The U.S. Farm Lease Debt Relationship: Evidence from a National Survey

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Introduction

According to USDA's Agricultural Resource and Management Survey (ARMS) data, farmers own about 59% of the acres they operate, while they lease 35% with cash payments and 6% on a cash crop share basis. ARMS data also indicate that large commercial farms tend to lease farmland more than intermediate and small farms and commercial farms have more leases than other farm types.

Commercial farms benefit greatly from leasing. Modern crop farming exhibits economies of scale, so leasing arrangements where the cash flow from farming involves balancing leasing costs with expected revenues while minimizing risk (Oppedahl, 2013).

Leasing may also serve another function for farm businesses. New entrants may find it increasingly difficult to debt finance the purchase of capital inputs such as land. For some farms, operating leases can be used to acquire the use of farmland. A body of literature has built up both in finance and agricultural economics research that advances the notion that leasing may be a substitute for debt. This assumes that leasing payments, a fixed obligation like a loan, displace debt and but also reduce debt carrying capacity (Ahrendsen, 1999).

We revisit this issue using national data. Our analysis only looks at land leasing. To the authors' knowledge, previous researchers have not looked at this issue using national farm data. Two previous studies examined this relationship for Illinois and Kansas farms (Taheripour et al., 2002 and Ahrendsen et al., 1999). Like the authors of these studies, we follow previous methodologies published in the finance literature but utilize a set of firms (non-corporate U.S. commercial farms) to test the leasing-debt substitution hypothesis.

Objectives

- To test the hypothesis that leasing and debt are substitutes
- To determine whether substitutability varies by farm typology

Previous studies

Ang and Petersen (1984) provide the seminal work on this topic in the finance literature. The authors fit tobit models to 1976-81 data on 600 firms where the leasing to book value of equity ratio is the dependent variable and a debt to book value of equity ratio and other variables are used as explanatory variables. The findings were contrary to expectation—their results indicate that leasing and debt are complementary activities.

Several competing theories have been advanced in later studies regarding the degree of substitution that exists between the use of debt alone or a mix of debt and leasing. The most frequently advanced view is that leases and debt are perfect substitutes. That is, an increase in leasing activity reduces conventional borrowing on a dollar-for-dollar basis.

The debt-to-lease displacement ratio

Following the literature we use the debt-to-lease displacement ratio, α, which is defined as:

$$DR_{NL} = DR_L + \alpha LR_L \quad (1)$$

where DR_{NL} is the debt ratio of a firm which does not lease (NL), DR_L is the corresponding debt ratio of a similar firm which does lease (DR_{NL}), and LR_L is the lease ratio of the latter. Thus, α is defined such that the aggregate debt ratios of the two otherwise similar firms are identical. A formal investigation of the relationship between leases and debt must explicitly take into account the differences in the financial variables among farms. Let $C(x_1, x_2, \ldots)$ be the set of factors which determines the debt ratio of a non-leasing firm, then equation (1) may be rewritten as,

$$DR_{NL} = DR_L + \alpha LR_L = C(x_1, x_2, \ldots). \quad (2)$$

Rearranging the above expression, the equation for the lease ratio of a firm follows:

$$LR_L = -1/\alpha\ DR_L + 1/\alpha\ C(x_1, x_2, \ldots) \quad (3)$$

This equation expresses the lease ratio (LR) as a negative function of the firm's debt ratio (DR), since debt and leases are hypothesized to be substitutes. We also assume that farms are at optimum debt-to-asset levels. The other financial variables of the firm, x1, x2, .., account for the differences in debt capacity among firms. The coefficient on DR, -1/α, measures the extent to which leases and debt are substitutes. Tobit estimation is used since the dependent variable is bounded by zero and one.

A simple model for $C(x_1, x_2, \ldots)$ is specified and estimated using a Tobit approach. The financial variables used in the model to account for debt capacity are the following: (1) net worth, (2) operator age, (3) current ratio, and, (4) return on assets.

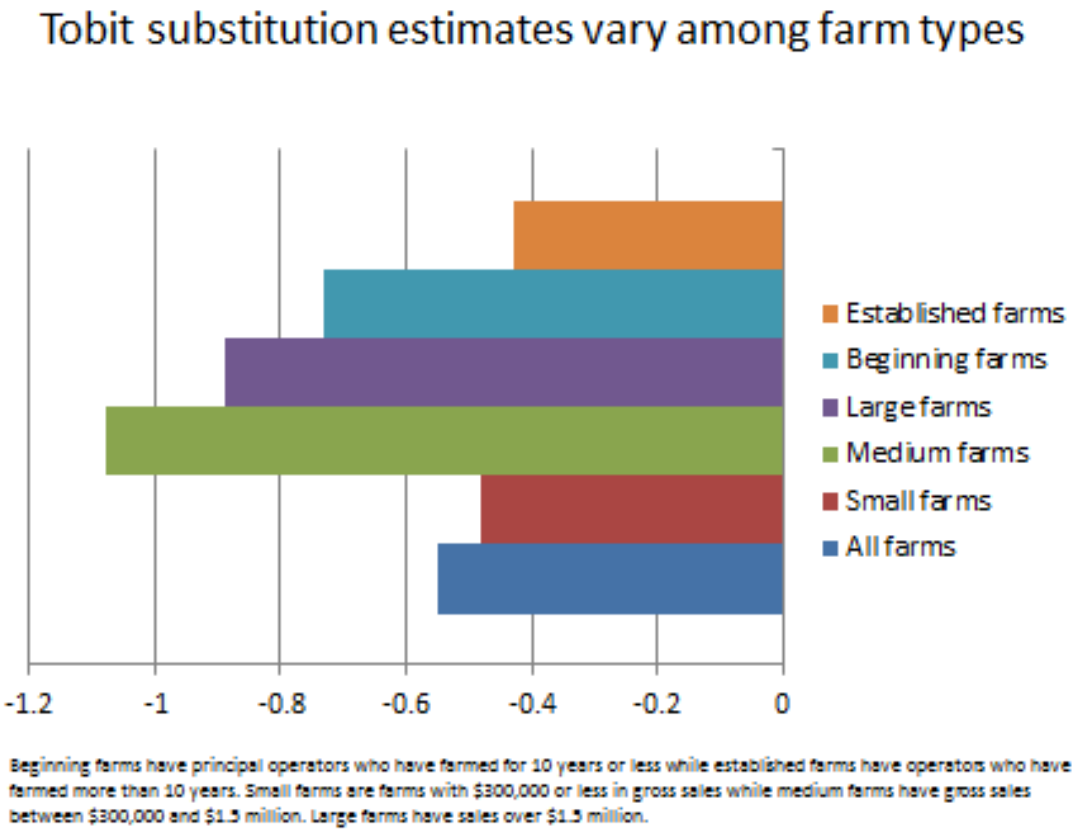
Evaluating the debt displacement ratio

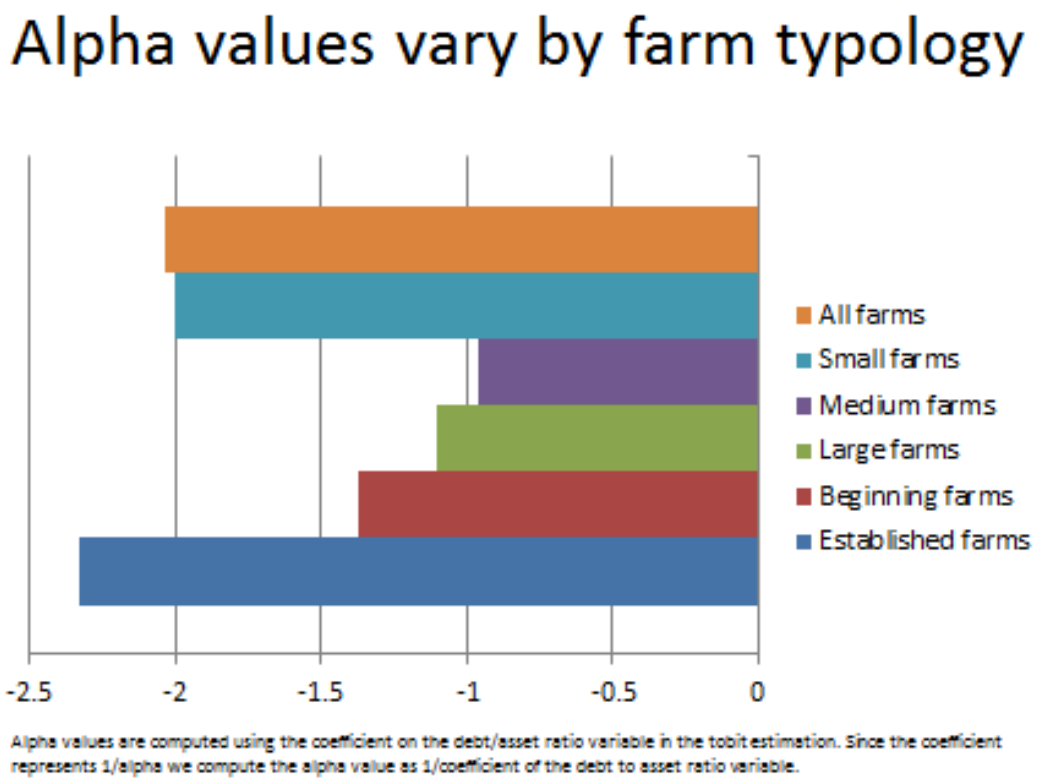
- A review of theories of finance and economics reveals three possible values for α. A noteworthy feature common to all three views is that leases are expected to reduce debt carrying capacity.
- The first and most popular view argues that a dollar of lease obligation replaces a dollar of potential debt obligation; equivalently, α is equal to 1.0 (Ang and Peterson, 1984).
- A second view, however, holds that α is less than 1.0, but greater than 0 ($0 < \alpha < 1$). If the debt-to-lease displacement ratio is negative but less than one, then leases and debt are substitutes but leased assets are less risky than debt financed assets. Some theorists make this argument, that the magnitude is less than one due to risk sharing between lease and lessor. For example, lessors may bear some risks not inherent in debt contracts.
- A displacement ratio greater-than-one indicates that leases and debt are substitutes but leased assets are risker than debt-financed assets ($\alpha > 1.0$). Klein, Crawford, and Alchian (1978) argue that leased assets are riskier than other assets, exposing the lease to additional liquidity and bankruptcy costs and causing the values of alpha to exceed 1.0.
- Positive ratios indicate that leases and debt are not substitutes.

Results from the tobit estimation

Variable	All farms	Small farms	Medium farms	Large farms	Commercial farms	Beginning farms	Established farms
Debt/asset ratio	-0.49 (0.05)	-0.49 (0.074)	-1.08 (0.0752)	-0.89 (0.081)	-0.96 (0.053)	-0.73 (0.163)	-0.43 (0.061)
Net worth	-0.25 (0.003)	-0.072 (0.009)	-0.04 (0.005)	-0.01 (0021)	-0.02 (0.002)	-.24 (0.047)	-0.02 (0.003)
Operator age	-0.01 (0.0005)	-0.009 (0.0007)	-0.005 (0.0006)	-0.002 (0.001)	-0.01 (0.0006)	-0.01 (0.002)	-0.008 (0.0006)
Current ratio	-0.0002 (0.0004)	-0.0002 (0.00005)	-0.0003 (0.00007)	-0.0004 (0.0001)	-0.0002 (0.0001)	0.000005 (0.00003)	-.00007 (0.00002)
Return on assets	-0.001 (0.0004)	0.006 (0.0005)	0.001 (0.0004)	0.0011 (0.0004)	0.001 (0.001)	-0.001 (0.0004)	0.00009 (0.00009)

Notes: The dependent variable is the ratio of the market value of leased land to the market value of land assets (both owned plus leased). Debt-to-asset ratio is computed as the value of debt divided by total farm assets. Two sided p-values are in parentheses.





Conclusions

- The debt-to-asset coefficient estimate is negative and significant in all cases. This supports the hypothesis that leasing and debt are substitutes, albeit not dollar-for-dollar for all farm typologies.
- A value of -0.49 on the total asset full sample model implies that on average, for each dollar decrease in debt there is a $0.49 increase in the value of land leased. This finding indicates for these farms, that in order to push the leasing ratio to higher levels, leasing must substitute for debt at increasingly higher levels.
- Our results indicate that leasing and debt are substitutes, except in the cases of medium and large farms where leasing and debt are near substitutes. For these farms, leasing and debt substitute nearly dollar for dollar.
- The signs of the non-debt-to-asset coefficients are as expected. The age and net worth variables support the life cycle theory that older operators and those with greater net worth replace leased land with owned land as they age and/or increase net worth.

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