Economic Feasibility of Farm Real Estate Equity Investments

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Abstract. *The potential for investment by nonfarm investors in U S farm equity is estimated by applying a micro-model of the nonfarm equity market to USDA's Farm Costs and Returns Survey The analysis indicates a potential market from farm operators of approximately $9 billion Establishment of real estate investment trusts (REIT's) is discussed as a possible institution to unite farmers and investors*

Keywords. *Real Estate Investment Trusts, equity financing, farm real estate, farm returns, Farm Costs and Returns Survey*

Historically, farm businesses have raised capital from owner equity, debt financing, or leasing Nonfarm businesses, on the other hand, can raise capital through various other financial instruments such as stock, limited partnerships, real estate investment trusts (REIT's), and leases Production agriculture's unique structural characteristics have restricted the use of these capital sources These restrictions have impacts on the growth, liquidity, inter-generational transfers, and risk-return tradeoffs of farm businesses This paper examines the potential market for external equity investments in farm businesses

Possible forms of external equity investments along with advantages and disadvantages of external equity financing have been the topics of previous studies (Lowenberg-DeBoer et al, Fiske et al , Matthews and Harrington, Raup, Crane and Leatham) [1] Economic models of investor and farmer behavior with respect to external equity have also been presented (Collins and Bourn, Penson and Duncan, Moore) The current literature on external equity for equity, however, includes few studies which focus on the market potential A lack of detailed farm-level financial data has restricted attempts to empirically estimate the non-farm equity's market potential USDA's Farm Costs and Returns Survey (FCRS) provides this information [2] This paper contributes to the literature by developing empirical estimates of potential demand for nonfarm equity from farm operators using FCRS data

Capital Sources for Farm Businesses

Farm businesses require capital to expand or take advantage of new technology Farm businesses with insufficient owner equity to meet their capital requirements have relied on debt and/or leasing as the primary sources of additional capital A major disadvantage of debt financing is the increased financial risk of a farm business The farm financial crisis of the 1980's provides an example of the risk imposed on farm businesses and the farm sector as a result of debt financing Lower commodity and land prices along with higher and more volatile interests rates during the 1980's lowered the return to farm assets and increased financial risk thus contributing to a significantly higher incidence of credit problems, loan delinquencies, foreclosures, and bankruptcies

The greatest capital investment for most farm businesses is real estate Leasing is a prevalent method in which farm operators acquire real estate for expansion Forty-two percent of all farm real estate is operated under some form of leasing arrangement Nearly two-thirds of all leased acreage is cash leased the remainder covered under type of share arrangement (USDA FCRS, 1991) Cash leases suffer from the same disadvantages as debt financing since they involve a fixed obligation Share lease arrangements result in less financial risk for the farm business since they are based on a proportion of production

Both share and cash leases, however, have several disadvantages compared to direct ownership Lessees have no right to the residual value of the asset and can result in agency costs In the case of agricultural real estate, a lessee has less of an incentive to maintain buildings, access roads and

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[1]Sources are listed in the References section at the end of this article

[2]The Agricultural Economics and Land Ownership Survey (AELOS) also includes much of this information (U S Department of Commerce, 1990) AELOS has an advantage over FCRS in that it includes information on landlords and operators FCRS includes information on operators only AELOS, however includes information for 1988 only which was a drought year in the Midwest and parts of the South

fences, or prevent erosion Lessors may seek to protect the residual values by incorporating control practices into the lease agreement However, this increases negotiation costs for both the lessee and lessor In searching for land, lessees may face high costs of search and assessment of quality

External equity arrangements may offer several advantages over leasing There are less concerns about the protection of residual value since each party has an interest in the property As an owner of the property, the operator avoids the possibility of annual search costs

A large proportion of farm businesses may require capital to facilitate inter-generational transfers of estates USDA data indicates a large portion of farm assets are held by farmers who are at or near retirement age Farmers over 55 years of age control 46 percent of all farm assets while farmers over 65 years of age control 21 percent of all farm assets (USDA Farm Costs and Returns Survey, 1991)

The large investment by farm businesses in real estate has implications for short-term cash management and investment options Farm businesses with short-term cash-flow problems cannot easily liquidate real estate investments to meet cash-flow shortfalls Illiquidity can also limit a farm operator's investment choices A farm operator with little liquidity cannot easily take advantage of opportunities to purchase new land or equipment The large land investment required by farm businesses can cause the farm operators' investment portfolios to be subject to unsystematic risk The wealth of a farm operator whose investments consisted entirely of agricultural assets would be vulnerable to changes in land values This vulnerability could be reduced if an operator could sell equity interests to nonfarm investors and use the proceeds for diversification into non-farm investments

The disadvantages associated with debt and leasing indicate a need to further examine alternative sources of capital for the owner/operators of farm businesses If markets for farm equity existed, farm businesses could raise capital for investment by selling equity interests to non-farm investors Compared to debt financing or cash leasing, external equity arrangements result in less financial risk Compared to the exclusive use of owner equity, external equity arrangements enable leveraged investments and reduced unsystematic risk for the farm operator Compared to share leasing, external equity investments enable the farm operator to have an interest in the residual value

The organizational structure of production agriculture and the transaction costs of establishing an external equity market have restricted the development of market mechanisms to channel equity from the non-farm sector to the farm sector An institution or single investor seeking to invest in farm businesses would likely incur significant search, information, and monitoring costs which may discourage the direct or shared ownership of farm assets Existing market mechanisms, such as going public, selling shares of common stock, or establishment of limited partnerships, can involve high start-up costs, even for large commercial farms On the other hand, evidence suggests that agricultural assets generate sufficient returns to be attractive to investors (Barry, Gertel and Lewis, Moss et al , Dodson)

A flow of capital from the nonfarm investor to farm businesses requires (1) a sufficient number of farm businesses which meet a minimum return and size criteria, (2) a sufficient number of farmers willing to participate in an equity market, and (3) an institution which unites farmers and investors and lowers transaction costs The objective of this study is to estimate the potential market for U S nonfarm or external equity by incorporating the aforementioned requirements into a micro-model for farmers' demand for external equity and investors supply of capital to agriculture

Because agricultural real estate is nondepreciable and often cited as a good inflation hedge, it is an attractive investment Farm businesses also require capital for livestock, machinery, and equipment The shorter life and depreciability of nonreal estate assets make them attractive for equity investments Investors and farm operators are not likely to want to the incur origination costs for shortterm external equity investments Also, investors are not likely to incur the cost of regularly monitoring and valuing depreciable assets such as machinery Because farm real estate represents the asset most likely to attract the interest of investors, it is the focus of this analysis

Establishment of REIT's for agricultural real estate investments is discussed as a possible institution to unite farmers and non-farm investors Assumptions concerning transactions cost of establishing and maintaining an agricultural REIT are incorporated as well as minimum size and returns of farm businesses Estimates of the potential market are based on the financial characteristics of farm businesses over the 1987-91 period as obtained from USDA's Farm Costs and Returns Survey

Relation to Previous Studies

Several previous studies have presented economic models of investor and farmer behavior which incorporated external equity Penson formulated a growth model which included external equity infusions Moore demonstrated the demand for external equity is a derived demand analogous to a production input Matthews and Harrington discussed the possible forms of non-farm equity and the merits of each Lowenberg-DeBoer et al, graphically presented the limitations and weaknesses of debt financing Leathem and Crane discussed the principle of Islamic banking as a method of relaying external equity from investors to farmers Fiske et al discussed the historical pattern of capital flows in agriculture and implications for future capital flows Collins and Bourn explored the economic conditions in which the external equity capital market could exist and suggested institutional structures for delivering external equity According to Collins and Bourn, "For external equity to be a significant source of equity for farm businesses, the transaction must be viewed as being beneficial by all parties " Collins and Bourn's approach was to derive micromodels of farmer and investor behavior and determine whether these models intersect at a meaningful equilibrium This research develops an empirical application of the Collins and Bourn model utilizing FCRS data

The Collins and Bourn Model

Collins and Bourn developed models of both farm operator demand and investor supply The Collins and Bourn model depicted an exchange of external equity for bank debt Application of their models to empirical data provides estimates of the amount of debt farm operators would be willing to exchange for external equity This procedure would likely provide conservative estimates since the approach does not recognize the impacts of the availability of external equity would on a farm operator's investment decision For example, the availability of external equity may encourage greater expansion through acquisition of land or improvement of facilities Also, farm operators may sell their own equity to investors in order to reduce unsystematic risk or increase their liquidity Another possibility is that the availability of external equity may encourage farm operators to substitute external equity arrangements for leasing The subsequent analysis should be interrupted as an estimation of external equity demand by farm operators under the conditions of a debt-equity swap

Collins and Bourn defined the price of external farm equity as

$$\gamma = \frac{\pi}{E/A}, \qquad (1)$$

where π is the proportion of the profit received by the investor, E is the equity supplied by investor, A is the total value of farm assets, and γ is the price of equity A price of equity equal to 1 implies a return to the investor in direct proportion to the investment In return for contributing "X" percent of the total investment, an investor would receive "X" percent of total returns Low farm business returns may not necessarily result in an investor not supplying capital The investor may simply require a greater proportion of income relative to their investment

For a farmer, the price of external equity is the proportion of returns one would be willing to give up to attract investment Risk aversion, the cost of debt relative to the cost of equity, and taxation are factors which may cause the farmer's price of external equity to deviate from unity A highly risk averse farmer, for example, may be willing to forgo income for equity to avoid the financial risk associated with leverage

The derived demand for external equity shown by equation (2) corresponds to Collins and Bourn's equation (10)

$$E = \frac{A - \gamma\,[R - KD - \rho\sigma_R^2\,\tau]}{2K\gamma + \rho\sigma_R^2/A\;\gamma 2\tau}, \qquad (2)$$

where E is the dollars of external equity, R is the random net return to activities of the farm prior to interest and tax payments, A is the value of farm assets, K is the interest cost of debt, D is the volume of outstanding debt, ρ is a risk aversion coefficient, τ is one minus the state plus federal marginal tax rates on personal income, and σ_R^2 is a measure of variance of farming returns Collins and Bourn demonstrate that the partial derivatives of (2) all have the expected signs implying more profitable farms should be less interested in an exchange of debt for external equity while farmers operating in a riskier environment and farmers which are more risk averse would be inclined to exchange debt for external equity

A reservation price of external equity for a farm operator (γ_f) is defined as the price of equity (γ) which makes the numerator of (2) positive

$$\gamma_f = \frac{K}{r - K\delta - \rho\, C\tau}, \qquad (3)$$

where $C = (\sigma_R^2/A)$, r is the expected return on assets, and δ is the debt-asset ratio

An external equity market transaction requires a positive intersection of the investor's supply intersect and farmer's demand Investors should be willing to supply external equity to an agricultural producer as long as the expected rate of return on agricultural assets at least equals the investor's required rate of return The investor's rate of return (K_e) is determined by farm profits and the investor's reservation price of equity (γ_I)

$$K_e = \gamma_I \frac{[R - K * (D - E)]}{A}, \quad (4)$$

where R denotes the expectations of investors as to the net returns to the farm business The numerator of equation (4) reflects the interest savings to the farm business as a result of the debt/equity swap, (K * (D – E)) At a price of equity equal to one the investor would receive the same rate of return as the farm business

The investor's reservation price for external equity (γ_I) is determined by the relationship between an investor's required return and the expected farm return The investor's required return represents the rate required by the investor as compensation for the systematic risk of the investment An investor's required rate of return can be approximated using capital market theory Market models such as the Capital Asset Pricing Model or Arbitrage Pricing Theory establish the required rate of return to be equal to the riskless rate, rf, plus a risk premium commensurate with the asset's systematic risk Using β_a to represent systematic risk of the asset and r_{Aj} to represent the investors required rate for period j and (r_{mj} – r_{fj}) to represent the market risk premium, the CAPM indicates a required rate of

$$ra_j = rf_j + \beta_a(r_{mj} - r_{fj}), \quad (5)$$

where ra_j is the rate required on agricultural investments in period j In equation (5) the market risk premium is defined as the market return in period j, (r_{jm}), less the risk free rate in period j, (r_{fj}) If the investors required rate is greater than the expected rate ($r_{Aj} > K_e$), the investor would require a share of profits greater than their share of the investment The investor's reservation price would thus be,

$$\gamma_I = \frac{r_{Aj}}{[R - K (D - E)]/A} \quad (6)$$

Thus, the individual farmer's demand for equity is a function of the price of equity (γ), risk aversion (ρ), farm returns (R), variance of returns (C), taxes (τ), farm debt (ζ), and cost of debt (K) In functional form this can be represented as,

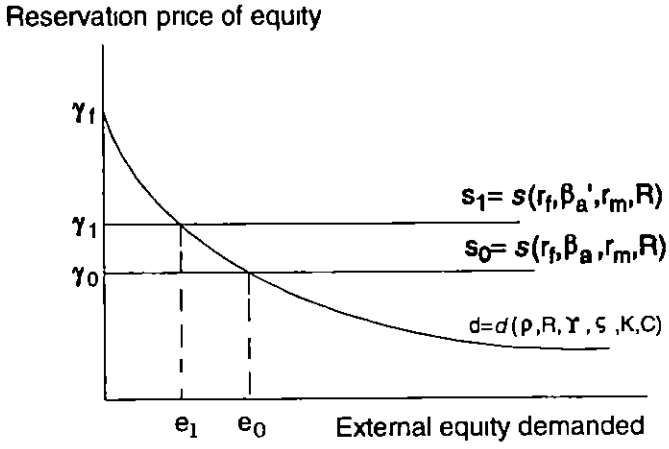
$$d = f(\gamma,\rho,R,K,\zeta,\tau,C), \quad (7)$$

where d is the estimated demand for external equity Graphically, the demand for external equity is a declining function of the price of equity with risk aversion, farm returns, variance of returns, taxes, and cost of debt are demand shifters (fig 1) Equity supplied to a farm owner/operator is a function of the risk free rate (r_f), the systematic risk of agricultural assets (β_a), the market return (r_m), and the farm return (R) In functional form this is represented as

$$s = f(r_f,\beta_a,r_m,R), \quad (8)$$

where s is the amount of external equity supplied to an individual farm operator This supply is perfectly elastic reflecting the lack of influence an individual farmer has on the aggregate return required by investors (fig 1) From equation (3), the farmer's reservation price is the intercept of the farmer demand schedule and the vertical axis as shown by γ_f The investors reservation price is represented by the intercept of investor's supply schedule An individual farmer should participate in a market for external equity if the farmer's reservation price exceeded the investor's reservation price ($\gamma_f > \gamma_i$) At a reservation price for the investor of γ_0, the farmer would demand e_0 of external equity Any factor which causes the investor's required return to increase would consequently result in a decrease in the amount of external equity demanded For example, an overall increase in the systematic risk of agricultural assets (β_a) would cause an upward shift in the investor's supply from s_0 to s_1 and corresponding reduction in the amount of external equity demanded from e_0 to e_1

Figure 1
Farm level demand and supply of external farm equity



Empirical Estimation of the Potential Market

In addition to an intersection of investor supply and farmer demand at a meaningful equilibrium, an institution must exist to unite suppliers of external equity with the farm owner/operators In commercial real estate, REIT's have represented institutions which have been successful at accomplishing this task A REIT is a corporation formed for the purpose of holding real estate and is taxed as a partnership First created by Congress in 1960, REIT's were designed to allow large groups of small investors to purchase stakes in real estate ventures Typically, REIT's issue common shares which can be traded over the counter or on organized stock exchanges REIT's vary in structure Some own and manage properties, some make and manage real estate loans, some do both REIT's which own and manage properties are the type considered in this analysis

Establishment of a REIT can involve substantial fixed costs such as underwriting and other associated legal fees requiring a large volume of investments over which to spread the cost The feasibility of agricultural REITs obviously depends on a sizable proportion of farm businesses with returns sufficient to attract non-farm investors Farm businesses which provide returns to investors greater than received on alternative investments would attract interest from non-farm investors Several studies have shown that agricultural assets have little or no systematic risk (Barry, Irwin et al , Dodson) Thus, with no transactions cost, agricultural investors would require rates of return approximately equal to the risk free rate approximated by U S Treasury bills

The proportion of farms with returns greater than Treasury bills can be estimated using FCRS data The FCRS details expenses, income, assets, debt, and many other items disaggregated by production region, farm size, production specialty and other characteristics From the FCRS, specific information is obtained concerning a farm business's indebtedness, cost of debt, return on farm assets, and value of assets [3] The return on farm assets from current income is added to an estimate of capital gains to obtain a total return on farm assets Capital gains are estimated by application of the annual change in average per acre land value for the state in which the farm is located to farm real estate values Land value data is obtained from "Agricultural Land Values and Markets Situation and Outlook" published by USDA The total returns for a sample farm for 1991 are calculated as

$$R^{i}_{91} = ROA^{i}_{91} + CGAIN^{j}_{91}, \quad (9)$$

where R^{i}_{91} is the total return on assets for farm i in 1991, ROA^{i}_{91} is the return on assets received from current income in 1991 for farm i as determined from the FCRS, and $CGAIN^{j}_{91}$ is the capital gain on farm real estate assets located in state j in 1991

In 1991, approximately 14 percent of all of farm businesses provided total returns on assets which were equal to or greater than the rate on 3-month treasury bill (table 1) Farm businesses which provided returns greater than Treasury bills were typically large, located in the Midwestern production region, and specialized in the production of corn-soybeans or red meat animals (table 2) [4]

Farm businesses with returns greater than Treasury bills held 28 percent of total farm operator suggesting a sizable market potential for non-farm equity (table 1) In addition to adequate returns, investor's may require farm businesses to meet a minimum size requirement Investors may also require an additional premium to cover intermediation costs Some states have restrictions which prohibit ownership of farmland by corporations or limited partnerships Eleven states had statutes which restricted or prohibited corporate ownership of farm land over the 1987-91 period (Aiken) [5] Even if a farm business has sufficient size, returns, and location to meet an investor's criteria, the farm owner/operator may still choose not to participate As shown by equation (2), an individual farm operator's demand for external equity depends on unique characteristics which include indebtedness, risk attitudes, and farm profitability

An empirical approximation of a farm operator's demand for external equity is estimated by applying the individual demand model shown in equation (2) to FCRS farm level data Investors would likely expect compensation for intermediation costs which include origination fees and annual servicing fees As in the Collins and Bourn analysis, a 6-percent one-time origination fee and a 2 2

[3]Detailed discussion of the FCRS is available in USDA publications (Morehart Johnson, and Banker, et al)

[4]For description of regions see app table 6 in Morehart, Johnson and Banker The Midwest region used in this analysis is an aggregation of the USDA s Lake States and Corn Belt The Plains region is an aggregation of Northern and Southern Plains The South region is an aggregation of USDA's Southeast, Delta and Appalachia regions while the West is an aggregation of the Mountain and Pacific regions

[5]These states include Arizona, South Dakota, Illinois, Minnesota Iowa Missouri, Kansas, North Dakota, Louisiana, Oklahoma and Wisconsin

Table 1—Percentage of farm operator debt and farms with total returns greater then 3-month Treasury Bill rates by farm size

	1987	1988	1989	1990	1991	5-Year Average
			percent			
Proportion of total farms						
$250,000 and over	4	3	3	3	3	3
$100,000 to $249,999	13	11	8	8	6	9
Less than $100,000	14	11	7	6	6	9
All sizes	31	25	18	17	14	21
Proportion of farm operator debt						
$250,000 and over	20	17	16	18	17	18
$100,000 to $249,999	24	16	14	13	10	16
Less than $100,000	6	4	3	2	2	4
All sizes	49	37	33	34	28	38

Source USDA Farm Costs and Returns Survey

Table 2—Distribution of farm operator debt held by U.S. farms with total returns greater than 3-month Treasury Bill rates

	1987	1988	1989	1990	1991	5-Year Average
			percent			
By farm size						
$250,000 and over	40	47	49	55	59	48
$100,000 to $249,999	48	43	42	38	34	42
Less than $100,000	12	10	10	7	7	9
All sizes	100	100	100	100	100	100
By production region						
Northeast	5	9	4	3	5	5
Mid-west	49	38	34	41	37	41
South	13	13	16	10	13	13
West	18	22	21	23	24	21
Plains	15	19	25	23	21	20
All regions	100	100	100	100	100	100
By production specialty						
Corn-soybean	24	22	20	18	24	22
Wheat & Barley	5	5	6	5	8	6
Tobacco	1	1	1	1	2	1
Cotton	4	2	2	2	2	2
Fruit & nut	2	4	4	3	3	3
Beef, hog, sheep	24	30	24	26	20	25
Dairy	18	18	14	17	12	16
All other types	22	18	28	28	28	25
All types	100	100	100	100	100	100

percent annual servicing fee are assumed The investor's required return is estimated using the 3-month Treasury bill rate with adjustments made for intermediation costs as shown by equation (10)

$$r^*_{Aj} = \{r_f \times (1 + \text{origination fee})\} + \text{servicing fee}, \quad (10)$$

were r^k_{Aj} represents the return required by investors after adjusting for costs of intermediation, r_f is an annual rate for 3-month treasury bills

The fixed costs associated with originating an equity investment in an agricultural REIT would probably lead to the exclusion of many smaller farm businesses This is similar to the minimum farm loan size requirement instituted by life insurance companies Minimum size requirements instituted by life insurance companies range from $100,000 to $500,000 (Thompson)

Baseline analysis

A baseline analysis is undertaken in which it is assumed than a farm business must have at least $100,000 in farm real estate assets to be considered for an external equity investments Farm businesses located in states which prohibit corpo-

rate ownership of farm land are excluded from the baseline analysis Farm operators are assumed to be risk averse with $\rho = 10^{-5}$ [6]

The Collins and Bourn model suggests that an individual farmer's demand for external equity is influenced by expected farm returns, capital gains, taxes, and cost of debt Since the data only covered 5 years (1987-91), it was not possible to develop expectations of these variables using time series relationships Alternatively, farmers are assumed to formulate expectations using a naive framework where the return on assets from the previous year approximates future returns Also, expected cost of debt is based on the average cost of debt from the previous year Expected capital gains are based an USDA forecasts of changes in land values (U S D A , "Proceedings Outlook") The marginal tax rate (τ) used in the analysis is the marginal federal tax rate of 28 percent plus the top marginal rate for each state (U S Department of Commerce, 1992) An estimate of variance of net returns is obtained by disaggregation of FCRS data by production specialty, farm size, and region into over 100 distinct categories Variance of total return on assets is approximately over the 1987-91 period for each of these categories These estimated variances are assigned to each sample farm based on the farm's productions specialty, size, and region [7]

Obviously, the use of naive forecasts for farm returns could result in biased estimates if the base year is untypical Thus, the results presented in subsequent tables and figures represent 4-year averages which are derived by application of the model over the 1988-91 period [8] The aggregate amount of non-farm equity demanded by farm operators is estimated by an aggregation of the demands by individual farm businesses

Results obtained from application of the equation (1) to the data indicated that in 1991, only 2 58 percent of farms would be expected to demand external equity A potential market from farm operators of $9 5 billion is indicated with a majority of the demand among farms with annual sales greater than $250,000 and with debt-asset ratios less than 0 40 (table 3) [9] Demand is divided between crop and livestock .farms with largest portion of total demand contributed by dairy, beef-hog-sheep, and corn-soybean production specialities The Western production region is an area with strong market potential with 45 percent of the total U S demand for external farm equity Also, producers of fruits and nuts, nursery products, and vegetable represent a large proportion of the potential market with approximately 15 percent of the total demand The average equity investment per farm was $265,603 The largest external equity investment per farm occurred on farms in the Western region On average, farms with over $250,000 in annual sales had an equity investment of $416,800

The operators of highly leveraged farms which were indicated to participate in external equity markets have relatively high rates of return Conversely, participants with lower leverage have relatively low rates of return A possible explanation is that farm businesses which borrow smaller amounts may be unable to negotiate favorable rates from lenders Consequently, these farms stand to gain more from an external equity investment because of the differential between the cost of equity and cost of debt Farm businesses which borrow greater amounts may be able to negotiate more favorable rates from lenders In this case participation in an external equity market occurs when the farm business provides a return sufficient to offer equity at a price less than 1 and still provide investors with their required return For example, in return for a 10 percent investment an investor would receive 5 percent of profits

Sensitivity analysis

Recent empirical studies have shown farm real estate investments to return significantly higher than comparable risk non-agricultural assets (Bjornson and Innes) Investors require higher returns because the assets are illiquid (Barry) and permit the owners limited diversification potential (Bjornson and Innes) Thus, the use of the Treasury bill rate as an approximation of the required return may overestimate the potential market Estimation of the external equity demanded by farm operators at various rates of return required by the investor traces out an aggregate demand function The aggregate demand function can subsequently be used to estimated

[6]Collins and Bourn describe this as a moderately risk averse farmer An individual with $\rho = 10^{-5}$ would pay $3 093 to avoid a 50-50 gamble where they would lose 50 percent of their $250 000 wealth

[7]Data were disaggregated in a manner described in "Profitability of Farm Businesses, A Regional Farm Type and Farm Size Analysis," an upcoming USDA Agricultural Information Bulletin

[8]The 1987 FCRS data was not used to estimate demand because 1987 data did not separate real estate and nonreal estate debt

[9]It should be noted that FCRS estimates include only farm operator debt used for farm business purposes Therefore the estimates for total debt are not the same as USDA's official numbers published in "Economic Indicators of the Farm Sector"

demand for external equity at various rates of required return The baseline demand function incorporated the previously discussed baseline assumptions but varied the investor's required return from 0 to 30 percent This baseline demand function is subsequently compared with demand functions which are estimated assuming risk neutrality, increases in the minimum investment size, removal of all state restrictions on corporate ownership of farmland, increased variance, and reduced debt cost

The farm operator's demand for external farm equity as a function of investor's required return is graphically displayed in figures 2-6 The demand functions represent an average of the annual demands for 1988-91 As expected, required return is inversely related to the demand for external equity An increase in demand for external equity due to an increase in the farm operator's risk aversion is a consequence of the lower financial risk of equity financing relative to debt financing (fig 2)

Another major factor which should influence the demand for external equity is the differential between the cost of debt and equity Farm businesses indicated to participate in the external equity market tended to have a high cost of debt relative to their returns

Total return on assets for all farm participating in the external equity market was 7 6 percent compared to average cost of debt of 9 4 percent (table 3) In recent years interest rates have fallen

Figure 2
The demand for external equity as a function of required investor return comparing risk aversion and risk neutrality

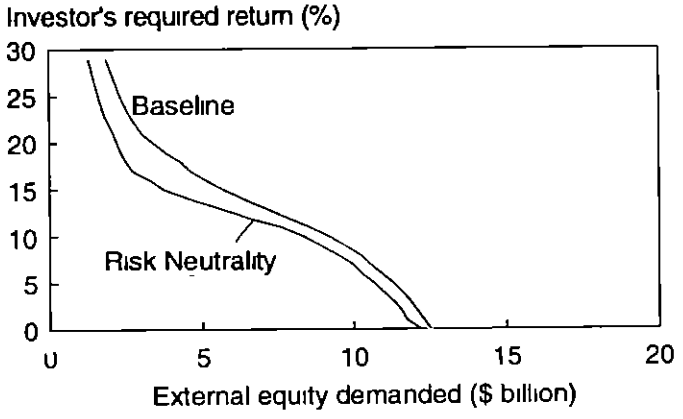


Figure 3
Demand for external equity as a function of required investor return estimated using the current average interest rate on real estate debt and the current average interest rate reduced by 10 percent

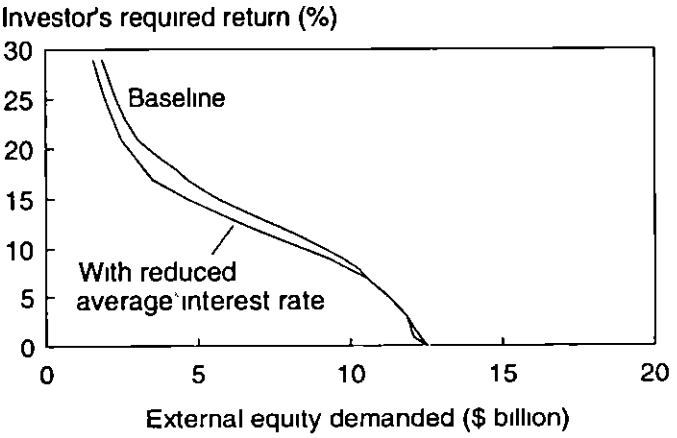
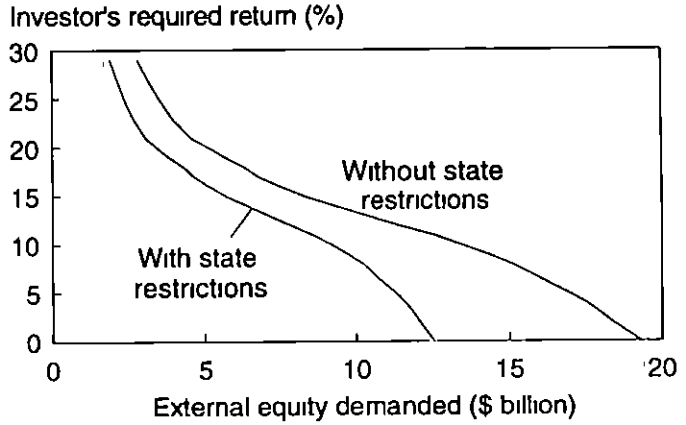


Figure 4
Demand for external equity with and without existing state restrictions on corporate ownership of farmland



enabling farm operators to lower their average cost of debt The sensitivity of the results to a decrease in interest rates is analyzed by reducing the average cost of debt by 10 percent, or approximately 1 basis point As expected, decreasing debt cost reduces the demand for external equity by approximately $500 million at a given interest rate (fig 3)

Figure 5

Demand for external equity as a function of investor's required return comparing minimum size requirements of $100,000, $250,000, and $500,000

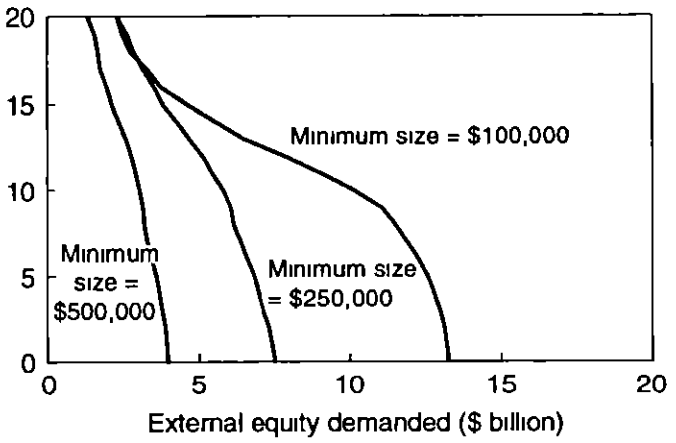
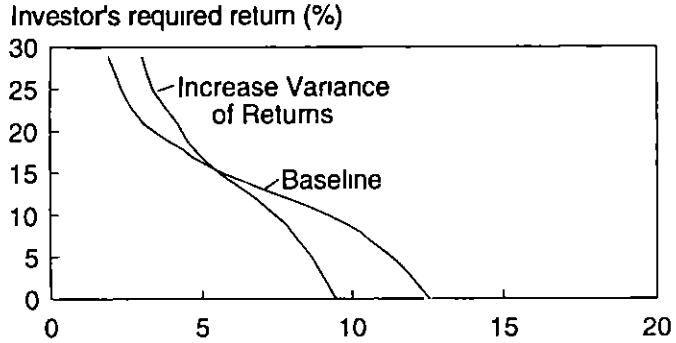


Figure 6

Demand for external equity as a function of required investor return estimated using baseline estimate of variance and increased variance



Relaxing the state restrictions on corporate ownership of farmland increase the demand for external farm equity (fig 4) The large increase for external farm equity shown for the Midwest region signifies the frequency of state restriction among these states With restrictions on corporate ownership, the Midwest region represents 21 5 percent of the total U S market for external equity (table 3) Removal of state restrictions increases the Midwest regions share of the total U S market to 36 percent and increases total U S demand from $9 1 billion to $14 1 billion

Increasing the minimum investment size from $100,000 to $250,000 would reduce the quantity demanded from $9 1 billion to $6 2 billion at a required return for investors of 9 percent (fig 5) Further increase in the minimum size requirements to $500,000 reduces quantity demanded to $3 5 billion

The sensitivity of the results to changes in variance of farming returns is analyzed by doubling the standard deviation of total returns on assets Equation 2 shows that an increase in variance should increase quantity demanded if R > KD This is reflected in the estimated demand schedules which indicate that at lower required returns for investors, an increase in variance decreases quantity demanded (fig 6) At higher required returns for investors, an increase in variance results in an increase in quantity demanded

Summary and Implications

Farm operations are capital intensive businesses requiring substantial capital outlays Farm operators have typically used bank debt, owner equity, and/or leasing as sources of capital Each of these options, however, has disadvantages Bank debt and cash leasing increases financial risk Owner equity financing can subject the owner/operator to unsystematic risk and result in illiquidity Leasing can result in high agency costs since the operator/lessee does not have an interest in the residual value of the assets External or non-farm equity investments represent an alternative source of capital for farm operators which does not have the disadvantages associated with bank debt, owner equity, or leasing A functioning market for external equity, however, would require sufficient interest on the part of both farm businesses and investors Also, it would require the establishment of institutions which unite farm operators and investors This study empirically estimates the market potential for external equity among farm operators under the conditions of a debt-equity swap REIT's are suggested as a institution for uniting operators and investors Intermediation and origination costs consistent with REIT's are incorporated into the analysis Over the 1988-91 period, an estimated $9 billion of farm operator debt would have been exchange for equity

The $9 billion probably represents a conservative estimate since the analysis does not consider the potential impacts that availability of external equity may have on investment decisions A greater availability of external equity investments may encourage greater expansion by farm operators Also, farm operators may sell their own

Table 3—Characteristics of farm businesses participating in proposed external equity market, by farm size, production region, and production specialty

	Farms	Total Assets per farm	External equity per farm	Percent of debt	Total external	Return on assets	Total Return on assets	Average cost of debt
	Number	---------Dollars---------		percent	$Thousands	----------percent----------		
All farms	35,907	1,062,698	265,603	100	9,538	7 2	7 6	9 4
By farm size								
Over $250,000	11,886	1,554,131	416,800	52	4,964	11 2	11 5	9 4
$100,000 to $249,999	12,121	780,477	202,648	26	2,456	6 1	6 4	9 3
Less than $100,000	11,900	859,304	178,707	22	2,127	1 1	1 8	9 5
By Debt-asset class								
0 01 to 10	1,895	2,870,173	196,756	4	373	3 2	3 6	9 4
0 11 to 0 40	22,101	1,108,888	251,847	58	5,566	6 8	6 8	9 5
0 40 to 0 60	7,658	760,252	296,313	24	2,269	9 0	9 3	9 2
Over 0 60	4,254	562,095	312,455	14	1,329	16 3	16 6	9 2
By production specialty								
Cotton	544	1,020,424	249,601	1	136	11 7	12 2	9 4
Wheat & Barley	1,445	1,247,867	332,786	8	481	6 0	6 3	9 6
Dairy	7,329	1,094,758	285,335	25	2,091	7 8	8 0	8 8
Tobacco	734	596,435	180,178	2	132	9 2	9 6	10 1
Corn-soybean	4,660	839,143	221,957	13	1,034	7 8	8 0	9 4
Beef, hog, sheep	7,509	1,169,374	269,147	17	2,021	5 3	5 8	9 4
Fruit & nut	3,492	1,357,073	281,868	6	984	4 2	5 1	9 6
Other Types	6,968	1,095,285	274,214	27	4,680	6 8	6 9	9 5
By production region								
Baseline analysis								
Northeast	2,947	962,353	230,921	4	681	7 3	7 5	9 1
Mid-west	8,456	877,628	241,966	27	2,046	7 8	8 3	9 1
South	7,833	794,526	216,998	23	1,700	8 3	8 8	9 7
West	12,686	1,394,438	323,766	37	4,107	6 4	6 7	9 5
Plains	3,986	1,000,700	251,799	10	1,004	8 2	5 3	9 1
No state restrictions on corporate ownership								
Northeast	2,947	962,353	230,921	4	681	7 3	7 5	9 1
Mid-west	21,758	869,685	233,106	27	5,072	7 2	7 7	9 0
South	8,031	796,337	217,714	23	1,749	8 6	9 0	9 7
West	12,962	1,397,385	326,209	37	4,228	6 5	6 8	9 6
Plains	9,369	906,554	247,910	10	2,323	8 1	8 5	9 0
All regions	55,067	1,062,698	265,603	100	14,053	7 2	7 6	9 4

Source USDA FCRS

equity to investors or substitute external equity arrangements for leasing The impact that the availability of external equity investments may have on investment is a topic left for further research

In addition, the $9 billion estimate only considers demand by farm operators The Collins and Bourn model is based on farm operators only and did not consider landlords Landlords, however, hold only 8 percent of total farm debt in the U S (U S Department of Commerce, 1990) Hence, they are not likely to contribute significantly to total demand for external farm equity under the conditions of a debt-equity swap

Proposals designed to encourage non-farm investment in farm businesses are likely to be politically unpopular with groups interested in preserving agrarian principles However, this analysis indicates economic gains to both investors and farm owner/operators Investors would benefit through capital gains and shares in operating income Farm operators would benefit through an additional source of capital for financing investment The availability of external equity to farm operators should enable farm businesses to expand without relying on debt, leasing, or owner equity External equity is less risky than debt or cash leasing and enables the operator to share in capital gains Moreover, external equity enables farm operators to diversify their wealth to non-agricultural investments and thus reduce their unsystematic risk

Origination fees and servicing costs compatible with REIT's are assumed This resulted in an average required return over the period of approx-

imately 9 percent Sensitivity analysis indicated that even with a required rate of 20 percent, a potential market of approximately $3 5 billion still exists State statutes restricting corporate ownership of land restricted the potential for external equity markets This is especially true in the Midwest production region These laws may have been originally intended to protect agricultural interests However, the harmful effect of these laws on the availability of capital to farm businesses should be recognized

This analysis suggest that there is a potential market for external equity The question is whether sufficient volume would be generated to justify establishment of specialized REIT's The market size indicated by this analysis may be too small for a specialized agricultural REIT Established REIT's in other sectors, such as commercial real estate, could diversify into agriculture Smaller institutions such as real estate limited partnerships (RELP's) are also alternatives The Farm Credit System could solicit and construct agricultural investment packages for sale to investors

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