



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

## APPLICATIONS OF CAPM TO INVESTMENT ANALYSIS UNDER RISK: DISCUSSION

Loren W. Tauer\*

The Capital Asset Pricing Model (CAPM) was developed by Sharpe more than 20 years ago. As Barry and Collins state, its applications to agriculture have been extremely limited. It seems strange that our profession would have overlooked a research technique for so long when adoption of other research concepts has been fairly swift by our profession. It is true that development of the CAPM stemmed from a set of assumptions that appears to be restrictive, but we have worked with other theories with restrictive assumptions. Besides, through the years many of these assumptions have been relaxed with little harm being done to the model.

I believe we have exploited the CAPM, or at least its underlying concepts, without referring to the results as CAPM. After all, the underlying principal is EV analysis, which we have been using for years. It is difficult to extend our analysis further because farms are not publicly traded, and an important concept in the CAPM is the term "market." The theory depends upon the concept of an efficient market where an asset can be priced. The expected return of an investment is equal to a risk-free rate plus a risk premium, which is equal to the market portfolio rate minus the risk-free rate, multiplied by the asset's beta (which is the covariance of the priced asset and the market portfolio divided by the variance of the market portfolio). The variance of the asset can be blended (diversified) with all of the other assets comprising the market portfolio. Extensions to the theory have allowed nonmarket assets, such as human capital, to be included in the market portfolio, but the asset being priced is almost invariably traded in the market.

Now, since very few farms are publicly traded, or even sold as whole units, it never appeared important to determine the value farms may have to a well-diversified investor. There was interest in farmland as an investment in the 1970s, and Barry, and White and Zeimer did use the CAPM on farmland and discovered beta values that were extremely low. At the time these low values were considered with skepticism (Carter); however, in retrospect they now appear reasonable.

We could view the farm business as an investment and compute its beta with a market portfolio. Many states have farm business summary programs where a large number of farms consistently participate over a number of years. The annual return of these farms can be correlated with any number of types of portfolios. The outside investor would be interested in the covariance with a well-diversified market portfolio. The farmer may be interested in his farm's covariance with a portfolio of other farms. However, since farms are not traded in a marketplace, the return and risk (covariance) of these farms may not lie on a security market line.

---

\*Loren W. Tauer is an associate professor, Department of Agricultural Economics, Cornell University.

Computing the total risk (including variance) may produce a better pattern between risk and return. Yet, although farms themselves are not traded, their individual assets are. The individual betas of these assets with a market portfolio can be summed, and this should represent the risk of the farm business. It would also be necessary to compute and include the beta of the farm manager as well.

In their paper, Barry and Collins review agricultural articles that use the CAPM and state areas where further application may be warranted. I would like to comment on the possibilities in these areas.

The use of futures contracts as an investment can be further researched, and I am sure that futures will receive an enormous amount of research attention by general economists as the number of contracts on nonagricultural commodities continues to increase. However, it may be appropriate to look at a hedged position (as an asset) rather than the use of a futures contract as a speculative investment (although the market portfolio should include the physical commodity). Since the hedged position would entail basis risk, it would be interesting to compute the betas of bases for various locations of production and storage. Although one would generally consider the producer as the hedger, there is no reason not to view a hedged position as an investment in basis.

CAPM applied to farmland may be of further interest to investors interested in farmland investment. This, of course, is only one of many assets available to the investor. Farmers are interested in the price of farmland, but as an integral part of their business rather than as part of their portfolio, which is not a piece of the market portfolio and probably not well diversified either.

Another application is to help farmers diversify their farming operations in their selection of crops or farming activities. The audience here today has carried out many research projects deriving risk-efficient farm plans. Maybe more of those efforts should have involved the construction of a capital market line, if only to determine if the utility of a farmer would have been significantly increased if he or she had the opportunity to select a combination of the farm plan and a risk-free return. Maybe efforts like these would assist farmers who are discussing the possibilities of selling a part of the farm operation to outside investors.

Rural communities are once again pursuing industrial development after the prosperous farming days of the 70s reduced interest in attracting industrial firms to rural America. (After all, nondiversification can be extremely profitable in a bull sector market.) It would appear to be in the interest of a rural community to select an industrial firm that has a low beta value (low covariance) to its local economy.

The final application that Barry and Collins discuss and analyze is the use of CAPM techniques in deriving the discount rate for use in capital budgeting. Our profession has instructed farmers for years to use a discount rate that reflects a risk component, but we have failed to instruct how that risk component should be derived or computed. In the corporate finance area, CAPM has been discussed for years as a technique to

determine the rate to impute because of the investment project risk. The concept is that the risk premium is only due to the covariance of the project (instead of a security) with the market portfolio. All other risk can be diversified away by investors in their market portfolios of stocks, so that effort by the firm provides no service to the investor.

This is applicable to companies that are traded in the marketplace. However, as Barry and Collins state, the procedure is not directly applicable to the closely or individually held farm business. They then go on to derive, using the concept of covariance risk, a similar relationship for the privately held firm. Unfortunately, the end product does not entail the same simplicity as the CAPM. As they indicate, the "price of risk" that results includes the proprietor's risk attitude ( $\rho$ ), which is the coefficient of absolute risk aversion. We all know the difficulty of measuring this coefficient for field work. In contrast, the CAPM only requires that investors be risk averse.

#### References

- Barry, Peter J. "Capital Asset Pricing and Farm Real Estate," American Journal of Agricultural Economics 62(1980):549-53.
- Carter, Colin. "Capital Asset Pricing and Farm Real Estate: Comment," American Journal of Agricultural Economics 63(1981):578-79.
- Sharpe, William F. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk," Journal of Finance 19(1964):425-42.
- White, Fred C. and Rod F. Zeimer. "Farm Real Estate Pricing under Risk: An Empirical Investigation," Southern Economic Journal 49(1982):77-87.