2. Separate regressions for location yielded stronger and more definitive results than dummy variable specifications for these variables.
3. Especially for the estimation done on all farms combined, results for R^2 are generally low and the F statistics usually suggest the models' lack of significance.
4. The price index variable was dropped in the North Central regional model because of its high correlation with the size variables, tenure, soil rating and crop yield index. These correlations are expected since the price index was calculated using only price data for corn, soybean and wheat which comprise a substantial portion of the farm production and incomes of North Central farms.
5. Data aggregation based on farm types will result in unbalanced panel data sets since farms do not consistently maintain a single farm type classification over the entire period. Farms generally shift from one farming operation to another periodically.
6. Prior to the inclusion of the age-squared variable, the condition index values remained considerably low (less than 2). This variable likely caused the indexes to increase, although the values (ranging from 14.19 to 15.98) generally still fall within Belsey's established guideline.

References

Barry, P.J. ed. *Risk Management in Agriculture*, Iowa State University Press, Ames, 1984.

Barry, P.J., N. Sotomayor & L Moss."Professional Farm Managers Views on Leasing Contracts & Land Control: An Illinois Perspective," Journal of the ASFMRA, 62(98-99):15-16.

Belsey, L. Conditioning Diagnostics: Collinearity and Weak Data in Regression, John Wiley & Sons, New York, 1991.

Green, W. Econometric Analysis, New York: MacMillan Publishing, 1990.

Hambleton, R. and G. Bullen. Illinois Grain Marketing Tools Survey. Department of Agricultural and Consumer Economics, Cooperative Extension Service, University of Illinois at Urbana-Champaign, February, 1994.

Hardaker, J.B., R.B.M. Huirne, and J.R. Anderson. Coping with Risk in Agriculture, New York, CAB International, 1997.

Harwood, J., R. H. Heifner, K. Coble, J. Perry, and A. Somwaru. Managing Risk in Farming: Concepts, Research, and Analysis, Agr. Econ. Rep. No. 774, Economic Research Service, U.S. Department of Agriculture, Washington, March 1999.

Pfleuger, B. and P.J. Barry. "Crop Insurance and Credit: A Farm-Level Simulation Analysis," Agricultural Finance Review, 46(1986): 1-14.

Purdy, B.M., M.R. Langemeier, and A.F. Featherstone. "Financial Performance, Risk, and Specialization," Journal of Agricultural and Applied Economics, 29(July 1997): 149-161.

Schurle, B. and M. Tholstrup. "Farm Characteristics and Business Risk in Production Agriculture," North Central Journal of Agricultural Economics, 11(July 1989): 183-188.

Tauer, L. "Age and Farmer Productivity," Review of Agricultural Economics, 17(1995): 63-69.

Table 1. Mean Financial and Demographic Characteristics, 1980-1996 Farms According to C.V. Classes

C.V. Class	No. of Farms	Net Farm Income ($)			Tillable Acres	VFP ($)	Tenure (%)	INTRAT (%)	Soil Rtg	Age (Yrs.)	Price Index	Yield Index	Diver Index
		Mean	Std. Dev.	C.V.									
Below 0.30	7	159,000	42,505	0.27	913	310,866	28.3	25.4	78	50	0.909	1.069	0.917
0.30 to 0.44	53	118,098	44,362	0.38	729	292,738	22.1	12.8	83	48	0.959	1.107	0.899
0.45 to 0.59	66	100,415	52,092	0.52	677	259,215	22.5	16.9	81	46	0.970	1.092	0.877
0.60 to 0.74	41	78,209	51,475	0.66	596	212,287	31.4	20.9	76	49	0.919	1.074	0.884
0.75 to 0.99	26	60,338	49,867	0.83	549	181,753	34.0	(304.2)	75	48	0.909	1.051	0.872
1.00 to 2.00	16	47,566	57,886	1.22	650	213,233	46.3	(110.3)	67	50	0.857	0.979	0.863
Over 2.00	4	11,336	39,314	3.47	334	38,616	59.7	150.8	60	52	0.634	0.879	0.799

Table 2. Mean Financial and Demographic Characteristics, 1980-1996 Farms According to Tillable Acre and VFP Classes, and Location

	No. of Farms	Net Farm Income ($) Mean	Std. Dev.	C.V.	Tillable Acres	VFP ($)	Tenure (%)	INTRAT (%)	Soil Rating	Age (Yrs.)	Price Index	Yield Index	Diver Index
Tillable Acres Class													
Less than 300	19	46,259	29,741	0.64	222	89,447	51.8	39.5	77	51	0.766	1.083	0.854
300 to 599	92	64,253	38,644	0.60	460	163,846	30.8	(75.3)	77	49	0.908	1.049	0.857
600 to 899	62	103,114	57,190	0.55	756	288,708	24.3	(14.5)	79	47	0.981	1.098	0.916
900 to 1,200	26	137,360	70,350	0.51	1,050	388,763	17.4	22.6	81	46	0.990	1.088	0.907
Over 1,200	14	178,072	81,596	0.46	1,389	500,987	16.4	17.6	75	45	1.012	1.091	0.887
Value of Farm Production													
Below $100,000	17	25,862	33,861	1.31	333	(1,867)	51.5	49.9	73	54	0.744	1.011	0.871
$100,000 to $199,999	78	60,919	67,499	1.11	447	156,760	33.3	(99.3)	75	49	0.906	1.049	0.873
$200,000 to $299,999	51	87,698	47,542	0.54	627	240,436	23.5	(13.5)	80	48	0.959	1.084	0.876
$300,000 to $399,999	36	121,999	60,838	0.50	862	345,851	19.2	20.2	82	48	1.000	1.101	0.906
$400,00 and above	31	167,480	81,358	0.49	1,181	480,209	20.6	19.7	81	44	0.986	1.124	0.895
Location													
NORTH CENTRAL	114	99,489	51,023	0.51	659	258,194	21.7	(59.6)	86	49	0.9774	1.082	0.871
WEST	57	90,576	52,798	0.58	649	234,215	36.3	24.4	76	47	0.871	1.070	0.893
SOUTH	42	65,313	43,128	0.66	667	214,536	34.9	(20.1)	58	46	0.898	1.058	0.899

Table 3. Regression Results of "Acres" Models, Time Series-Cross Sectional Models, Coefficients and (Prob > /T/)

Variable	All Farms	North Central Farms	Southern Farms	Western Farms
Intercept	-0.027688 (0.9274)	2.828235*** (0.0001)	-16.205963*** (0.0001)	2.465272*** (0.0001)
Tillable Acres	-0.000185*** (0.0013)	-0.000179*** (0.0001)	-0.001924*** (0.0001)	-0.001192*** (0.0001)
Interest to Asset Ret.	0.120653 (0.1124)	-0.000754 (0.9828)	0.013204 (0.7453)	0.212881*** (0.0001)
Yield Index	-0.620681*** (0.0001)	-0.602497*** (0.0001)	-2.992016*** (0.0001)	-2.722025*** (0.0001)
Age	0.109432*** (0.0001)	-0.076231*** (0.0001)	0.459819*** (0.0001)	0.391541*** (0.0001)
Age Squared	-0.001362*** (0.0001)	0.000975*** (0.0001)	-0.006013*** (0.0001)	-0.004249*** (0.0001)
Price Index	-2.269050*** (0.0001)	See Note 4	3.872867*** (0.0001)	-5.704295*** (0.0001)
Diversification Index	1.559448*** (0.0001)	-0.142645*** (0.0001)	9.138240*** (0.0001)	-1.542945*** (0.0001)
Number of Observations	3,195	1,710	630	855
R^2	0.7150	0.7005	0.9211	0.9480
$F_{k-1, n-k}$	1142.208	663.8573	1037.342	2205.923

Note: Asterisks denote significance at the 1% (***), 5%(**) and 10% (*) confidence level.

Table 4. Regression Results of "VFP" Models, Time Series-Cross Sectional Models, Coefficients and (Prob > /T/)

Variable	All Farms	North Central Farms	Southern Farms	Western Farms
Intercept	0.217845 (0.4697)	2.785435*** (0.0001)	-16.432181*** (0.0001)	2.004018*** (0.0001)
VFP	-0.000000213*** (0.0015)	-0.0000000811*** (0.0045)	-0.000001385*** (0.0112)	-0.000000819*** (0.0001)
Interest to Asset Ret.	0.110923 (0.1158)	-0.002560 (0.8982)	0.018897 (0.6150)	0.232278*** (0.0001)
Yield Index	-0.591507*** (0.0001)	-0.615976*** (0.0001)	-3.013537*** (0.0001)	-2.654433*** (0.0001)
Age	0.101414*** (0.0001)	-0.075624*** (0.0001)	0.432639*** (0.0001)	0.413251*** (0.0001)
Age Squared	-0.001292*** (0.0001)	0.000949*** (0.0001)	-0.005790*** (0.0001)	-0.004545*** (0.0001)
Price Index	-2.318294*** (0.0001)	See Note 4	3.558941*** (0.0001)	-6.147758*** (0.0001)
Diversification Index	1.469786*** (0.0001)	-0.182710*** (0.0001)	9.576894*** (0.0001)	-1.790692*** (0.0001)
Number of Observations	3,195	1,710	630	855
R^2	0.7265	0.8513	0.9155	0.9997
$F_{k-1, n-k}$	1209.379	1624.932	962.7067	403212.3

Note: Asterisks denote significance at the 1% (***), 5%(**) and 10% (*) confidence level.