RISK ANALYSIS FOR AGRICULTURAL
PRODUCTION FIRMS: CONCEPTS,
INFORMATION REQUIREMENTS AND POLICY ISSUES

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A DYNAMIC MODEL OF THE DEBT-EQUITY STRUCTURE OF A
PROPRIETORY FIRM: DISCUSSION
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As I understand the purpose of Bob Collins' paper, it is to
stimulate thinking about the financial structure relationships
for farm firms that may be optimal over time. This is important.
It represents an attempt to further generalize the financial
concepts of firm behavior from the static to the dynamic frame-
work. As such, this aim is consistent with the efforts of
others in this project to utilize capital theory concepts both
over time and under risk in order to expand our analytical
framework and enhance our capacity to do useful empirical work--
here focussing on financial structure issues. Recall, in this
context, a very useful paper at last year's meeting by Don Reid
and Wes Musser on investment theory under certainty and its
implications for farm financial analysis.

The framework for Bob Collins' paper is based on optimal
control theory. This can be heavy going. It fits well under
the title of Dick Day's paper "Complicated Economic Behavior,"
also given at last year's meeting. I recall over ten years ago
trying to assess the relevance of control theory to optimization
over time at the firm level, and trying to follow the concepts
developed by Dorfman and others, and applied to various farm
decision situations by Boussard (using the Turnpike theorem),
as well as by Hochman, et al, Rausser, Mauldon, and others.
This got into interesting groups of strategies like open loops,
stochastic open loops, feedback mechanisms, adaptive controls,
and so on. It appeared, for example, that the conventional
multi-period linear and risk programming approaches to firm
growth analyses fit into the open loop category--essentially
static analyses--that came up short of having much if any truly
dynamic content. Some of the farm level simulation work has
gone farther. So, clearly, this is a promising area for further
development, especially with a finance flavor to it.

I have only a few comments, questions, or suggestions,
relative to Bob Collins' analysis--that vary in terms of scope
and relevance. The first is to observe that the optimal

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financial structure of the agricultural firm clearly is not a neglected area of study. Perhaps a complete theory of financial structure is not yet in place, but many studies have addressed this issue from numerous vantage points. These include such topic areas as debt carrying capacity under conditions of certainty and uncertainty, equilibrium analysis and portfolio adjustments, the role of various sources of liquidity as financial responses to risk, leasing issues, firm growth strategies, coping with financial stress, evaluating farm level financial responses to various public policies, and others. At least citing a variety of such studies and perhaps critiquing their theoretical bases would help in understanding the context and validity of the framework set forth in this paper.

A second point is to further explore the conditions under which the rates of return to equity would decline as leverage increases. In the paper, this is apparently due to the cost of borrowing rising as risk increases, due in turn to the related higher lending costs. This seems theoretically plausible, but the lender response in practice often takes nonprice forms: capital rationing, limits on leverage, additional security requirements, and others. Perhaps most or all of these other responses are equivalent to higher costs of borrowing, but rationalizing them in terms of the present specifications of the model might be useful in terms of empirical applications.

A third point is to consider further generalizing the model to allow a risk averse decision criterion and to allow for changes in both risk preferences and time preferences as the decision maker progresses through time, perhaps reflecting the effects of various stages in the life cycle of the proprietory firm. Making these generalizations might yield a leverage path with greater empirical validity. It appears that leverage can differ among firms based on differences in both time preferences and risk attitudes, so this might be a useful area to consider.

Closely related to the leverage path question is the gains that this dynamic framework offers relative to a static framework, in terms of understanding the characteristics of an optimal financing structure over time. As I understand, the equilibrium condition in the paper signifies a constant capital structure that reflects equality between a rate of return on equity and a risk adjusted discount rate. Wouldn't this result come from a static framework too, perhaps generalized to include risk aversion as well? If so, what is really gained at this point from the optimal control framework.

Another accounting point that puzzled me briefly and might others is the measurement of returns to assets net of borrowing costs. This doesn't produce a very meaningful measure of returns, even though it is a commonly used measure in commercial banking and perhaps other industries as well. This turns out not to be a problem in the analysis since multiplying a rate of return to assets, defined in this way, by the firm's ratio of assets to equity (the same as the DuPont identity) does yield a correct measure of the rate of return to equity capital--but, it is a distracting procedure that masks the importance of the cost of debt. Perhaps expressing the rate of return on assets as a weighted average of the cost of debt and the return on equity could be a useful alternative for the leverage evaluations.

Finally, I would encourage introducing into the analysis as much of the unique financial features of agriculture as is possible to further enhance the depth, timeliness, and useful-ness of this analytical approach. One example is the dominant role of real estate in the asset structure of agriculture, and the associated liquidity problems since the non-depreciability of farm land makes real estate loans inherently non-self liquid-ating. Thus, an optimal (or safe) level of indebtedness relative to equity may depend as much on the repayment plans that are available, as on the levels of interest rates and lenders' rules of thumb on various balance sheet ratios. Another example is how optimal leverage, as measured by balance sheet ratios, may vary with a farm's tenure position. Usually, more leasing is associated with higher leverage. And finally, an appropriate policy-oriented setting for studying financial behavior is offered by today's stress conditions in agriculture--too much debt, too high interest rates, low asset values, and too little income. Developing appropriate financial paths for an orderly adjustment out of stress conditions to a more solvent, stable financial position is a relevant, timely issue.

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