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# ILLINOIS AGRICULTURAL ECONOMICS STAFF PAPER

AN EXAMINATION OF FARM REAL ESTATE  
RETURN DEFINITIONS, INFLATIONARY EFFECTS,  
AND THE RISKINESS OF NONLAND FARM EQUITY

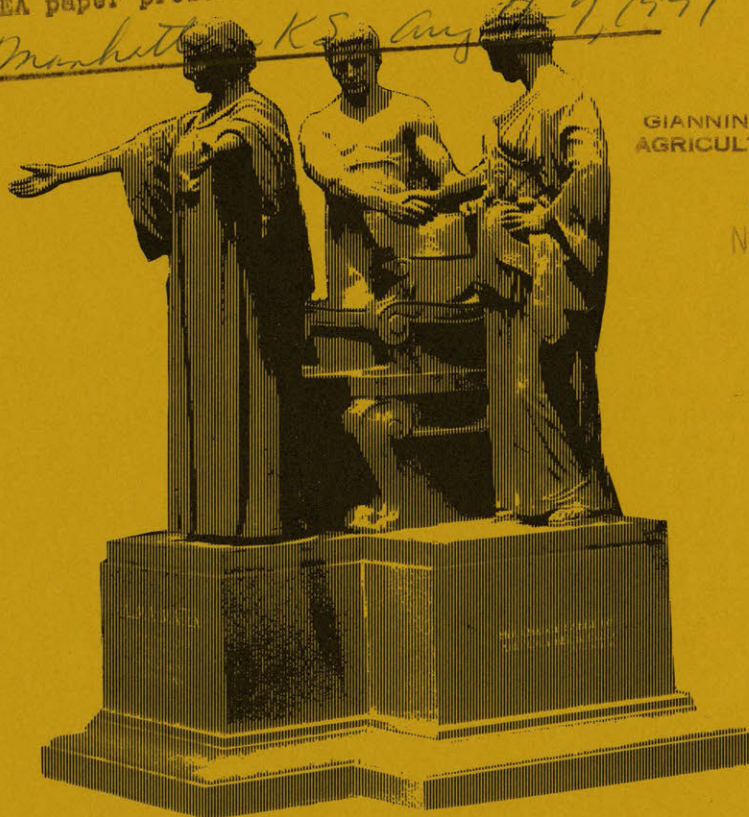
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91 E-469

August 1991

AAEA, 1991

AAEA paper presented at its annual meetings,  
Manhattan KS August 7, 1991



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## **Abstract**

Analyses of agricultural real estate under alternate return definitions find returns that offer market investment premiums; may hedge positive beta asset returns; and exhibit unexpected inflation premiums. The assumption of a zero-beta return to non-real estate equity is not robust and CAPMUEI is superior to the CAPMUI specification.

## INTRODUCTION

The Sharpe-Lintner-Mossin Capital Asset Pricing Model (CAPM) or a related version, the Capital Asset Pricing Model Under Uncertain Inflation (CAPMUI) have been used by agricultural economists to analyze U.S. farm real estate returns. Farm real estate is an asset with risky returns in the form of yearly income (loss) and capital gains (losses) and therefore should be analyzed as a risky financial asset. Models such as CAPM or CAPMUI which are derived under a perfect market assumption, may not perform well empirically. The financial literature contains many studies that test the CAPM for its performance under assumption violations. However, empirical results that are counterintuitive may not be the failure of the theoretical model. The empirical methods employed may be at fault. In other words, data inavailability, measurement errors, and methodological biases may also be culprits. Farm real estate does have characteristics which may cause its returns to deviate from that which is theoretically expected. Farm real estate is characterized as a highly illiquid asset which has high transaction costs and is subject to income and yearly property taxes. Furthermore, the market for farm real estate is thin and may be subject to the characteristics of an imperfect market. Therefore, empirical results from theoretical models which are derived under perfect market assumptions may be suspect due to assumption violations and data limitations. In this paper, the some of the empirical issues of a CAPM analysis of farm real estate are re-examined.

The remainder of the paper is organized as follows. First, the CAPM and CAPMUI are reviewed. Then, past CAPM and CAPMUI analyses of agricultural real estate are discussed as benchmarks. Third, the methodology of this analysis and the data are discussed. In this section, definitions of proxies for theoretically important variables and definitions of models are outlined. The empirical shortcomings which are evaluated in this study are: (a) the exclusion of capital expenditures in calculating capital gains returns, (b) the exclusion of imputed housing returns in calculating the income returns from farm real estate, and (c) the assumption that returns to non-real estate farm equity is the riskless rate of return (the zero beta return). Also, a model that accounts for unexpected inflationary effects on asset returns (CAPMUEI) is proposed and is expected to be more efficient than the CAPMUI. Next, the results supporting possible empirical shortcomings of past studies and models are reported. Last, conclusions and limitations are offered.

## THE CAPITAL ASSET PRICING MODEL

The familiar Sharpe-Lintner-Mossin Capital Asset Pricing Model (CAPM) is often stated as:

$$E(R_i) = R_f + \{[E(R_m) - R_f] / \sigma_m^2\} \sigma_{im}^2 \quad (1)$$

where  $E(R_i)$  is the expected return to asset  $i$ ,  $R_f$  is the return to the riskless asset or the risk-free rate of



interest,  $E(R_m)$  is the expected return to the market portfolio,  $\sigma_m^2$  is the variance of the market portfolio, and  $\sigma_{im}^2$  is the covariance between the market portfolio returns and asset  $i$ .

The excess expected return to asset  $i$  is linearly related to the excess expected returns of the market by its beta. However, only *ex post* returns are observable. An *ex post* CAPM relationship may be estimated if it is assumed that return distributions are stationary. This relationship, often called the Jensen CAPM, may be expressed as:

$$R_i - R_f = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i \quad (2)$$

where  $R_i$  is the observed return to asset  $i$ ,  $R_f$  is the observed return to the riskless asset (which in most empirical studies is defined as the 90-day T-Bill return),  $\alpha_i$  is expected to be zero,  $\beta_i$  is asset  $i$ 's relative risk measure, and  $\epsilon_i$  is the error term, which is assumed to have an expected mean of zero.

The Sharpe-Lintner-Mossin CAPM is not without its criticisms. The most recognizable criticism of the traditional empirical CAPM is the Roll critique. One point of the Roll critique can be concisely paraphrased as: all tests of significance in an empirical CAPM study are joint tests of the market portfolio proxy and of the coefficient. Therefore, standard t-tests of significance may be uninterpretable. It is assumed that a market portfolio that contains more asset return information is in fact better than a market portfolio with less information. Thus, one tries to use a market index that is highly correlated to the true market portfolio (all assets), so that tests of significance for coefficients approach true significance tests.

Another shortcoming of the traditional CAPM is its misspecification under imperfect markets. One misspecification concerns unexpected inflation. Under unexpected inflation, the single factor CAPM treats two assets having the same covariance with market returns equally (they require the same rate of return in equilibrium) even though they provide differing levels of exposure to inflation. Because changes in inflation do not perfectly reflect changes in purchasing power over all consumers, inflation risk is priced in the market. Both market risk and inflation risk should be reflected in the price of an asset. Hence, a capital asset pricing model should incorporate an asset's relative return for all risks which bear a reward.

The CAPM models which account for uncertain inflation are termed capital asset pricing models under uncertain inflation (CAPMUI). Brueggeman, Chen, and Thibodeau have argued that the following generalized form of the CAPMUI is a valid equilibrium model:

$$E(R_i) = R_f + \beta_{i1}[E(R_m) - R_f] + \beta_{i2}[E(\pi) - R_f] \quad (3)$$

where  $E(R_i)$  is the expected return on asset  $i$ ,  $R_f$  is the return to the risk-free asset,  $E(R_m)$  is the expected return to the market,  $E(\pi)$  is the uncertain inflation rate,  $\beta_{i1}$  is the systematic market risk of asset  $i$  and  $\beta_{i2}$

is the inflation risk of asset  $i$ . Assuming stationarity of the distributions of *ex post* returns and the inflation rate, the empirical CAPMUI model is:

$$(R_i - R_f)_t = \alpha_i + \beta_{1i}(R_m - R_f)_t + \beta_{2i}(\pi - R_f)_t + \epsilon_t \quad (4)$$

where  $(R_i - R_f)_t$  is the excess return to asset  $i$  in time period  $t$ ,  $(R_m - R_f)_t$  is the excess return to the market in time period  $t$ ,  $(\pi - R_f)_t$  is the excess rate of inflation in time period  $t$ ,  $\epsilon_t$  is the error term that is assumed to be normally distributed with an expected value of zero. The OLS regression coefficients,  $\beta_{1i}$  and  $\beta_{2i}$ , are asset  $i$ 's response to market risk and inflation risk, respectively. The regression intercept,  $\alpha_i$ , is an index of asset performance under uncertain inflation. Analogous to tests under the traditional CAPM, a significantly positive (negative)  $\alpha_i$  indicates returns greater (less) than needed to compensate investors for systematic market risk and inflation risk.

### THE CAPM APPLIED TO FARMLAND

Barry (1980) analyzed farmland returns from 1950-1977 using a CAPM framework. Barry used the Jensen CAPM to estimate the Jensen index,  $\alpha$ , and beta for U.S. aggregate farmland and for 12 United States Department of Agricultural (USDA) designated production regions. Returns to farmland from production were based on a former USDA method. This approach first estimates net income from production as total net income of farm operators from farming plus cash wages and perquisites of hired labor, interest on real estate and non-real estate debt, and net rent to landlords, minus the imputed portion of rental value of farm dwellings. Net income from farm production then is reduced by imputed returns to total farm labor, management, and non-real estate assets to yield a residual return to farm real estate. Annual return to non-real estate assets are estimated as the sum of interest paid on non-real estate debt and opportunity costs on equity in non-real estate assets charged at the three-month U.S. T-Bill Rate. As noted by Barry, the imputation procedure for returns to equity in non-real estate assets likely ignores any risk premium which may understate non-farm equity returns and overstate resulting returns to farm real estate.

Barry's market portfolio included (a) the Standard and Poor's 500 index returns; (b) the returns of corporate bonds including railroad, industrial, and utility bonds; (c) domestic municipal bond returns ; and (d) U.S Treasury bonds returns.

Barry found a significant and positive alpha at the aggregate national level and the beta for farmland was statistically insignificant from zero. Barry concluded that the low beta value implied that investment in farmland contributes little systematic risk to a well-diversified portfolio. Furthermore, the positive and

significant alpha indicates that farm real estate has offered investment premiums.

The effects of unanticipated inflation may partially explain the low betas that were found. The impact of unexpected inflation on assets was not accounted for in Barry's model - especially the unexpected inflation in the 1970s. This fact implies that if investors in farm real estate correctly anticipated the inflationary increases in farm returns, then the own-variance and CAPM risk measures reported are overestimated. Therefore, risk associated with farm real estate investment would then be related to deviations about the expectations rather than about actual values.

A second limitation may be that the returns to farm real estate may be overstated because of perfect market failures in which the CAPM is derived. These failures include high transaction costs, taxes, indivisibilities, and thin markets. Furthermore, from Levey's results, since farmers are not well diversified, beta values may be understated and true alpha values overstated. A third and serious limitation was the data which may have had aggregation problems, measurement error, and imputation errors.

Barry uses an incomplete market index and suffers the problems associated with the Roll critique, hence the tests for the significance of the alphas and betas are joint tests of the market index and the significance of the coefficients. Next, Barry's measure of the capital appreciation is likely overstated. Capital improvements made to farm real estate appear as capital gain. Data are available to adjust for capital improvements - as is done later in this paper. Furthermore, Barry's capital gain return included the gains to farm real estate improvements, yet the current return only considers returns to the unimproved farmland.

Another potentially important issue in the return to farm real estate calculation is caused by subtracting the imputed rent for farm dwellings from the returns. The returns from dwellings on the farm real estate are valid. One flaw with keeping the imputed rent as a return is that the imputed rent is an estimate. Therefore, the regression used to estimate the alpha and beta coefficients will suffer from errors in variables bias. On the other hand, imputed management and labor costs are used in the study. Thus, the regression already suffers from the bias and it is not clear if the inclusion of the imputed rent to farm dwellings will exacerbate the problem of bias. Furthermore, errors in variable bias is, in most cases, ignored. It is consistent to use the imputed rent as part of the return to farm real estate. Non-farm investors would rent the existing dwelling and the return is an economic return even though it is not a cash or accrual return for a farmer who owns and uses the dwelling on the farm real estate.

The final and potentially most serious issue addressed in this study concerns the estimated return to non-real estate farm equity. Non-real estate equity was assumed to earn a zero beta rate of return or the risk-free rate. From capital asset pricing theory, we know that farmers would invest their assets at a rate which is on the capital market line; however, we don't know what the true beta on non-real estate equity should be. Data limitations preclude separate calculation of this beta, and hence a "menu" approach is used in this study to present evidence of the sensitivity of the results to this assumption.

A second CAPM analysis was performed by Irwin, Forster, and Sherrick. Their paper was in part an effort to extend Barry's article. The areas of improvement were: (a) in using a broader based market index, (b) in using a CAPM which was corrected for inflation, and (c) in lengthening the sample period.

The Irwin et al. annual asset return market index is the Ibbotson et. al., U.S. market index. Ibbotson et. al., estimate annual returns and market values for (a) equities from the New York Stock and the American Stock Exchanges, and the over-the-counter markets; (b) for fixed income corporate securities which include preferred stock, long-term and intermediate-term corporate bonds, and commercial paper; (c) for real estate including farm, commercial, and residential housing; (d) U.S. government securities which include agency securities and T-Bills, notes and bonds; (e) metals; and (f) municipal bonds. The data allow an approximation of the composition of the U.S. investment portfolio as well as the average return to this portfolio. Some investments are omitted from the estimates, e.g., the value of many small businesses, personal holdings, and human capital. However the estimates account for investments that are most marketable, identifiable, and available to most investors.

Irwin et al. choose the Jensen excess return CAPM for their "control" CAPM in the study. The CAPMUI model chosen was first proposed by Brueggeman, et al. who found that real estate returns were strongly related to uncertain inflation in a study of real estate investment trust funds.

Percentage changes in the consumer price index were used to estimate inflation rates. The risk-free rate was defined as the 90-day T-Bill rate. Excess inflation was defined as the annual percentage change in the consumer price index in period  $t$  less the T-Bill rate of return in period  $t$ . The returns to farmland were similar to Barry's. The sample period analyzed was 1947-84 and 1950-1977 for the comparison sample period. The later years account for some of the decrease in farmland values in years which followed Barry's study.

For the period 1950-1977, the results of the one factor model, the traditional Jensen specified CAPM, are only slightly different from Barry's due to measurement differences and possibly because of the



manner in which returns to farm real estate were calculated. Farmland was found to have a positive and significant intercept of 7.64 and an insignificant beta. The two factor model has a significant and positive intercept of 7.80 and insignificant excess inflation factor and market betas. Therefore, for this time period, the Irwin et al. estimates are equivalent to Barry's.

For the 1947-84 time period, the results of the single factor model are inconsistent with the results of Barry. The market risk beta for farm real estate in the one factor CAPM is insignificant as was Barry's; however, the intercept is no longer significantly different from zero. Furthermore, for the period 1947-84, the two factor model has an insignificant intercept term and a significant positive excess inflation coefficient of 0.86. The beta for market risk is still insignificant. Therefore, the sample period of the analysis may be important and the CAPMUI performs better for the longer time period.

Irwin et al. conclude that returns to farm real estate are not too low, and that, "(a) farm real estate offers only slight (not substantial) premiums above those from systematic risk; (b) contributes little systematic risk to a well-diversified portfolio; and (c) exhibits substantial risk from uncertain inflation."

Irwin et al. also has potential shortcomings and errors. The research uses similar methodologies as Barry. Their current return to farmland excludes returns to farm structures. This paper addresses some of these potential shortcomings and demonstrates the sensitivity of the results to the assumptions.

## METHODOLOGY AND DATA

The first issue addressed involves the measurement of returns to farm real estate. Two sets of real estate returns are studied. The first set of returns (denoted return scheme I) to farmland follows Barry's definition. Recall that Barry estimates net income from production as total net income of farm operators from farming plus cash wages and perquisites of hired labor, interest on real estate and non-real estate debt, and net rent to landlords, minus the imputed portion of rental value of farm dwellings. Barry reduces net income from farm production by imputed returns to total farm labor, management, and non-real estate assets. This results in a residual return to farm land. Annual returns to non-real estate assets are estimated as the sum of interest paid on non-real estate debt and opportunity costs on equity in non-real estate assets charged at the three-month U.S. T-Bill Rate, which is equal to the zero beta rate. Capital gains in period  $t$  are calculated as the difference in farm real estate value in period  $t$  and in period  $t-1$ .

Because the measurement of farm real estate value includes structures and buildings, the capital gain (loss) includes changes in the value of both the land and the structures. Furthermore, the return to farm real estate should include economic returns to the land and buildings. Therefore, the return to farm real

estate should also include the imputed portion of rental value of farm dwellings. Also, capital investments in real estate during period  $t$  are subtracted from the value of farm real estate in period  $t$ . This reduction accounts for increases in farm real estate value not due to capital gains. One shortcoming with this approach is that depreciation of the new investment is ignored; however, for investments in real estate, economic depreciation may be minimal. This redefined measure of returns (denoted return scheme II) includes the rental value of the farm dwelling and excludes the capital investments from farm real estate gains.

The required rate of return to non-real estate farm equity is not known *a priori*. Therefore, one should not expect non-real estate farm assets (or the equity in them) to have a beta of zero or earn the risk-free rate of return. For this study, a "menu" of rates of return from the capital market line is considered. The zero beta rate is defined as the 90 day T-Bill rate and the rate of return for an asset with a beta of one is defined as the return to the market index. All other rates of return from the capital market line are defined as weighted averages between the zero beta rate and the return to the market. The range of betas considered for non-real estate farm equity in this study is zero to 1.5.

Also, for this study, the market return index was defined as the Ibbotson et. al., annual U.S. market index, which is believed to be the broadest available. Percentage changes in the consumer price index were used to estimate inflation rates. Following Brueggeman, Chen, and Thibodeau, unanticipated inflation was defined as the annual percentage change in the consumer price index in period  $t$  less the T-Bill rate of return in period  $t$ . Unexpected inflation was defined (following Brueggeman, Chen, and Thibodeau) as the annual percentage change in the consumer price index in period  $t$  less the 90 day T-Bill rate of return in period  $t-1$ , where expected inflation is defined as the previous period 90 day T-Bill rate of return. Excess unexpected inflation was defined as unexpected inflation less the T-Bill rate of return in period  $t$ .

One purpose of this study is simply to compare the redefined returns to farm real estate to Barry's return to farmland. A second purpose is to test the robustness of the assumption that the return to non-real estate equity is the riskless rate is examined using a menu of capital market line returns. A third purpose of this study is to propose a more efficiently specified capital asset pricing model which accounts for inflationary effects to asset returns. In the CAPMUI specification used by Irwin et al., the unanticipated inflation index includes unexpected inflation and anticipated inflation. Following rational expectation theory, fully anticipated factors should have no differential effect on the returns to an asset. Anticipated factors are fully accounted for by the asset's relationship to the market as is shown in many standard finance texts.



Only the unexpected factors and an asset's sensitivity to the unexpected factor affects the asset's return. Therefore, a Capital Asset Pricing Model under unexpected inflation (CAPMUEI) will be compared to the CAPMUI specification to determine which model is more justifiable.

Excess return CAPM versions used throughout this study are consistent with examining *ex post* returns. The intercept, or Jensen index, provides valuable insight into the superiority (inferiority) of the returns to nonsystematic risk that an asset has earned. All equations were estimated over the sample period running from 1950 to 1984 using USDA agricultural real estate data as described above.

## RESULTS

The results from the battery of tests are organized as follows. Table 1 uses the scheme *I* measure of returns throughout. It compares the CAPMUI to the CAPMUEI specification for varying levels of the assumed beta on non-real estate equity. Table 2 uses returns scheme *II* to compare the CAPMUI to the CAPMUEI model, again across varying potentially relevant ranges of the beta for non-real estate equity. Comparisons between table 1 and 2 point out the consequences of the altered measure of returns while comparisons within a table indicate consequences of the assumption on non-real estate equity betas and the treatment of inflation.

The first regression examined in table 1, the benchmark case for this study, uses scheme *I* returns and the zero beta return for non-real estate. The model specification is the CAPMUI used by Irwin et al. but the definition for returns to real estate is from Barry. The coefficient for the market, or the market beta, is insignificant as in past studies, but the coefficient is -0.07. Past studies have had positive coefficients. The coefficient for the unanticipated inflation index is 2.31 and significant at the one percent level. This result is consistent with Irwin et al. The intercept, the Jensen index, is 10.81 and significant at the 1% level, which agrees with Barry's findings; however, it differs from Irwin et al. who found an insignificant intercept.

Next, the benchmark case is compared to the CAPMUEI as opposed to the unanticipated inflation model, CAPMUI. Recall that the difference between the CAPMUI and CAPMUEI models lies in the treatment of the inflation index. The CAPMUI model has the unanticipated inflation index defined as the percentage change in CPI in time  $t$  less the 90 day T-Bill rate of return in time  $t$ . The CAPMUEI defines the unexpected inflation as the percentage change in CPI in time  $t$  less the 90 day T-Bill rate of return in period  $t-1$ , where expected inflation is equal to the previous period 90 day T-Bill rate of return. This model naive expectation of future inflation is then expressed in excess return form.

The zero beta return to nonland farm equity CAPMUEI regression (table 1, right half) is slightly different from the benchmark case. The market beta is insignificant as before, but the coefficient is a positive 0.01. The sign of the unexpected inflation index in the CAPMUEI is as expected, positive. The inflation beta is 1.09 and is significant at the one percent level. The sign and significance level for the intercept are the same in both regressions, although the intercept in the CAPMUEI is 14.84, which is larger. The CAPMUEI model explains more than the CAPMUI model as evidenced by the higher  $R^2$ , although the difference does not appear to be material.

Another result to examine using scheme I returns measures is whether the assumption of the zero beta for non-real estate farm equity returns is robust. It is clear that as the returns to non-real estate farm equity increase, *i.e.*, the beta for nonland farm equity increases, the coefficients and intercept of both models decrease in magnitude. In fact, for both CAPMUI and CAPMUEI model specifications, if the nonland farm equity has a return equal to the market index (*i.e.* a beta of one), then the coefficient for the market index is negative and significant at the five percent level. This result is strikingly different from past findings and calls into question the previously reported results that did not account for these possibilities. Therefore, for these models, the assumption of the zero beta return for nonland farm equity is not robust. Again, data limitations preclude direct measurement of non-real estate equity betas which may in fact differ dramatically from one and may depend upon individual investor characteristics. Under both returns definitions, the market beta declines as the non-real estate equity riskiness increases while retaining high significance in the coefficients on the inflation measure and the intercept.

The results from the CAPMUI using scheme II definitions of return to farm real estate differ from those using scheme I. Under scheme II, the zero beta benchmark regression has a market beta of 0.16, but is insignificant. Also, the coefficient for the inflation index is 1.75 and significant at the one percent level. The magnitude of the beta is smaller. The intercept is 4.85 and significant at the five percent level, which is smaller than the previous case.

When the results from the CAPMUEI with the newly defined return to farm real estate are examined (table 2, right half), it appears that the model explains the data better than the CAPMUI regressions and the CAPMUEI regressions in table 1 for all cases. This model specification and the improved definition of returns to farm real estate are used to interpret this study's findings. For the zero beta return to non-real estate farm equity case, the market beta is 0.13, but insignificant as has been found in past studies. The coefficient on the unexpected inflation index is 1.54 and significant at the one percent

level. The Jensen index is 12.17 and significant at the one percent level. Therefore, if equity in non-real estate assets earn the riskless rate of return, farm real estate has earned substantial returns for nonsystematic risk. Furthermore, farm real estate is a good hedge for unexpected inflation. Last, farm real estate adds little systematic risk to a well diversified portfolio while adding potential yield.

However, the cases where non-real estate equity earns a higher rate of return (has a larger beta) do not have the same interpretation. The principal difference lies with the market beta. If the return to non-real estate equity is greater than or equal to 1.4, then the market beta is negative and significant. The interpretation is that farm real estate would be a hedge against any asset with a positive market beta. Thus, the assumption of the riskless return to non-real estate farm equity has again been found not to be robust.

### CONCLUSIONS AND LIMITATIONS

The results from this study indicate that if the non-real estate farm equity earns the risk-free rate of return, then (a) farm real estate returns are not too low; (b) farm real estate offers substantial premiums above those from systematic risk; (c) contributes little systematic risk to a well-diversified portfolio; and (d) exhibits substantial risk premiums from unexpected inflation.

If the non-real estate farm equity earns a risky rate of return and has a market beta of at least 1.4, then (a) farm real estate returns are not too low, (b) farm real estate offers substantial premiums above those from systematic risk; (c) acts as a hedge for positive market beta assets in a well-diversified portfolio; and (d) exhibits substantial risk premiums from unexpected inflation.

Thus, the results indicate that the assumption of a zero beta return to non-real estate equity is not robust. The real problem is that the correct rate of return is not observable and must therefore be estimated. A menu approach was chosen so that managers and policy makers may choose the return to non-real estate equity they believe is most realistic and interpret the attributes of farm real estate accordingly.

The results from this study indicate that the Capital Asset Pricing Model under Unexpected Inflation (CAPMUEI) is superior to the Capital Asset Pricing Model under Unanticipated Inflation (CAPMUI). This is a simple efficiency result since the CAPMUI has unneeded information in its inflation index.

This study does have limitations. The correct risk-free rate should have been the 360 day T-Bill return; however, this return was not readily available. It is unknown how this limitation affect the findings. Also, CAPM models may be specified with more than two factors. An under specified model suffers from omitted variable bias. A multi-factor CAPM may be more appropriate to examine farm real estate returns.



Table 1.

CAPMUI and CAPMUEI Coefficients using Scheme I Returns to Farmland across  
Nonland Farm Equity Betas from 0 to 1.5 \*

Beta of Nonland Equity <sup>a</sup>	CAPMUI Market Beta <sup>b</sup>	CAPMUI Inflation Beta <sup>b</sup>	CAPMUI Jensen's Alpha <sup>b</sup>	CAPMUI Adjusted R Squared	CAPMUEI Market Beta <sup>b</sup>	CAPMUEI Inflation Beta <sup>b</sup>	CAPMUEI Jensen's Alpha <sup>b</sup>	CAPMUEI Adjusted R Squared
0.0	-0.07 (-0.33)	2.31** (4.61)	10.81** (7.64)	0.38	0.01 (0.07)	1.09** (3.13)**	14.84** (5.45)	0.41
0.1	-0.12 (-0.52)	2.29** (4.56)	10.77** (7.58)	0.37	-0.03 (-0.14)	1.09** (3.10)	14.77** (5.28)	0.41
0.2	-0.17 (-0.70)	2.28** (4.51)	10.74** (7.51)	0.37	-0.07 (-0.35)	1.08** (3.06)	14.70** (5.23)	0.40
0.3	-0.20 (-0.88)	2.26** (4.45)	10.70** (7.43)	0.36	-0.11 (-0.56)	1.07** (3.03)	14.63** (5.17)	0.40
0.4	-0.24 (-1.07)	2.24** (4.40)	10.66** (7.36)	0.36	-0.15 (-0.78)	1.07** (3.00)	14.56** (5.19)	0.39
0.5	-0.29 (-1.25)	2.22** (4.33)	10.62** (7.28)	0.36	-0.19 (-0.99)	1.06** (2.96)	14.48** (5.06)	0.39
0.6	-0.32 (-1.43)	2.20** (4.27)	10.58** (7.20)	0.35	-0.23 (-1.20)	1.05** (2.93)	14.41** (5.00)	0.39
0.7	-0.36 (1.61)	2.19** (4.21)	10.54** (7.12)	0.35	-0.27 (-1.42)	1.05** (2.90)	14.34** (4.95)	0.39
0.8	-0.40 (-1.79)	2.17** (4.15)	10.50** (7.03)	0.35	-0.31 (-1.63)	1.04** (2.86)	14.27** (4.89)	0.39
0.9	-0.44 (-1.97)	2.14** (4.08)	10.46** (6.95)	0.35	-0.35 (-1.84)	1.03** (2.83)	14.20** (4.84)	0.39
1.0	-0.48 <sup>c</sup> (-2.15)	2.12** (4.02)	10.42** (6.86)	0.36	-0.39 <sup>c</sup> (-2.06)	1.03** (2.80)	14.13** (4.78)	0.39
1.1	-0.52 <sup>c</sup> (-2.33)	2.10** (3.95)	10.37* (6.77)	0.36	-0.43 <sup>c</sup> (-2.27)	1.02** (2.77)	14.06** (4.73)	0.39
1.2	-0.56 <sup>c</sup> (-2.51)	2.08** (3.89)	10.33** (6.68)	0.36	-0.47 <sup>c</sup> (-2.48)	1.01** (2.73)	14.00** (4.68)	0.40
1.3	-0.60 <sup>c</sup> (-2.69)	2.06** (3.82)	10.28** (6.58)	0.37	-0.51 <sup>c</sup> (-2.70)	1.01 <sup>c</sup> (2.70)	13.92** (4.62)	0.40
1.4	-0.64** (-2.87)	2.03** (3.75)	10.23** (6.49)	0.37	-0.55** (-2.90)	1.00 <sup>c</sup> (2.67)	13.85** (4.57)	0.41
1.5	-0.68** (-3.05)	2.01** (3.68)	10.19** (6.39)	0.38	-0.59** (-3.11)	1.00 <sup>c</sup> (2.64)	13.79** (4.52)	0.41

<sup>a</sup>A zero beta corresponds to the nonland equity receiving the riskless rate of return and a beta of one corresponds to the nonland equity receiving the market portfolio return.

<sup>b</sup>T-ratios are in parentheses. A \* or \*\* indicates the coefficient is significant at the 0.05 or 0.01 levels respectively.

<sup>c</sup>Regressions were corrected for first order autocorrelation using a Cochrane-Orcutt procedure when Durbin-Watson statistics fell into significant ranges.

Table 2.

CAPMUI and CAPMUEI Coefficients using Scheme II Returns to Farmland across  
Nonland Farm Equity Betas from 0 to 1.5 \*

Beta of Nonland Equity*	CAPMUI Market Beta <sup>b</sup>	CAPMUI InflationBeta <sup>b</sup>	CAPMUI Jensen's Alpha <sup>b</sup>	CAPMUI Adjusted R Squared	CAPMUEI Market Beta <sup>b</sup>	CAPMUEI Inflation Beta <sup>b</sup>	CAPMUEI Jensen's Alpha <sup>b</sup>	CAPMUEI Adjusted R Squared
0.0	0.16 (0.70)	1.75** (2.78)	4.85* (2.39)	0.41	0.13 (.065)	1.54** (5.42)	12.17** (5.45)	0.58
0.1	0.12 (0.52)	1.74** (2.76)	4.81* (2.36)	0.40	0.09 (0.45)	1.53** (5.36)	12.10** (5.38)	0.57
0.2	0.08 (0.34)	1.73** (2.74)	4.78* (2.34)	0.39	0.05 (0.25)	1.52** (5.31)	12.03** (5.32)	0.59
0.3	0.04 (0.17)	1.72* (2.72)	4.74* (2.32)	0.39	0.01 (0.05)	1.51** (5.25)	11.95** (5.25)	0.55
0.4	-0.01 (-0.01)	1.71* (2.70)	4.71* (2.29)	0.38	-0.03 (-0.15)	1.51** (5.19)	11.88** (5.19)	0.55
0.5	-0.04 (-0.20)	1.69* (2.68)	4.67* (2.26)	0.37	-0.07 (-0.35)	1.50** (5.13)	11.81** (5.13)	0.57
0.6	-0.09 (-0.38)	1.68* (2.66)	4.63* (2.24)	0.37	-0.11 (-0.55)	1.49** (5.07)	11.74** (5.06)	0.53
0.7	-0.13 (-0.56)	1.67* (2.64)	4.60* (2.22)	0.36	-0.15 (-0.75)	1.48** (5.01)	11.66** (5.00)	0.53
0.8	-0.17 (-0.74)	1.66* (2.63)	4.56* (2.19)	0.36	-0.19 (-0.95)	1.48** (4.95)	11.59** (4.93)	0.52
0.9	-0.21 (-0.92)	1.65* (2.61)	4.52* (2.17)	0.35	-0.23 (-1.15)	1.47** (4.89)	11.52** (4.87)	0.52
1.0	-0.25 (-1.10)	1.64* (2.59)	4.49* (2.15)	0.35	-0.27 (-1.35)	1.46** (4.83)	11.45** (4.80)	0.51
1.1	-0.29 (-1.29)	1.63* (2.57)	4.45* (2.12)	0.35	-0.31 (-1.55)	1.45** (4.77)	11.37** (4.74)	0.51
1.2	-0.33 (-1.47)	1.62* (2.55)	4.41* (2.11)	0.35	-0.35 (-1.75)	1.45** (4.71)	11.30** (4.67)	0.50
1.3	-0.38 (-1.65)	1.61* (2.53)	4.38* (2.07)	0.35	-0.39 (-1.95)	1.44** (4.65)	11.23** (4.61)	0.50
1.4	-0.42 (-1.83)	1.60* (2.52)	4.34* (2.05)	0.35	-0.43 (-2.15)	1.43** (4.59)	11.15** (4.54)	0.50
1.5	-0.46 (-2.01)	1.59* (2.50)	4.31* (2.03)	0.35	-0.47 (-2.34)	1.42** (4.54)	11.08** (4.48)	0.50

\*A zero beta corresponds to the nonland equity receiving the riskless rate of return and a beta of one corresponds to the nonland equity receiving the market portfolio return.

<sup>b</sup>T-ratios are in parentheses. A \* or \*\* indicates the coefficient is significant at the 0.05 or 0.01 levels respectively.

<sup>c</sup>Regressions were corrected for first order autocorrelation using a Cochrane-Orcutt procedure when Durbin-Watson statistics fell into significant ranges.

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