

RETURN AND RISK COMPARISONS  
BETWEEN FARM REAL ESTATE AND ALTERNATIVE INVESTMENTS

By

GREGORY C. BARRON

B.S., Kansas State University, 1979

---

A MASTER'S THESIS

Submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Agricultural Economics

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1982

Approved by:

  
Major Professor

SPEC  
COLL  
LD  
2668  
.T4  
1982  
B377  
c. 2

A11202 254004

TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS . . . . .	i
LIST OF TABLES . . . . .	ii
LIST OF FIGURES . . . . .	iii
CHAPTER	
I. INTRODUCTION . . . . .	1
II. REVIEW OF LITERATURE . . . . .	4
III. METHODOLOGY . . . . .	13
IV. RESULTS . . . . .	28
V. SUMMARY AND CONCLUSIONS	
Summary . . . . .	42
Conclusions . . . . .	44
NOTES . . . . .	46
LITERATURE CITED . . . . .	49
APPENDIX . . . . .	50

## ACKNOWLEDGEMENT

The author wishes to express his thanks to Dr. Larry Langemeier, Professor of Agricultural Economics, for his consultation and assistance in the writing of this paper.

A word of thanks is also extended to other committee members, Dr. Mark Newman and Dr. Bryan Schurle for their constructive advice.

A special thanks goes to my parents for their love and support.

LIST OF TABLES

Table	Page
1. Investment total annual returns 1926 to 1976 . . . . .	12
2. Kansas Land Value Index 1972 to 1980 . . . . .	17
3. Year-by-year Total Returns 1973 to 1979 . . . . .	29
4. Regression of Gross Farm Income to Farm Real Estate Income Rate of Return . . . . .	30
5. Investment total annual returns 1973 to 1979 . . . . .	33
6. Year- by-year Income and Price Appreciation Returns foe Common Stock and Farm Real Estate 1973 to 1979 . . . . .	37



LIST OF FIGURES

Figure	Page
1. KSU Farm Management Associations . . . . .	27
2. Regression Plots Real Estate Income Rates of Return to Gross Farm Income 1973 . . . . .	31
3. Annual Rate of Return from Common Stock and Farm Real Estate . . . . .	39

## Chapter 1

### Introduction

This study examines and compares returns and associated risks between farm real estate in Kansas and national market securities. More specifically these market securities are examined as an alternative investment for the farm.

Can farm real estate compete with alternative investments on the market? A number of economists feel farm real estate should not be compared to alternative investments because of the non-monetary values attached to the real estate. That is, these non-monetary values force farm real estate into a non-investment class. If farming is a way life, then the real estate used cannot be bought and sold like other investments if the farm is to remain a going concern.

In this study, the farmer is assumed to be totally profit oriented. Thus real estate used to produce these profits will be treated as an asset that can be liquidated if it is advantageous to do so. That is, real estate will be bought and sold like any other investment.<sup>1</sup> It is also assumed, the farmer is able to take advantage of all

---

1. This study assumes purchasing farm real estate is a long run decision.

production and marketing opportunities available to him.

Farm real estate, as an investment, will be compared to common stock, long term government bonds, long term corporate bonds, and United States treasury bills, for risk and return properties.

Another assumption, applying to the alternative investments, is the concept of an efficient capital market. In such a market, security prices are assumed to be "fair" in that they reflect all future information that is available.

#### Justification

The farmer can use the results of this study to compare average state-wide rates of return figures for farm real estate, to his own operation, as well as alternative investments. A farmer, who has funds that are available for investment, must decide where these funds will be channelled. Should funds be invested back into the farm business or are alternative investments, that yield a safer and greater return, pursued?

If the farmer decides to channel funds back into his operations, historical return and risk measures are helpfull in making intra-operational investment decisions. Political and agricultural organizations can also use study results to help formulate agricultural policies.

Most studies that compare farm real estate returns to alternative investments, use a national sample for their farm real estate returns. This study uses a sample of

Kansas farms for real estate returns, thus results are more representative of the Kansas farm.

### Objectives

The primary purpose of this study was to develop return-risk comparisons for the following investment alternatives: Farm real estate, common stock, government bonds, corporate bonds, and treasury bills. More specific objectives were to test the following hypothesis:<sup>2</sup>

- (1) The rates of return associated with farm real estate are identical with the returns achieved from the other investment alternatives.
- (2) The price rates of return associated with farm real estate and common stock are equal.
- (3) The income rates of return associated with farm real estate and common stock are equal.

---

2. See the chapter on Methodology and Data Sources for the definitions of rates of return, price rate of return, and income rate of return.

## Chapter II

### Review of Literature

There have been very few studies which compare risk-return characteristics of farm real-estate and alternative investments, such as common stock, bonds, and short term notes.

In a 1963 study, Kost tried to answer the question, "Are farm real estate and common stocks close substitutes in an investment portfolio?"(1) Kost first examined the differences between the two investments. Are common stock and real estate similar with respect to risk, management, taxation, and marketability? If the two investments were similar in these areas, then the rate of return would become a key variable in selecting the class in which to invest. If not, then the two investments cannot be compared only on the basis of their rates of return.

Kost felt that farm real estate and common stock have many similar characteristics since both provide a form of equity ownership, are earning assets and carry similar risks.

Kost sites three major differences between the two investments. The first was the marketability characteristics of the two investments. "Farm real estate is an immobile and unstandardized commodity and is therefore traded in relatively unorganized, low-volume, local markets. On the other hand, common stocks, which are more standardized, are sold on large, well-organized,

or at least regional markets, in large numbers."(2)

Farm real estate and common stock also carry different forms of ownership. Farm real estate is usually solely owned by the investor. The investor in common stock is a fractional owner. This fractional ownership gives the common stock investor limited liability, contrasted with the real estate investor who carries full liability responsibilities in most cases.

Kost also felt that investors attitudes towards these two investments were different. "There still exists, in many minds, a value for farm real estate which is not directly connected with its economic productivity."(3) Many people have a bias for or against farm real estate. Kost believed that this attitude does not exist with common stock.

Kost analyzed two components of rate of return: an income rate of return and a price rate of return. The income rate of return reflects the return received from the investment during a period of time. For farm real estate the income rate of return would be reflected in the production income from the real estate. In common stock the income rate of return would be in the form of a dividend received in a time period.

The price rate of return is defined as the change in value of the investment due to a change in price of the asset. The income rate of return and the price rate of return are then added to get a total rate of return. Kost

defined risk as the variability of return which was measured using the standard deviation.

Kost's time horizon included years 1950-1963. He found a mean income rate of return to be 9.31 percent for common stock and 4.41 percent for farm real estate. Kost used a nonparametric U-test and rejected the null hypothesis that the rates of return were the same for the two investments, at the 5 percent level.<sup>3</sup> The income rate of return was higher in all fourteen years for common stock; standard deviations were 3.59 and .95 for common stock and real estate, respectively.

The mean price rate of return, for this time period, was 8.64 percent for common stock and 4.85 percent for farm real estate. Again a U-test was used, at the 5 percent level. The null hypothesis that the rates of return from the two investments were the same was accepted. The price rate of return for common stock was higher in 7 of the 14 years; with standard deviations of 14.45 and 3.96 for common stock and farm real estate, respectively. The mean total rate of return, for this same period, was 17.94 percent on common stock and 9.26 percent on farm real estate. The null hypothesis, the rates of return were the same, was rejected at the 5

---

3. Kost uses a nonparametric test because he hypothesizes that the two populations of measurements are identical, not that the two populations have the same mean, as the parametric test would examine.

percent level. The total rate of return for common stock was greater than the total rate of return for real estate 11 years out of 14. The standard deviations of the total rate of return were 14.31 and 4.47 for common stock and farm real estate, respectively. Variations Kost found in the total rate of return were dominated by variations in the price rate of return.

Kost concluded that the total rates of return for common stock were higher than total rates of return for farm real estate, between 1950 and 1963. Variations, or risk, in the rates of return were greater for common stock than for farm real estate.

In a different study, Barry examined risk-return characteristics of farm real estate relative to those of other investments, for the period 1950 to 1977.(4) Barry used the capital asset pricing model (CAPM) to estimate risk premiums, or a risk adjustment factor, needed to hold farm real estate in a diversified market portfolio. This relationship between the risk of an asset and the risk premium required to hold that asset is expressed in a linear fashion. In some literature this linear relationship is expressed in a "security market line" (5) (SML) as:

$$R_i = i + [E(R_m) - i] B_i,$$

where:

$R_i$  = the expected return on an investment or security;

$i$  = a risk-free return;



$E(R_m)$  = expected return on the market;

$B_i$  = a measure of the volatility of the individual investments's returns relative to the market returns.

The logic of this linear relationship is that the required return on an investment is a risk-free return plus a risk adjustment factor. The risk adjustment factor is figured by multiplying the riskiness of the individual investment by the risk premium required for the market return. If returns on individual investments fluctuate by the same amount as returns on the market, the beta for the security will be 1. If variations in the individual security are greater than the variations in the market then, the beta will be greater than 1, and its risk adjustment factor greater than the market as a whole. Barry stated, "empirical tests appear to support the view that beta is a useful risk measure and that high beta securities are priced to yield high rates of return."(6)

Barry estimates risk premiums on farm real estate by regressing a time series of annual rates of return on farm real estate against annual rates of return of a market portfolio. In his study, Barry used 9 to 12 month U.S. government securities, as the the risk-free asset. The market portfolio was a combined stock, bond, and farm real estate index.

Barry first reports his results as means, standard deviations, and coefficients of variation for various return measures for farm real estate, stock and stock-bond

indexes, and the market index. Then, the beta values for the CAPM were developed.

Barry found that the rate of return on farm real estate, for the period 1950-1977, was 6.6 percent with a standard deviation of 6.31 and a coefficient of variation of .95. Mean rates of return for the stock and stock-bond indexes alone were 7.44 and 4.31 percent respectively; with standard deviations of 14.42 and 10.33, and coefficients of variations of 1.94 and 2.40. Mean rates of return on the stock, bond, and farm real estate index were 4.74 percent with a standard deviation of 8.6 percent and a coefficient of variation of 1.83.

Analyzing the coefficients of variation, farm real estate exhibited lower variation relative to mean returns than does the market index and its stock and bond components. This lower coefficient of variation meant less risk for farm real estate than for stock and bond investments.

Results from the CAPM model provided a beta value of .19 for farm real estate, which was not significantly different from zero at the .01 level. In his study Barry stated that, "standard errors are relatively high and sample values of confidence intervals are relatively wide, so that the sample estimates leave much uncertainty about values of beta." (7)

Beta values for long-term bonds fall in the zero to .5 range. Beta values for most common stocks fall in the

.5 to 1.5 range.

With Barry's results we see a higher return in farm real estate with less risk as measured by the standard deviation of returns and beta values.

In another study, Colin Carter suggested that farm real estate returns were not dictated by returns in a portfolio of stocks, bonds, and farm real estate like the CAPM model assumed.(8) Roll also questioned the use of CAPM, suggesting that this method had not been empirically validated.(9) In addition the application of CAPM to a nonfinancial asset such as farm real estate was questionable because of farmlands indivisibility and illiquidity. "Because farm real estate is not a financial asset in the traditional sense of the word, it is tenuous to argue that its equilibrium returns will adjust to a level that reflects the risk it contributes to an efficient market portfolio of all financial assets."(10)

Carter made risk-return comparisons between farm real estate and common stocks listed on the Standard and Poor's Common Index, for the years 1956 to 1978. In that study, farmland returns represented only changes in land values. Over the period, farmland returns averaged 8.0 percent per annum, with a coefficient of variation of 6.0. Returns in the stock market averaged 4.0 percent per annum, with a coefficient of variation of 27.0. Carter's findings indicated that investing in farmland for capital appreciation would be less risky than investing in an

alternative asset such as common stock.

In a 1979 analysis, Ibbotson and Sinquefield compared common stocks, long-term government bonds, United States treasury bills, long-term corporate bonds, and inflation, for the 1926 to 1976 period, for returns and variability of those returns.(11) Standard deviations were used as a measure of variability.

Table 1 shows the basic investment total annual return series for the 1926 to 1976 period.(12) Ibbotson and Sinquefield found common stocks had the highest total rate of return followed by corporate bonds, government bonds, treasury bills, and inflation respectively. Returns for common stocks showed the greatest variability followed by government bonds, corporate bonds, inflation, and treasury bills respectively. Ibbotson and Sinquefield used this return and variation series for portfolio management and for making forecasts for future returns.

Table 1

Investment total annual returns  
1926 to 1976

Series	Arithmetic Mean	Standard Deviation
Common Stock	11.6%	22.4%
Corporate Bonds	4.2%	5.6%
Government Bonds	3.5%	5.8%
Treasury Bills	2.4%	2.1%
Inflation	2.4%	4.8%

12) Ibbotson, Sinquefeld; Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) and the Future (1990-2000), 1980.

## Chapter III

### Methodology

This study deals with risk-return comparisons of the following investment alternatives: Farm real estate, common stock, long-term government bonds, long-term corporate bonds, and United States treasury bills. Definitions for return and risk measures will be shown, tax considerations for the individual investments will be presented, along with definitions to clarify terms used in the data collection and analysis.

The investment alternatives analyzed can be categorized as either debt or equity investments. United States government bonds, treasury bills, and corporate bonds are evidence of debt. Farm real estate and common stock are a form of equity ownership. An investor in debt becomes a creditor of a business corporation or the government that issued the security. If an investor buys shares of stock or invests in farm real estate then equity ownership is obtained through a part or full ownership of a business enterprise.

The total rate of return on all investments analysed, except treasury bills, will consist of two parts: an income rate of return and a price rate of return. For common stock and farm real estate, separate series showing the returns reflecting both price appreciation and income will also be developed.

The income rate of return is defined as the income

produced from the investment. For farm real estate, the income rate of return represents the income earned from production. While for common stock the income rate of return is a reflection of dividends received through the ownership in the stock. The income rate of return for both government and corporate bonds is a function of the coupon payment received from bond ownership.

The price rate of return is a function of the capital appreciation of the investment over the holding period. In this study, the price rate of return for farm real estate, common stock, corporate bonds, government bonds, and treasury bills was defined as the appreciation in the investment value over the holding period.

Only monetary returns, including price and income rates of return, and associated risks will be analyzed for the investments included in this study. Non-monetary values, which are more characteristic of common stock and farm real estate, than with debt instruments, were not considered

#### Farm Real Estate

Real estate used in a farm business operation is not usually thought of as a pure economic investment, but involves some non-monetary returns. These non-monetary returns, such as the value one receives from land ownership, are usually not measurable. In this study, price appreciation of the land and the returns from

production were the only factors analyzed.

The total rate of return to farm real estate was formed by:

$$R_{r,y} = (RC/TA) + CAL$$

where  $R_{r,y}$  is the total rate of return to farm real estate during the year.

RC/TA represents farm real estates income rate of return;

RC is the return to capital, and

TA is total assets.

CAL is the capital appreciation of the real estate.

Return to capital was used to reflect the "true return" to the farmer, and defined as follows:

$$NETI - V092 - (V001 \times 10000) - (.10 \times GROS) + (V068)$$

where NETI is net farm income;

V092 is unpaid family labor;

V001 X 10000 is number of operators X \$10000 a year wages;

.10 X GROS is 10% of gross farm income charged to management; and

V068 is interest paid.

Total assets were defined as:

$$V096 + B + V089$$

where V096 is current and intermediate assets;

V089 is buildings owned; and

B is land value owned.

The income rate of return was calculated for each farm studied, and then a regression analysis was executed to determine if an average income rate of return was



representative of all farms in the study.

Regression analysis is a technique used to estimate the value of one quantitative variable by considering its relationship with one or more other quantitative variables.(13)

This study examines the dependence of income rates of return, called the dependent variable in regression, to gross farm income, the independent variable.

To determine if an average income rate of return could be assumed to be representative of all observations, the coefficient of determination ( $r^2$ ) the slope of the regression equation (B), and data plots were studied.<sup>4</sup>

Kansas Farm Management Associations do not revalue land annually, and thus the 1973 land value was used as a base.<sup>5</sup> This base value was indexed each year to reflect capital appreciation for real estate. Index numbers of land values are shown in Table 2.(14)(15)

Current and intermediate assets are revalued each year, so no adjustments are needed. Buildings are assumed to be revalued each year but in many cases do not reflect

---

5. Kansas Farm Management Associations are defined on page 25 under Source of Data.

Table 2  
 Kansas land value index  
 1972-1980

Year	Kansas LandValue	Index
1972	174	.87
1973	199	1.00
1974	253	1.27
1975	296	1.49
1976	330	1.66
1977	376	1.89
1978	380	1.91
1979	440	2.21
1980	504	2.53

1973=Base

14) Pine, Johnson, Trends in land value in  
 Kansas, Bulletin 625, December 1978, Ag.  
 Experiment Station; Manhattan, Ks.

15) Farm Real Estate Developments, ESCS, U.S.  
 Department of Agriculture

the current market value. Accounting practices value buildings at book value and not market value.

### Common Stock

Common stock represents a share in the ownership of a firm. By definition; all corporations, open or closed, issue common stock. Common stock is the first security a corporation issues and the last security it retires, and therefore it has the last claim on the company's earnings and assets. Common stock certificates are proof of ownership, and can be readily transferred to other investors in the marketplace.

Common stocks unlimited potential for capital appreciation and dividend payout, makes it a very attractive investment. All other corporate securities a firm issues have predetermined dividend payouts, a feature common stock does not have. If a firm fails, common stock holders are the last to be paid, thus added risk to the investor. With this added risk the common stock investor expects a higher return.

The return a common stock holder realizes is a function of both capital gain or loss through price fluctuations and dividends distributed.

The common stock total return index is based on the Standard and Poors (S&P) Composite Index.(16) Standard and Poors Index is widely known, carefully constructed, and market value weighted. Market value weighted means,

the weight of each stock in the index equals its price times the number of shares outstanding. S&P Composite Index includes 500 of the largest stocks in the United States. S&P Composite Index gives a monthly index and shows dividends per share quarterly. Ibbotson and Sinquefeld used this index to construct their common stock total return series.(17)

Designating common stocks as "m", monthly total rates of return are formed by:

$$R_{m,t} = [(P_{m,t} + D_{m,t}) / P_{m,t-1}] - 1,$$

where  $R_{m,t}$  is the common stock total return during month t;

$P_{m,t}$  is the value of the S&P Composite Index at the end of the month t; and

$D_{m,t}$  is the dividend received during month t.(18)

### Corporate Bonds

"Corporate bonds are a promise to pay a stated rate of interest for a defined period and then to repay the principal at the specific date of maturity."(19) All corporate bonds differ according to maturity, security pledged, coupon rate, selling price, and other technical aspects.

Because corporate bonds are debt instruments, bondholders have preference over preferred stockholders and common stockholders as to after-tax earnings in the form of dividends and assets in the event of liquidation.

In terms of risk, the bondholder is in a less risky position than the equity investor. The return a corporate bondholder realizes is a function of capital gain or loss and the interest paid on the face value of the bond.

Data for the long-term corporate bond total rate of return series was found in Ibbotson and Sinquefeld.(20) Ibbotson and Sinquefeld reference Soloman Brothers for their data series.(21) Ibbotson and Sinquefeld try to "maintain a 20-year term bond portfolio whose returns do not reflect potential tax benefits, impaire negotiability, or special redemption or call privileges."(22)

Monthly returns for the long-term corporate bond series are formed by:

$$R_{c,t} = [(P_{c,t,19-11} + D_{c,t}) / P_{c,t-1,20}] - 1$$

where  $R_{c,t}$  is the monthly bond total rate of return for the month t;

$P_{c,t-1,20}$  is the purchase price at the end of the month t-1 for the series given a 20-year maturity;

$P_{c,t,19-11}$  is the sale price of the bond at the end of the month t, assuming 19 years and 11 months to maturity.

$D_{c,t}$  is the coupon received. (23)

#### United States Government Bonds

United States government bonds like corporate bonds are an obligation to pay a predetermined interest rate for a period of time and repay the principal at maturity.

United States government bonds are of such high quality

that their yield is often used as an example of a risk-free interest rate. "Government bond maturities run from 7 to 40 years from date of issue."(24) Bonds in this study will have a 20-year life.

Data for the total rate of return series for Long-Term United States government bonds was found in Ibbotson and Sinquefeld.(25) In their study, a bond portfolio was developed using data obtained from the U.S. Government Bond File at the center for Research in Security Prices (CRSP).(26)

Monthly returns on Long Term Government Bonds are formed by:

$$R_{g,t} = [(P_{g,t} + D_{g,t}) / P_{g,t-1}] - 1$$

where  $R_{g,t}$  is the total return for long term government bonds during the month;

$P_{g,t}$  is the average between the bid and ask price of the bond at the end of the month  $t$ ; and

$D_{g,t}$  is the coupon payment received during month  $t$  and invested at the end of month  $t$ .(27)

### Treasury Bills

Treasury bills are very liquid, short term notes that mature in 13, 26, or 52 weeks. Treasury bills like government bonds are guaranteed by the United States government. New bills are offered every week by the Treasury. These bills are sold on a discount basis. The difference between the price the investor pays and the

face amount of the bill he receives at maturity is the discount. This discount is the price appreciation of the bill. An interest or coupon payment is not received on a Treasury bill by the investor, and thus no income rate of return is realized.

Ibbotson and Sinquefeld again reference the CRSP U.S. Government Bond file for the U.S. Treasury Bill Index Series. From this file, an index that included short-term bills not less than 1 month in maturity was constructed.

Monthly returns on Short Term Treasury Bills are formed by;

$$R_{f,t} = [P_{f,t} / P_{f,t-1}] - 1$$

where  $R_{f,t}$  is the monthly total U.S. Treasury bill return during the month  $t$ ; and

$P_{f,t}$  is the average of the bid and ask price.(28)

Total rates of return for Common Stock, U.S. government bonds, corporate bonds, and treasury bills are presented on a monthly basis. For this study annual calender returns were formed by compounding the monthly returns collected by Ibbotson and Sinquefeld.(28)

### Risk

Risk in holding an investment is associated with the probability that "real" returns will be less than the returns that were expected.

In this study, risk will be defined as the variability of returns. Sources that contribute to this

variability make up the elements of risk, with the sources divided into two main groups - systematic and unsystematic causes.

Systematic risk is defined as that portion of the total variability in return caused by factors that affect an investment group, in the same direction. "Economic, political, and sociological changes are sources of systematic risk." (29) Unsystematic risk is defined as that portion of total variability in return that is unique to a firm or industry. "Such factors as management capability, consumer preferences, labor strikes, and the like cause unsystematic variability of returns in a firm." (30) Components of the systematic and unsystematic risks make up the total risk, or the total variability of return.

The separate components of systematic and unsystematic risk affect all investments in distinct ways and magnitudes. Thus, we see the basis for portfolio management and diversification of investments, topics this study will not touch on.

A reasonable surrogate of risk is the variability of return, which in statistics is the variance or standard deviation of the returns around the mean return over a specific period. The standard deviation and the coefficient of variation will be measured and presented in this paper.



### Tax Treatments

Taxes generally have a sizable affect on the profitability of investments. An understanding of some tax law is therefore essential to maximize investment profits. A brief discription of tax treatments for each investment studied will be presented. To minimize the tax burden, the tax effcts of interest, cash dividends, stock dividends, ordinary income, and capital gains must be understood.

In 1981, interest and dividends were given the same tax treatment. An exclusion of up to \$200 of combined qualifying interest and dividend income can be taken, or \$400 on a joint return. Cash dividends received from domestic corporations, taxable interest on government bonds, and interest received from domestic corporate bonds all qualify for interest and dividend exclusion treatment.

Stock dividends are not in themselves taxable. As a result of a stock dividend, the investor will realize a greater cash dividend, and increased capital gains upon liquidation of the investment. Only after a cash dividend distribution or liquidation of the security, will the investor be taxed.

Production income received from real estate ownership is treated as ordinary income. There are various deductions and exemptions unique to farm income. These deductions vary depending on each individual's operation.

Capital gains stem from the increased value of the

investment. To the investor, a rise in the price of a stock, corporate bond, marketable government bond, treasury bill, real estate, or the sale of breeding stock above the purchase price all represent capital gains. For income to qualify for capital gains treatment, the asset must be held for more than one year. Forty percent of the entire capital gain is treated as ordinary income under current tax laws.

All of the above tax laws affect each individual investment, and should play a major role in investment selection and decisions. The Investment alternatives analysed in this study all have unique tax treatments. Common stock, government bonds, and corporate bonds receive capital gains treatment, if the asset is held for more than one year, along with cash dividend and interest income exclusion treatment. Returns from farm real estate receive capital gains tax treatment, if the asset is held for more than one year, and ordinary income tax treatment. Treasury bills only receive capital gains tax treatment, unless the investment is held for less than a year, in which case, it receives ordinary income treatment.

#### Source of data

Data for the farm real-estate rate of return series was obtained from the K-MAR-105 (Kansas, Management, Analysis, Research) whole farm and enterprise data bank. The K-MAR-105 data bank was developed by the Department of

Economics at Kansas State University, K-MAR-105, and the Kansas Farm Management Associations, and has been in existence since 1972. The Kansas Farm Management Associations are part of the Kansas State University Cooperative Extension Service and cover the entire state of Kansas. Figure 1 shows the association breakdown by county. The Extension Service employs fieldman to help association members with management and marketing decisions. These fieldmen also collect data for the K-MAR-105 data bank. K-MAR-105 was developed for these reasons: to provide detailed information to each member about his farm and its situation; to provide information and reports to the various associations; and to provide extension, teaching, and research personnel with a data bank for information on the Kansas Farm Management Associations. (31)

K-MAR-105 contains 215 variables per farm for the years 1973 through 1980. This study used farms from all six associations that had data for seven consecutive years. One thousand one hundred and thirty three observations were included in the sample for this study.

Rates of return figures for common stock, government bonds, corporate bonds, and treasury bills were found in Ibbotson and Sinquefield. (32)



## Chapter IV

### Results

Table 3 presents the total rates of return for farm real estate, common stock, long term government bonds, long term corporate bonds, and United States treasury bills, for the 1973-1979 period. The total rates of return shown were calculated using the individual rate of return equations in the Methodology chapter. Total rates of return include both income and price rates of return.

In order for the total rates of return outlined in Table 3 to be comparable between farm real estate and the other investment alternatives, the "average" income rate of return from farm real estate must be representative of all farms in the study. To test this assumption, the income rate of return portion of the farm real estate total rate of return for each farm was regressed against gross farm income. Table 4 presents the average income rates of return for farm real estate coupled with the regression results. For the 1973-1979 period, the regression  $r^2$  values ranged from .037 percent in 1976 to .149 percent in 1974, while the beta values ranged from  $1.5 * 10^{-7}$  in 1976 to  $5.9 * 10^{-7}$  in 1974. The slope of the regression equation (B) was significantly different from 0 at the .0001 level for all the years studied. Figure 2 shows the regression results graphically for the year 1973.

This regression analysis assumed a simple linear relation of return to farm size. Examination of the

Table 3

Year-by-year total returns  
1973-1979

Year	Common Stock <sup>a</sup>	Long Term Government Bonds <sup>a</sup>	Long Term Corporate Bonds <sup>a</sup>	United States Treasury Bills <sup>a</sup>	Real Estate
1973	-.1466	-.0111	.0114	.0693	.2950
1974	-.2648	.0435	-.0306	.0800	.2646
1975	.3720	.0919	.1464	.0580	.1807
1976	.2384	.1675	.1865	.0508	.0940
1977	-.0718	-.0067	.0171	.0541	.1476
1978	.0656	-.0116	-.0007	.0718	.0595
1979	.1844	-.0122	-.0418	.1038	.2176

a) Ibbotson, Sinquefeld; Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And The Future (1980-2000), 1980.

Table 4

Regression of gross farm income to farm real estate  
income rate of return

Year	B	T for HO: Parameter B = 0	PR> T	Std. error of est.	Average income rate of return	r <sup>2</sup>
1973	$5.5 \times 10^{-7}$	12.31	.0001	$.5 \times 10^{-7}$	.145	.118
1974	$5.9 \times 10^{-7}$	14.06	.0001	$.4 \times 10^{-7}$	-.0054	.149
1975	$4.1 \times 10^{-7}$	17.29	.0001	$.2 \times 10^{-7}$	.0107	.209
1976	$1.5 \times 10^{-7}$	6.61	.0001	$.2 \times 10^{-7}$	-.0160	.037
1977	$2.1 \times 10^{-7}$	10.60	.0001	$.2 \times 10^{-7}$	.0076	.090
1978	$2.5 \times 10^{-7}$	15.27	.0001	$.2 \times 10^{-7}$	.0495	.170
1979	$1.6 \times 10^{-7}$	9.88	.0001	$.2 \times 10^{-7}$	.0580	.079

# **ILLEGIBLE DOCUMENT**

**THE FOLLOWING  
DOCUMENT(S) IS OF  
POOR LEGIBILITY IN  
THE ORIGINAL**

**THIS IS THE BEST  
COPY AVAILABLE**

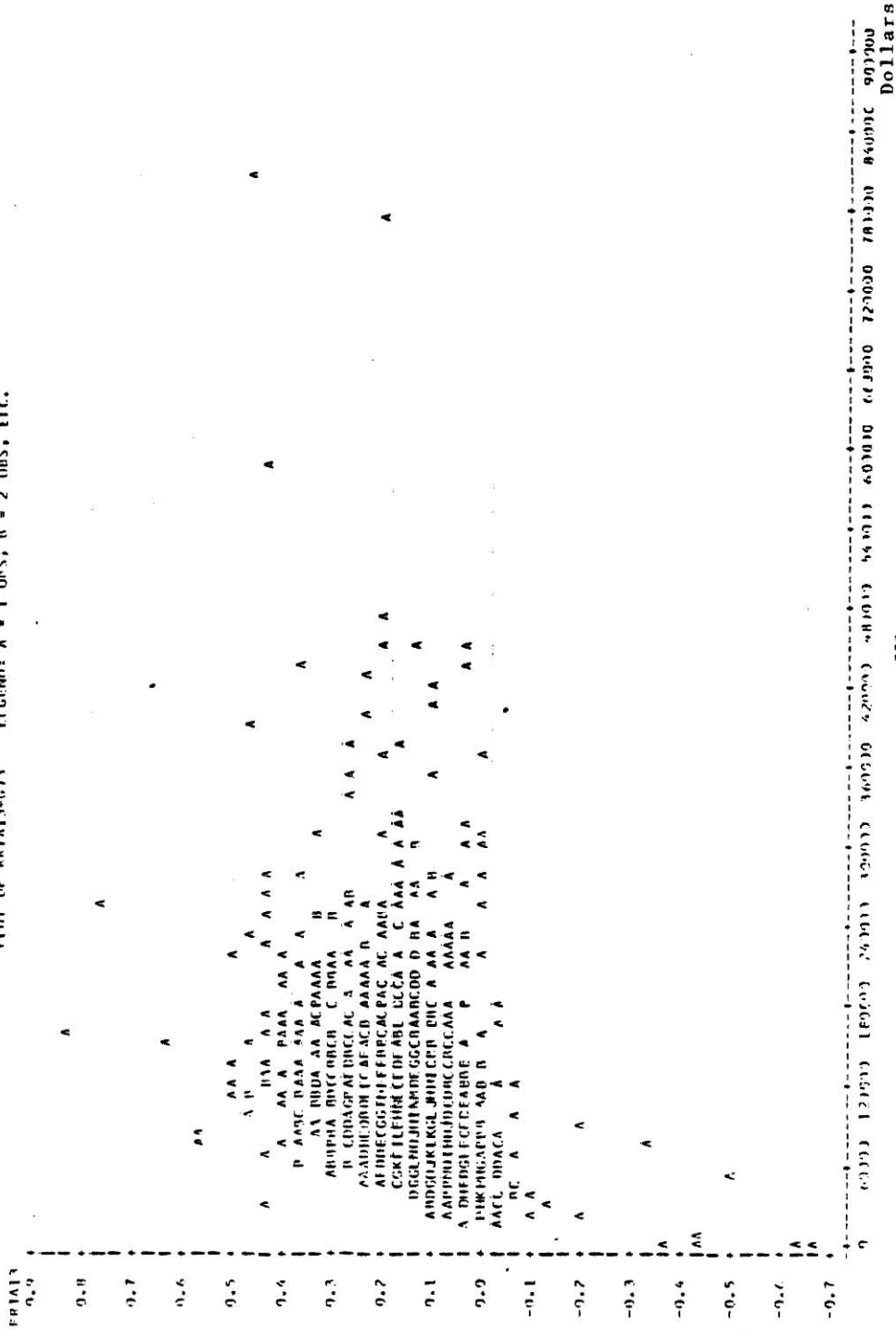


23:06 TUESDAY, NOVEMBER 17, 1991

STATISTICAL ANALYSIS SYSTEM

PRINT OF PRINT36G73 LEGEND: A = 1 OBS, B = 2 OBS, ETC.

Figure 2



NOTE: 1 OBS AND MISSING VALUES

673

Dollars

various data plots indicate that a simple linear regression may not be descriptive of the "true" relation of return to size. A few extremely small farms indicate a very low return which distorts a true linear relationship.

Based on an analysis of the regression results and data plots, an average income rate of return will be representative of all farms in the study. Examination of the plots was a major consideration in this decision. With a regression beta value that is significantly different than zero, larger farms will demonstrate slightly higher income rates of return than the average income rate of return for all farms; and vice versa for smaller farms.

The average total rates of return for the seven-year period are presented in Table 5. Farm real estate showed a return of 18.0 percent, 5.4 percent for common stock, 4.1 percent for long term corporate bonds, 3.7 percent for long term government bonds, and 7.0 percent for United States treasury bills.

Variabilities of return, or risk, was measured by standard deviation and coefficients of variation for the five investments studied. Standard deviations and coefficient of variation figures for the investments are also presented in Table 5. Farm real estate shows a standard deviation of 8.6 percent, 22.7 percent for common stock, 8.9 percent for long term corporate bonds, 7.0 percent for long term government bonds, and 1.8 percent

Table 5

Investment total annual returns  
1973-1979

Series	Arithmetic Mean	Standard Deviation	Coefficient of variation
Farm Real Estate	18.0%	8.6%	.5
Common Stock	5.4%	22.7%	4.2
Long Term Corporate Bonds	4.1%	8.9%	2.2
Long Term Government Bonds	3.7%	7.0%	1.9
U.S. Treasury Bills	7.0%	1.8%	.3

for United States treasury bills. Farm real estate shows a coefficient of variation of 4.8, 4.2 for common stock, 2.2 for long-term corporate bonds, 1.9 for long-term government bonds, and .3 for treasury bills.

Common stock showed the greatest variability in total rates of return for the 1973-1979 period. The least variability is reflected in United States treasury bills. The remaining three investments, long term corporate bonds, farm real estate, and long term government bonds show standard deviation figures that are fairly close. However, farm real estate shows very little variation relative to its mean, compared to government and corporate bonds, as reflected in the coefficient of variation.

In comparison to other studies, Kost and Barry showed higher rates of return for common stock than for farm real estate for the periods 1950-1963 and 1950-1977, respectively. In both studies the common stock investment carried more risk. In the period 1956-1978, Carter found farm real estates price rate of return, to be higher than common stocks price rate of return, with the common stock investment reflecting the most risk. Ibbotson and Sinquefield, in the 1926 to 1979 time period, found that common stock yielded the highest return followed by corporate bonds, government bonds, and treasury bills, respectively. Common stock, again reflected the most risk followed by government bonds, corporate bonds and treasury bills, respectively.

Based on a Paired t-test, the null hypothesis that the total rates of return associated with farm real estate are identical with the total rates of return to common stock was accepted at the 10-percent level rather than the research hypothesis that the rates of return were different for the two investments.<sup>6</sup> The null hypothesis was accepted, even though there was a 12.6 percent difference in returns, 18.0 percent for farm real estate and 5.4 percent for common stock.

A Paired t-test was also used to test the equality of the total rate of returns between farm real estate and the other three investment alternatives--long-term corporate bonds, long-term government bonds, and United States treasury bills. In all cases, the null hypothesis that the total rates of return for farm real estate and the other investments were equal was rejected at the 10.0

---

6. The paired t test statistic is:

$$t = \frac{\bar{d}}{sd/\sqrt{n}}$$

where  $\bar{d}$  is the average of the two sample differences;  
n is the number of pairs of observations;  
and sd is the standard deviation of the differences.

percent level. The mean total rate of return for farm real estate was 14.3, 13.9, and 11.0 percent higher than the total rates of return for long-term government bonds, long-term corporate bonds, and United States treasury bills, respectively.

The t-test demonstrates, that total rates of return are higher for farm real estate than returns to alternative investments, except for common stock. United States treasury bills show the next highest return followed by common stock, long term corporate bonds, and long term government bonds, respectively.

Common stock, as an investment, showed the greatest risk followed by corporate bonds, government bonds, farm real estate, and treasury bills, respectively.

Year-by-year income and price appreciation returns and associated risks for common stocks and farm real estate are presented in Table 6, for the years 1973 to 1979. Common stock showed an average price rate of return of .84 percent, ranging from a negative 30.7 percent in 1974 for a low, to a 32.6 percent return, for a high in 1975. In contrast, farm real estate showed an average price rate of return of 14.4 percent, ranging from a 1.0 percent return in 1978, for a low, to a 27.0 percent return, for a high in 1974.

Price appreciation returns for common stock show a standard deviation of 22.4 percent, and a coefficient of variation of 24.8, while farm real estate had values of

Table 6

Year-by-year income and price appreciation returns for  
common stock and farm real estate  
1973-1979

Year	Common Stock		Farm Real Estate	
	Capital Appreciation	Dividend Returns	Land Appreciation	Production Returns
1973	-17.7%	3.1%	15.0%	14.5%
1974	-30.7%	4.2%	27.0%	-.5%
1975	32.6%	4.6%	17.0%	1.1%
1976	19.7%	4.1%	11.0%	-1.6%
1977	-11.8%	4.6%	14.0%	.8%
1978	1.1%	5.5%	1.0%	5.0%
1979	12.7%	5.8%	16.0%	5.8%
X	.9%	4.7%	14.4%	4.1%
s	22.4%	.9%	7.7%	5.3%
CV	24.99	.19	.53	1.29

7.7 percent and .53, respectively. This high standard deviation and coefficient of variation for common stock indicates a greater risk in regards to price appreciation returns for common stock than farm real estate. That is, farm real estate showed a greater price appreciation return with less risk.

Common stock showed an average income rate of return of 4.7 percent for the period 1973-79 while the return for farm real estate was 4.1 percent. In reference to variability, standard deviations for common stock and farm real estate were .903 percent and 5.26 percent, respectively, with coefficients of variation of .19 and 1.29, respectively. By investing in common stock, an investor can expect a higher rate of return from dividends received than the realized rate of return from production on the farm real estate. This higher return carries less risk, as demonstrated by the standard deviation and coefficient of variation.

Figure 3 presents the total rates of return for common stock and farm real estate, for the period 1973-79. This figure contrasts the volatility of the total rates of return for common stocks to the much less risky farm real estate, as an investment.

Based on a Paired t-test, the null hypothesis that the price rates of return associated with farm real estate and common stock were equal for the two investments was rejected at the 10-percent level. In contrast, the null



**THIS BOOK  
CONTAINS  
NUMEROUS PAGES  
WITH DIAGRAMS  
THAT ARE CROOKED  
COMPARED TO THE  
REST OF THE  
INFORMATION ON  
THE PAGE.**

**THIS IS AS  
RECEIVED FROM  
CUSTOMER.**

Figure 3

Annual rates of return from common stock  
and farm real estate

hypothesis that the income rates of return associated with farm real estate and common stock were identical was accepted at the 10-percent level.

The largest portion of farm real estates total rate of return, 72 percent was due to price appreciation on the real estate. This price appreciation receives the more favorable capital gains tax treatment, rather than the income rate of return, which receives ordinary income tax treatment. In contrast, income rates of return to common stock showed the greatest contribution to the stocks total rate of return. This income rate of return receives interest and dividends tax treatment, the price appreciation of the stock receives capital gains treatment, if the security is held for more than a year. This study did not differentiate price and income rates of return for government and corporate bonds. Both corporate and government bonds receive interest and capital gains tax treatment. United States treasury bills total rate of return receives capital gains tax treatment, unless the investment is held for less than a year, in which case, it receives ordinary income treatment.

Various biases may be incorporated in all the rates of return calculated in this study. That is, the rates of return on farm real estate may show an upward bias. Farms participating in the Kansas Farm Management Association Program are some of the better farmers in the state, and thus may achieve a higher rate of return.

The rates of return on common stock may also reflect an upward bias. The common stock series is based on the Standard and Poors list of 500 stocks, which are listed on the New York Stock Exchange. Stocks listed on this exchange are the older, larger, and stronger corporations; and the stocks must meet the requirements of the Security Exchange Commission. These requirements limit New York members to the companies that will show rates of return that are above average.

Chapter V  
Summary & Conclusions  
Summary

This study examined and compared farm real estate, as an investment, to alternative investments for risk and return characteristics for the years 1973 to 1979. Total rates of return were measured as a combination of income and price rates of return for all investment alternatives analyzed. Risk was approximated by the variation in the rates of return as measured by standard deviation and coefficient of variation values.

Farm real estate demonstrated higher total rates of return than common stock, long-term corporate bonds, long-term government bonds, and United States treasury bills. Although common stock showed a lower total rate of return than farm real estate, the difference was not significant at the 10-percent level.

The greatest portion of farm real estate total rates of return, 72 percent, is due to the appreciation in the land, or a price rate of return. Like any investment, this capital appreciation will not be realized unless the investor liquidates his holdings.

In the period 1973-79, common stock returns showed the most variability, or risk. The standard deviation for common stock returns was more than double the standard deviation value for the second most variable investment.

This high variability explains why common stock returns were not significantly different than farm real estate returns. United States treasury bills showed the least risk followed by government bonds, corporate bonds, and farm real estate, respectively.

Farm real estate and common stock total rates of return were subdivided into price rates of return (capital appreciation) and income rates of return. Farm real estate showed a much higher price rate of return than common stock and the returns were significantly different.

Income rate of return reflects the income received from the asset over the holding period. Common stock showed a slightly higher income rate of return than farm real estate, although the returns were not significantly different between the two investments. The amount of risk associated with this income rate of return was much higher for the farm real estate than for the common stock.

## Conclusions

When treated as an investment, farm real estate showed higher total rates of return, in the period 1973 to 1979 than the alternative investments studied. Yet the majority of this return was capital appreciation which will not be realized unless the investor sells the asset.

In most cases, the farm real estate investor or owner realizes both monetary and nonmonetary returns therefore, alternative investments presented in this analysis must be reviewed by each individual farmer and the total rates of return must be adjusted to meet his business operation. Tax adjustments for each investment must also be considered.

If a farm operation is to remain an on-going concern, liquidation of the real estate holdings could not be considered. Yet if the farmer is considered as an investor seeking out the most profitable investment plan, disinvestment and channeling of the funds elsewhere may be advantageous. Each individual must analyse his situation and adjust the results of this study accordingly, to meet his objectives and risk preferences.

Further studies could divide the farms into distinct income classes for return to size comparisons to determine how economies of size influence farm real estate income rates of return. Also, studies that

explain how various economic forces affect the individual investments is needed to supplement this analysis.



## Notes

- 1) William E Kost, "Rates of Return for Farm Real Estate and Common Stock," American Journal on Agriculture Economics, Vol.50 (1968):213-14.
- 2) *ibid*
- 3) *ibid*
- 4) Peter J. Barry, "Capital Asset Pricing and Farm Real Estate." American Journal of Agr. Econ. Vol.62, (1980):549-553.
- 5) Weston, Brigham, Essentials of Managerial Finance, 5th edition, (1979):338.
- 6) Peter J. Barry, "Capital Asset Pricing and Farm Real Estate." American Journal of Agr. Econ. Vol.62, (1980):549-553.
- 7) *ibid*
- 8) Colin Carter, "Capital Asset Pricing and Farm Real Estate: Comment," American Journal of Agr. Econ. Vol.62, (1980).
- 9) Roll, "A Critique of the Asset Pricing Theory' Tests: Part 1: On Past and Potential Testability of the Theory." J. Finan. Econ.4(1977):129-176.
- 10) *ibid*
- 11) Ibbotsin, Siquiefeld, Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And The Future (1980-2000), 1980.
- 12) *ibid*
- 13) Pfaffenberger, Patterson; Statistical Methods for Business and Economics, (1981),409.
- 14) Pine, Johnson, Trends in Land Value in Kansas, Bulletin 625, Dec. 1978, Ag. Experiment Station, Manhattan, Kansas.
- 15) Farm Real Estate Developments, ESCS, U.S. Dept. of Ag.
- 16) Price Dividend Earnings File, Standard and Poors Composite, 1972-1979.
- 17) Ibbotson, Siquiefeld, Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And The Future

- 18) ibid
- 19) Francis, Investments: Analysis and Management, (1976):9.
- 20) Ibbotson, Sinquefield, Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And the Future (1980-2000), 1980.
- 21) Leibowitz, Johannesen, "Introducing the Soloman Brothers' Total Performance Index for the High-Grade Long-Term Corporate Bond Market," Memorandum to Portfolio Managers (N.Y. Soloman Bros., Nov.1973).
- 22) Ibbotson, Sinquefield, Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And the Future (1980-2000),1980.
- 23) ibid
- 24) Francis, Investments: Analysis and Management, (1976):9.
- 25) Ibbotson, Sinquefield, Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And the Future (1980-2000),1980.
- 26) The U.S. Government Bond File was compiled by Lawrence Fisher and consists of month-end price data on virtually all negotiable direct obligations of the U.S. Treasury for the period 1926-1979.
- 27) Ibbotson, Sinquefield; Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And the Future (1980-2000),1980.
- 28) ibid
- 29) Fischer, Jordon; Security analysis and Portfolio Management, 2nd edition, (1975):108.
- 30) ibid
- 31) Larry Langemeier, "The K-MAR-105 Whole-Farm and Enterprise Data Bank and Retrieval System, User Manual and Request Forms, "Kansas State Cooperative Extension Service, Farm Management Studies, p.1.

- 32) Ibbotson, Sinquefield, Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And the Future (1980-2000), 1980.
- 33) Ott, Mendenhall, Larson; Statistics: A Tool for the Social Sciences, 2nd edition (1980):266.

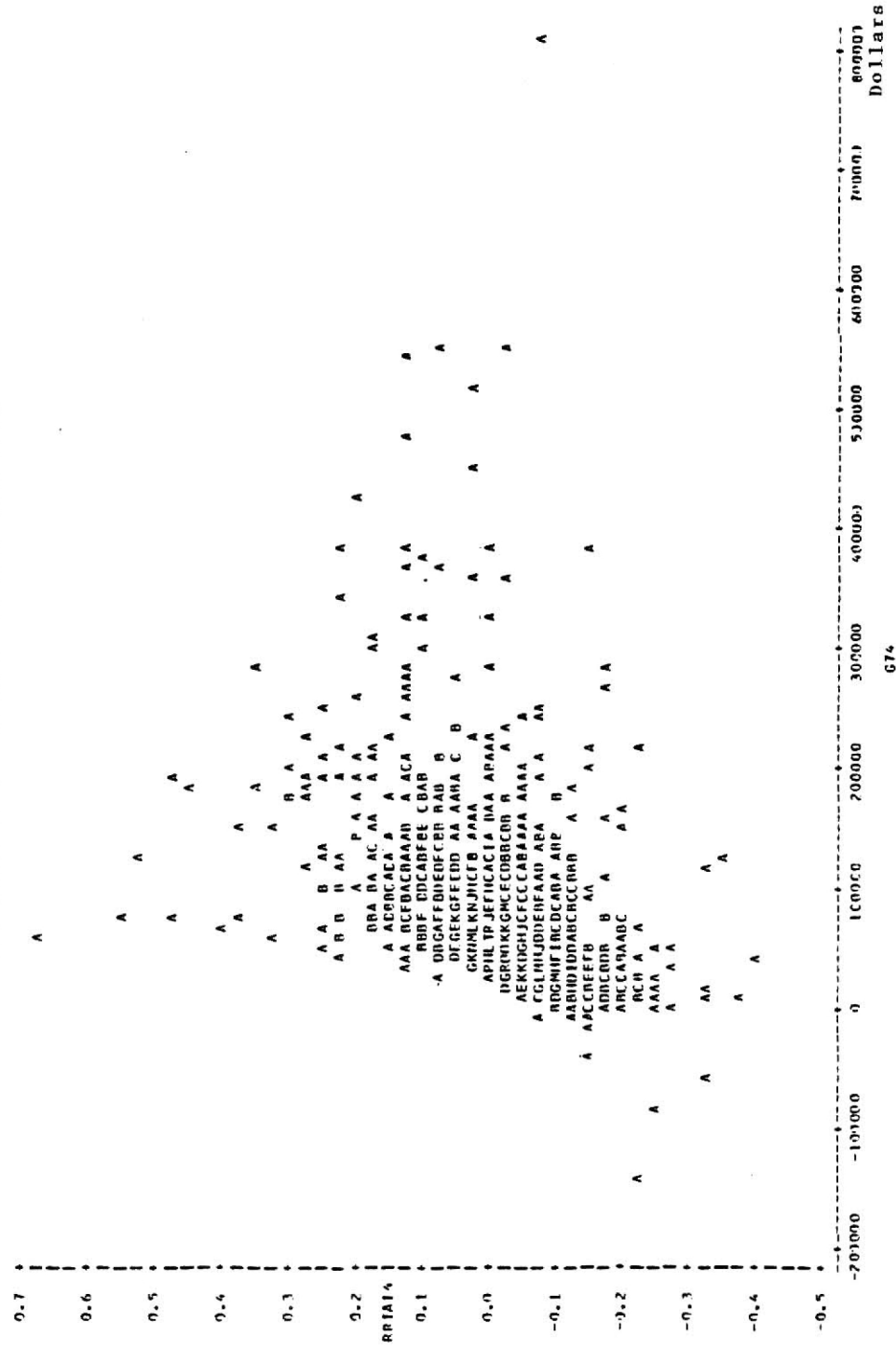
## Literature cited

- Colin Carter, "Capital Asset Pricing and Farm Real Estate: Comment," American Journal of Agr. Econ., 62(1980).
- Farm Real Estate Developments, ESCS, U.S. Dept. of Ag.
- Fischer, Jordon; Security Analysis and Portfolio Management, 2nd edition, (1975).
- Francis, Investments: Analysis and Management, (1976).
- Ibbotson, Sinquefield, Stocks, Bonds, Bills, and Inflation: The Past (1926-1979) And The Future (1980-2000), 1980.
- Larry Langemeier, "The K-MAR-105 Whole-Farm and Enterprise Data Bank and Retrieval System, User Manual and Request Forms," Kansas State Cooperative Extension Service, Farm Management Studies.
- Leibowitz, Johannesen, "Introducing the Soloman Brothers' Total Performance Index for the High-Grade Long-Term Corporate Bond Market", Memorandum to Portfolio Managers (N.Y. Soloman Bros., Nov.1973).
- Ott, Mendenhall, Larson; Statistics: A tool for the Social Sciences, 2nd edition (1980).
- Peter J Barry, "Capital Asset Pricing and Farm Real Estate." American Journal of Agr. Econ. 62(1980).
- Pfaffenberger, Patterson; Statistical Methods for Business and Economics, (1981).
- Price Dividend Earnings File, Standard and Poors Composite, 1972-1979.
- Pine, Johnson, Trends in Land Value in Kansas, Bulletin 625, Dec. 1978, Ag. Experiment Station, Manhattan, Kansas.
- Roll, "A Critique of the Asset Pricing Theory's Tests: Part 1: On Past and Potential Testability of the Theory." J. Finan. Econ., 4(1977).
- Weston, Brigham, Essentials of Managerial Finance, 5th edition, (1979).
- William E Kost, "Rates of Return for Farm Real Estate and Common Stock", American Journal on Agricultural Economics, 50(1968).

**APPENDICES**

STATISTICAL ANALYSIS SYSTEM  
 PLAN OF RR1A14674 LEGEND: A = 1 DNS, B = 2 CBS, ETC.

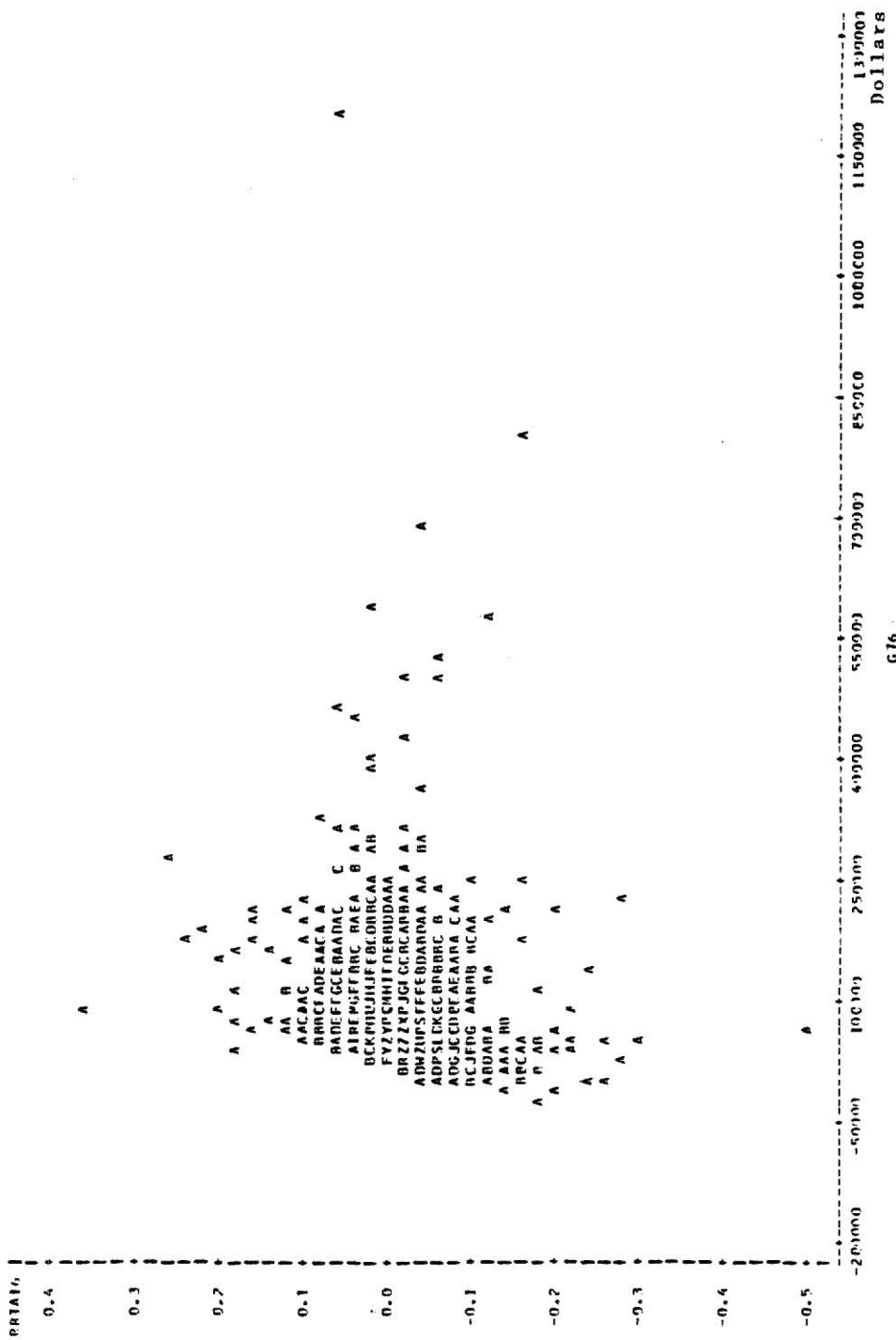
Figure A





STATISTICAL ANALYSIS SYSTEM

PLOT OF BRTAIGG76 LEGEND: A = 1 OBS, B = 2 OBS, ETC.

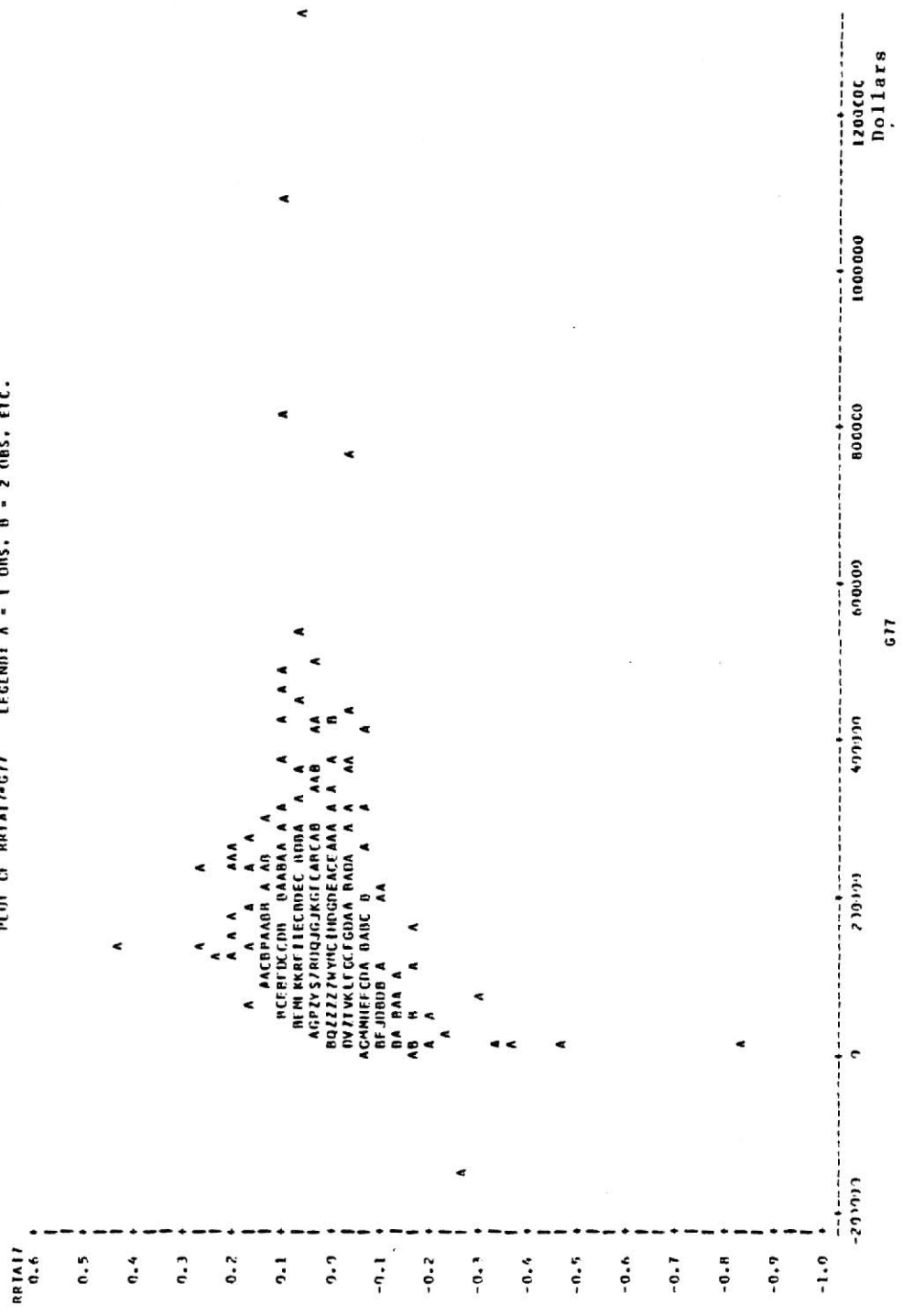


NOTE: 16 OBS HIDDEN



STATISTICAL ANALYSIS SYSTEM

PLOT OF PRIA17\*G77 LEGEND: A = 1 OBS, 0 = 2 OBS, ETC.



NOTE: 100 OPS HIDDEN

13  
1354 WEDNESDAY, SEPTEMBER 9, 1981

STATISTICAL ANALYSIS SYSTEM

PRINT OF PRINTING78 LEGEND: A = 1 OBS, B = 2 OBS, ETC.

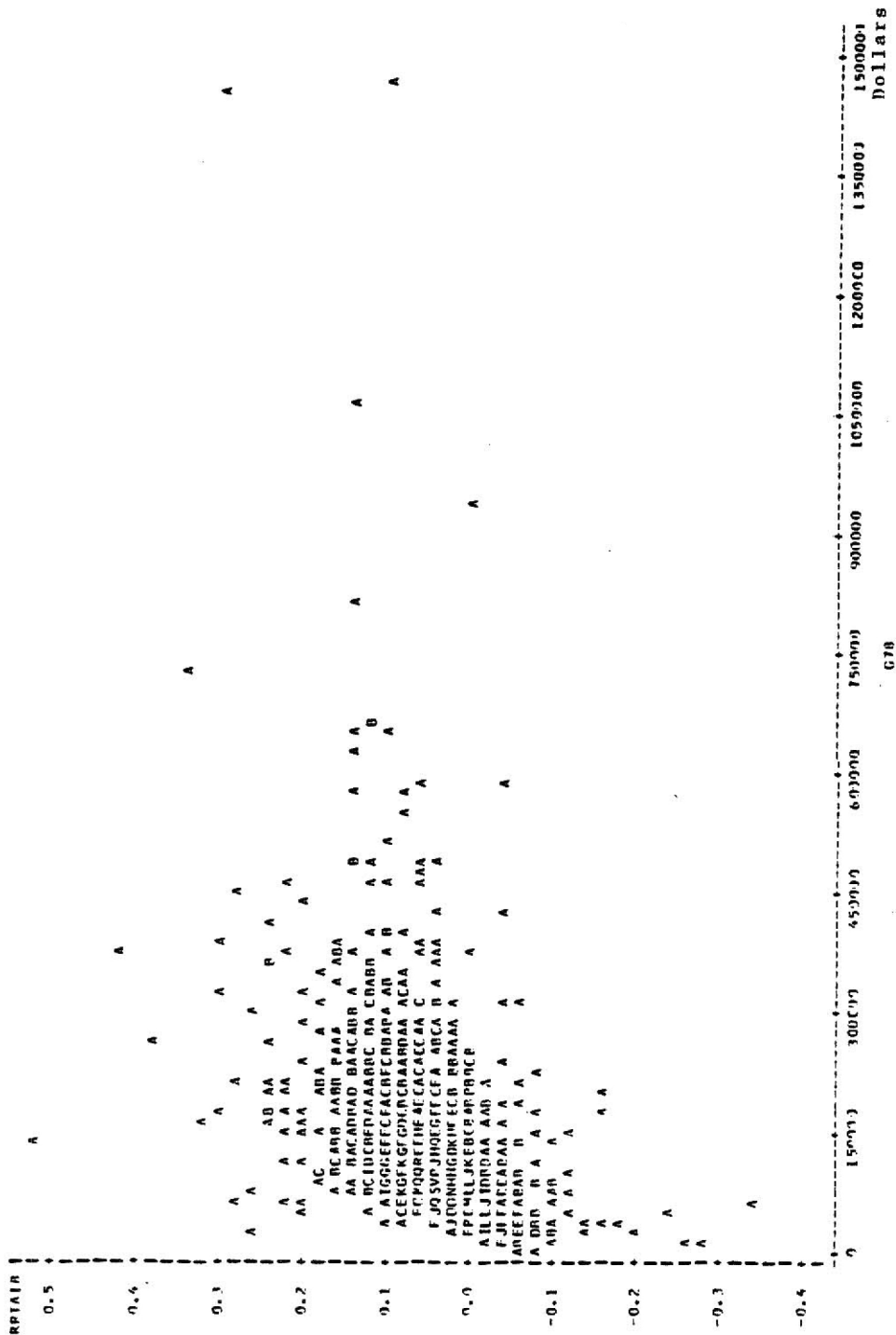
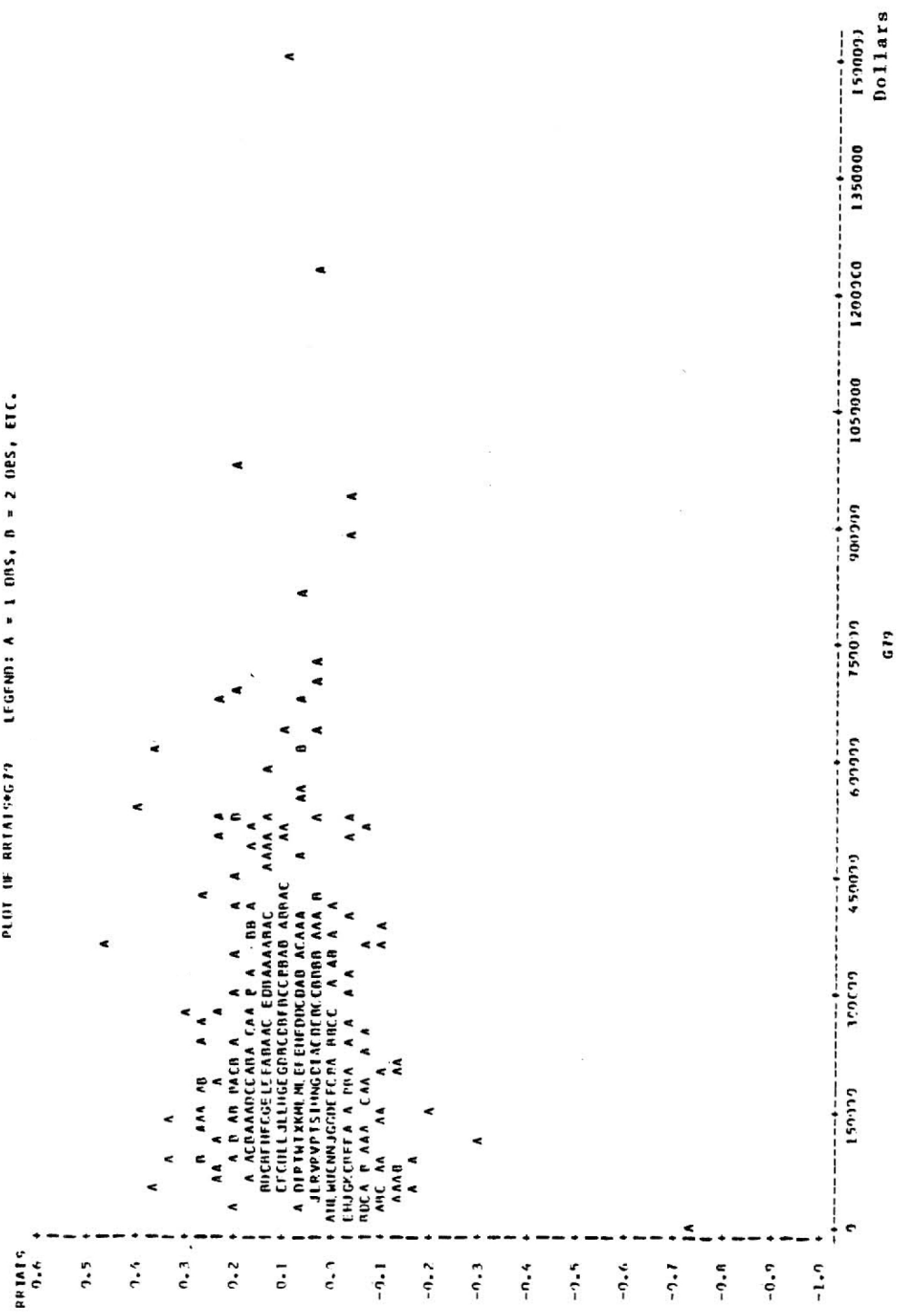


Figure E

1:54 WEDNESDAY, DECEMBER 9, 1981

Figure F STATISTICAL ANALYSIS SYSTEM

PLOT OF RR1A1\*G79 LEGEND: A = 1 OBS, D = 2 OBS, ETC.



RETURN AND RISK COMPARISONS BETWEEN  
FARM REAL ESTATE AND ALTERNATIVE INVESTMENTS

By

GREGORY C. BARRON

B.S., Kansas State University, 1979

AN ABSTRACT OF A MASTER'S THESIS

Submitted in partial fulfillment of the  
requirements for the degree

MASTER OF SCIENCE

Department of Agricultural Economics

KANSAS STATE UNIVERSITY

Manhattan, Kansas

1982

## Abstract

There has been considerable debate in recent years concerning the income position of the farming sector in the economy.

The purpose of this study was to compare farm real estate, as an investment, to alternative investments, on the market, for return and risk characteristics. Alternative investments studied, include; common stock, long term government bonds, long term corporate bonds, and United States treasury bills.

Total rates of return for the individual investments are the addition of a price rate of return and income rate of return.

Farm real estates total rate of return was compared to the total rate of return for the other investments in the study. Farm real estate and common stocks total rate of return was then broken down into a price and income rate of return for further comparison. The Paired t-test was used to test for equality between farm real estates returns and the alternative investments studied.

Risk was approximated by the variation in the rates of return. This variation was measured using the standard deviation of the rates of return.

Farm real estate demonstrated significantly higher total rates of return than all investments studied, with the exception of common stock.

Common stocks total rates of return showed the greatest amount of variability, for the study period. More than twice the variation demonstrated by farm real estate. This variation reflects the amount of risk in holding each investment.

Farm real estates income rate of return was not significantly different than common stocks income rate of return. Farm real estate showed higher price rates of return than common stock. The Paired t-test showed real estate and common stocks price rate of return were significantly different.

As stated, the purpose of this study was to compare rates of return, and associated risks, to farm real estate against returns and risks for alternative investments. It was not the intent to use this study for estimating future returns.