MEASURING FARM OPERATORS NONFARM WEALTH

(or - WHERE HAS ALL THE MONEY GONE?)

by

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ABSTRACT

Hughes, Dean W. -- Measuring Farm Operators Nonfarm Wealth (OR - Where
    Has All The Money Gone?)

The Balance Sheet of the Farming Sector makes no attempt at reporting

the nonfarm equity position of farm sector participants. This study esti-

mates the size of such holdings for farm operator families and finds them

to be significant, conservatively accounting for about twenty percent of

reported assets in 1977.

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The Balance Sheet of the Farming Sector (BSFS)[1] was first published
in its current form in 1940. Since that time many criticisms of the account-
ing procedures used in its development have been made, with the best sum-
mary of the accounts conceptual problems to be found in Carlin and Handy.
Both inconsistent sectoring and incomplete coverage of transactions can
be found in the BSFS. Farm operators' and nonfarm landlords' physical farm
assets and debts are reported together. However only specific financial
assets held by farm operators are provided. And, with the exceptions of
deposits and currency, U.S. savings bonds and investments in cooperatives,
nonfarm assets are ignored. Without question such omissions and inconsis-
tencies have a direct impact on residually calculated Proprietor's Equities
which often serves as the measure of the wealth of "farmers."[2]

This paper will present a first attempt at measuring the equity posi-
tion of farm operator families in investments not reported in the BSFS.
In doing so it provides a method to improve our knowledge of the economic
well being of the producers of our food and fiber. No attempt will be made
in this paper to handle the other problems of the BSFS, yet the need to do
so is great.

Much of today's macro financial and economic analyses are based upon
the assumption that wealth can be measured accurately. Little meaning
can be ascribed to the standard financial ratios of debt to equity, returns
on equity or debt to assets when neither assets nor debt, and therefore
equity, are measured properly for a specific group of people. Perhaps even
more disconcerting is the fact that without good measures of wealth, one

can not even properly measure the returns on investment in farm assets.
As Grove pointed out in 1960 both the conventional net farm income reported
in Farm Income Statistics and unrealized real capital gains in price sensi-
tive assets should be considered as return to the actitivies of farming.
Complete enumeration of all investments is central to Tobin's and subse-
quently Penson's (1972) use of the expected returns-variance risk model to
develop portfolio balancing models of aggregate behavior. It is through
this portfolio balancing behavior that the basic questions of economics
are answered. If resources being used on farms are not being put to their
most rewarding use then farmers seeing higher returns in other areas will
add to their holding of nonfarm assets. Alternatively, if farming prospers
and expectations of sector returns are high nonfarm equities may provide
funds for increasing farm production.

The next section of this paper will explain the approach taken in
developing a measure of farm operator families' nonfarm wealth. Section
three will provide the actual analysis and an evaluation of the importance
of these stocks to other balance sheet components. Finally, the last sec-
tion of this paper will point out some further questions that need to be
answered to improve the time series provided in section three.

II. The Approach

A stock variable such as wealth can either be directly measured at
one point in time or it can be considered the accumulation of flows since
the beginning of time.[3/] Because no one has gone to the expense to directly
measure either the stock of nonfarm equities or the savings flows that have
been placed in non BSFS assets less direct methods must be followed to

evaluate the potential value of such information. Penson (1977) outlines

a method for identifying yearly flows of dollars into nonfarm equities in

his "Personal Income and Outlay Account" (PIOA) and his "Capital Finance

Account" CFA).[4] Basically the PIOA combines income received by farm ope-

rator families from farm, off-farm labor and returns from off-farm nonhuman

capital sources, and then subtracts expenditures and capital outlays asso-

ciated with farm families' consumer related behavior leaving gross savings

as a residual. The CFA then sums up asset accumulations reflected in the

income and balance sheet accounts and subtracts the net change in debt and

retained corporate profits. The remainder represents the savings which

must have been used to finance additions to nonfarm investments. If gross

savings exceeded the equity financing needed to cover net farm capital

accumulation and net increases in the BSFS financial assets, savings must

have been placed in other nonfarm assets. On the other hand, if saving

was insufficient, dissavings in other assets must have occurred.

While this approach yields some of the information needed to develop

an estimate of nonfarm wealth it is insufficient to completely specify the

stock. No data series can be extended to the beginning of time so that

some initial wealth position must be estimated to reduce the informational

requirements to manageable levels. Additionally, since nothing is known

about the types of nonfarm assets farmers have purchased with their excess

funds a complete specification of the total returns on off-farm investments

is impossible. Although current cash returns on such investments are

accounted for in the estimate of off-farm income reported in Farm Income

Statistics, unrealized capital gains and losses on these assets are unknown.[5]

Given information on the magnitude of returns on equity and the interest

rate which generated such returns it is a simple matter to calculate the stock of equity. Dividing returns by the interest rate yields the stock of funds needed to provide the observed income. Again only partial information is available. Total off-farm income includes both labor and capital income. The USDA has an unpublished data series which estimates off-farm labor income and therefore the difference between total off-farm income and off-farm labor income must be returns to nonhuman wealth.[6/] Unfortunately, with no information the mix of non BSFS assets owned by farm operator families no weighted rate of return can be specified from observed data and only assumptions which bracket a wealth position in any year can be made.

III. Analysis

Data from Agricultural Statistics, The Agricultural Finance Databooks, the Balance Sheet of the Farming Sector, Farm Income Statistics and The Economic Report of the President were collected to extend Penson's and Davis's results back to 1950 and forward to 1977. The first column in Table I presents the residual time series which differs only slightly from those numbers reported in Davis's thesis due to restatements of some of the input data by the USDA. Values are in billions of current dollars and represent the flow of savings during a specific year into assets not reported in the BSFS. In the early 1950's, farm operators were forced to draw down outside wealth to finance both their personal consumption and investment in farm assets. However, with the exception of 1960 farm operators have been choosing to add to nonfarm assets for the last twenty years.

Given the assumption that equity can never be less than zero, column

TABLE I

Savings and Equity Positions of Farm Operator Families in Nonreported Assets 1950-1977

Year	Column 1 Savings During Year[a]	Column 2 EOY[b] Stock $W_{57} = 0^c$	Column 3 EOY[b] Stock $\hat{r}_{57} = .10^c$	Column 4 EOY[b] Stock $\hat{r}_{57} = .0347^d$
	-----------------------------$ Billions-----------------------------			
1950	- 1.754	17.083	49.607	112.649
1951	- 0.808	16.275	58.799	111.841
1952	- 1.304	14.971	47.495	110.537
1953	- 4.792	10.179	42.703	105.745
1954	- 4.965	5.214	37.738	100.780
1955	- 2.696	2.518	35.042	98.074
1956	- 0.566	1.952	34.476	97.508
1957	- 1.952	0.000	32.524	95.556
1958	1.035	1.035	33.559	96.591
1959	0.454	1.489	34.013	97.045
1960	- 0.136	1.353	33.877	96.909
1961	0.053	1.406	33.930	96.962
1962	1.814	3.220	35.744	98.776
1963	1.653	4.873	37.397	100.429
1964	1.485	6.358	38.882	101.914
1965	3.181	9.539	42.063	105.095
1966	4.685	14.224	46.748	109.780
1967	0.656	14.880	47.404	110.436
1968	0.855	15.735	48.259	111.291
1969	4.423	20.158	52.682	115.714
1970	4.106	24.264	56.788	119.820
1971	3.934	28.198	60.722	123.754
1972	8.192	36.390	68.914	131.946
1973	20.069	56.459	88.983	152.015
1974	15.586	72.045	104.569	167.601
1975	7.295	79.340	111.864	174.896
1976	7.693	87.033	119.557	182.589
1977	9.539	96.572	129.096	192.128

a   Penson's net additions equity in life insurance reserves, individual retirement accounts, stocks and bonds, and other nonfarm capital.

b   End of year

c   Assumed

d. The long term government bond rate of return for 1957.

2 shows the summations of the savings flows given in column 1. 1957 is the last year within the covered time period where dissaving could not be covered by past accummulations of equity and is therefore set equal to zero.

At this point the problem of determining an initial wealth position must be faced. Additional wealth determined in any year will simply act as a base to which savings are added and will therefore simply shift each year's wealth up by a constant amount. This is not to say that the analysis is indifferent to what year is chosen to determine initial wealth. To be conservative, i.e. to not overstate the importance of the non BSFS equity positions of farm operator families, one would choose an estimate of the rate of return on nonfarm equity that would be too high, therefore decreasing the value the estimate of initial wealth. It can be shown that if the chosen interest rate is too high estimates of wealth throughout the period are closest to actual levels when initial wealth is calculated with total wealth at a minimum value.[7]

Columns 3 and 4 in Table I present two possible time series of non BSFS assets given two different assumed interest rates for 1957, the minimum wealth year for the covered time period. The current values of total off-farm income and off-farm labor income used were $7.84 and $4.49 billion respectively leaving $3.35 billion as a return to nonhuman wealth during 1957.[8]

As pointed out in footnote 4 the numbers presented in Table I do not capture the unrealized capital gains on nonfarm investments. To determine an upper range on the size of this component of farmer operators' wealth, a constant six percent yearly capital gains rate of return was applied to all of the investments made. Since farm land values have grown by about six percent per year over the 1950-1977 time period the growth rate used

would be consistent with the assumptions that nonfarm land has kept pace with farm land price increases and that farmers comfortable with real estate investments placed all of their funds into nonfarm land holdings. With capital gains accounted for the accumulations of residual savings in unreported assets since 1957 would total 133.5 billion dollars at the end of 1977. And, any dollar of wealth at the end of 1957 would have grown by a factor of 3.025. This yields wealth positions comparable to columns 3 and 4 in Table I of 231.9 and 422.6 billion dollars. While these numbers are very likely much too high the values $96.6 and $422.6 billion at the end of 1977 effectively bracket the range of possibilities.

How do these values compare to the rest of the BSFS entries? Even if the conservative numbers reported in column 3 of Table I are used then non BSFS assets are second only to land in proprietors' asset holdings. In fact, they represent almost twenty percent of reported assets at the end of 1977. They also represent more in equity positions than is owed on all farm debt by all farm participants! And, if farmers have the same debt to equity ratio on farm assets as they do with farm assets, farm operator families may actually control over $150 billion in assets off the farm.

IV. Summary and Remaining Questions

The Balance Sheet of the Farming Sector has long been unable to report some of the assets and debts held by farm participants. And, due to this lack of information, economists analyzing and modeling the farm sector have implicitly treated the level of these equities as zero. This paper used procedures reported by Penson coupled with rather conservative assumptions to evaluate the size of the equity position of farm operator families

in assets not reported in the BSFS. At minimum, these equities must total $96 billion and may have been as high as $400 billion at the end of 1977. Clearly farm operators on average must be more solvent than one would be lead to believe by the balance sheet. And, disregarding these funds leads to an important specification bias in models trying to explain the behavior of sector participants.

However, before agricultural bankers become complacent about their farm loans or researchers can reasonably proceed to capture the on-farm versus off-farm investment decisions by farm operators, more information is needed. All we have to date is an estimate of residual dollars placed in unreported assets by all farm operators during each year. We need to know through direct measurement what the total value of equities in non BSFS assets really are in order to anchor the wealth measurement on something more solid than the values estimated in this paper. It is also necessary to identify the types of assets being held by farm operator families in order to evaluate their effects on liquidity and to determine what the total rate of return on such equities might be. And finally, data on how this wealth is distributed among farmers based on major farm output, farm size and all other relevant disaggregations is required if policymakers desire to evaluate programs on specific particapants within the sector.

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FOOTNOTES

1. Publication previously called The Balance Sheet of Agriculture.

2. Wealth and equity positions are used interchangeably within this paper since I am not concerned with either human capital or imperfect markets which would cause disparities between the two terms.

3. Basically I am defining wealth in time t_o to be $\sum_{-\infty}^{t_0} s_t(1+r_t)^{-t}$ where s_t is the flow of savings per time period and r_t is the total return on the invested funds over time.

4. Penson previously presented the same concepts at the Workshop on Farm Sector Financial Accounts held in Washington D.C., April 14-15, 1977, where two potential problems with his approach were raised. Both problems were addressed by Davis and found to have little impact on the final residual time series.

5. Since I am working with current dollars over a time period where there has been no major periods of deflation it is an extremely conservative approach to treat all capital gains as zero. Analysis of an alternative is included in the next section of this paper.

6. Another qualification must be made at this point. Total returns are based on total asset holdings which can either be financed by equity or debt capital. Since we know nothing about the nonfarm debt position of farm operator families it is implicitly assumed to be zero for this paper. Note that while this leads to an overstatement of the final equity positions reported, the bias is not as great as it might first appear. The dollar returns on debt-financed nonfarm assets should be a very small portion of total returns since they must be net of debt

costs. Therefore equity is only overstated by $D(i-r)/i$; where D is non <u>BSFS</u> debt, i is the rate of return on non <u>BSFS</u> assets and r is the debt interest rate. As the cost of borrowing approaches the rate of return this term vanishes.

7. Basically our estimate of initial wealth, $\hat{W}^0$, as described in the previous section can be represented as

(1) $$W^0 = \frac{R^0}{\hat{r}^0} = \frac{r^0 W^0}{\hat{r}^0}$$

where R^0 represents the returns to nonhuman wealth observed in year zero, $\hat{r}^0$ is a guess as to the rate of return on nonhuman capital, r^0 is the actual rate of return and W^0 is the actual level of nonhuman wealth in year zero. What is desired is to find the conditions on W^0 for which $\hat{W}^0$ is least effected by the arbitrary guess on r^0. A penalty function that measures both positive and negative deviations in the estimate of wealth is

(2) $$Z = (W^0 - \hat{W}^0)^2 = (W^0 - \frac{r^0 W^0}{\hat{r}^0})^2 = W^{0^2}(1 - \frac{r^0}{\hat{r}^0})^2$$

The sensitivity of Z with respect to $\hat{r}^0$ would then be

(3) $$S = \partial Z/\partial\hat{r}^0 = 2W^{0^2}(r^0/\hat{r}^{0^2})(1 - r^0/\hat{r}^0)$$

And, the relationship between S and the level of actual wealth can be described by checking the sign of $\partial S/\partial W^0$.

(4) $$\partial S/\partial W^0 = 4W^0(r^0/\hat{r}^0)(1 - r^0/\hat{r}^0)$$

Note that all parts of equation 4 can easily be shown to be postive with the exception of $(1 - r^0/\hat{r}^0)$ which can be separately analyzed.

A) If $r^0 > \hat{r}^0$ then $\partial S/\partial W^0 > 0$.

B) If $r^0 = \hat{r}^0$ then $\partial S/\partial W^0 = 0$.

C) If $r^0 < \hat{r}^0$ then $\partial S/\partial W^0 < 0$.

B simply points out that if you know what r^0 is then the initial wealth position has no impact on your estimates. A and C however show that if $\hat{r}^0$ is not perfectly known consideration should be given to which year is chosen in estimating W^0.

8. Note that the returns cover the entire year so that $R^0/\hat{r}^0$ must give the average wealth invested during year zero. This explains why column 3 year 1957 is not exactly equal to $33.5 billion. If 1956 and 1957 end of year stocks are averaged, they do yield the results of the estimating procedure discussed above.

BIOGRAPHICAL SKETCH

Dean W. Hughes is an Agricultural Economist currently working for the USDA and stationed at Texas A&M University while finishing his Ph.D. His previous degrees include a M.S. from Purdue University in Agricultural Economics and a B.A. in Economics from Princeton University.