Farm Sector Capital Structure Indicators in Estonia

Maire Nurmet, Juri Roots, and Ruud Huirne

Paper prepared for presentation at the 13th International Farm Management Congress, Wageningen, The Netherlands, July 7-12, 2002

FARM SECTOR CAPITAL STRUCTURE INDICATORS IN ESTONIA

Maire Nurmet[1], Jüri Roots[1] and Ruud Huirne[2]
[1] Estonian Agricultural University, Tartu, Estonia
[2] Wageningen University, Wageningen, The Netherlands

ABSTRACT

Empirical tests are provided to determine the optimal leverage adjustment in transitional economy. Econometric model of agricultural firm capital structure is specified and estimated in order to analyze, how different factors affect agricultural firm's capital structure. Issues in financial structure, that under particular ownership type should be considered in responding to changes in the operating environment, are found. The evidence suggests that profit, income tax, depreciation have an influence on increase in financial leverage. Results indicate that increase in firm's profits may induce firms to increase financial risk through capital structure adjustments.

Introduction

Agricultural firms have to operate in a rapidly changing economic environment. Financial decisions have a long-run impact to the survival and success of agricultural firms in a transition economy such as in Estonia. In order to reach an efficient scale of operation, growth of most farms is very important. There are two general sources for firm growth, i.e. (1) profit-based retained earnings and (2) increased use of debt. The fist is only possible for the limited number of farms that are already rather profitable. The second option seems to be most promising, but in particular young small agricultural firms have a low level of equity that could be a limitation in attracting debt capital. However, such decisions about the capital structure are central in the growth of most Estonian farms. Therefore it is important to specify and analyze those factors that determine capital structure, also called the leverage position.

Firms' capital structure is the combination of debt and equity (Barry et al., 2000). There are two possible ways to define the optimal capital structure. Optimal capital structure

can be defined as the combination of long-term resources that (1) maximize stock price (Raudsepp, 1997) or that (2) maximize expected returns at some minimum level of risk. Typical purpose of finance is to minimize the cost of capital or maximize the market value of debt-to-equity ratio, which is based on stock price. This measure is applicable to companies with market access in conditions of effective capital markets. Since agricultural firms are not normally traded in capital markets, such approach is useless. Therefore adjustment of capital structure to private farms, taking specific features into account is necessary.

Financial leverage has an influence on firm value, return on equity and the firm's financial risk. So, whole firm value is dependent on capital structure and the user cost of capital may be regarded as the rate of return that is required by a rational investor in order to retain capital in the agricultural sector.

The choice of a leverage target for a farm business is based on such factors as expected returns and levels of risk, costs of borrowing, the risk attitudes of farmers and lenders, and the structural characteristics of farm businesses (Robison and Barry, 1987). Finance theory suggests increases in financial leverage will raise the expected level and variability of returns on a farm's equity capital, provided the returns on assets exceed the cost of borrowing. This approach is applicable to smaller firms. Developing an optimal capital structure model for agricultural firms, Collins (1985) focused on equity. A leverage decision made by an owner will have an influence both on return on equity and its variance.

Relatively little research on capital structure has been undertaken in Estonia, and no research was focused on agricultural or small firms. In this paper, we tested empirically the most widely accepted model on farm capital structure decisions, the expected utility maximization model for agricultural firms. This model was tested including responses of farm capital structure decisions to the effect of government policy, including risk-balancing dimensions of agricultural policy such as the relationships between business risk, profitability, taxes, and financial risk (Ahrendsen et al., 1994). The main aim of the study was to analyze how different factors affect an agricultural firm's capital structure. We analyzed, taking into account changes in major financial variables such as profitability, taxation, interest rates, risk, what possible issues in financial structure, under particular ownership and production type should be considered in responding to changes in the firm's environment. To summarize, the objectives of this study are

twofold: (1) to find whether capital structure is different in transitional economy and (2) to test a general model to demonstrate the empirical applicability of the model for support managerial decisions on small farms in Estonia.

Models for capital structure

Our model of optimal farm capital is presented and tested using empirical data. Previous studies about optimal capital structure (such as Collins, 1985; Jensen and Langemeier, 1996) have developed a theoretical basis for our model. Our model of optimal farm capital is based on Jensen and Langemeier (1996), and reads:

$$\mathrm{RE}=\left\{\frac{\pi(1-T)-F+\frac{r_g(L+\theta)(1-T)+y\Gamma+\Delta\theta T}{L+\theta}}{}-[r\delta](1-T)\right\}\cdot\left\{\frac{1}{1-\delta}\right\} \qquad (1)$$

with

RE	return on equity
δ	debt-to-asset ratio (leverage)
π	profit before taxes, interest and depreciation,
r_g	growth of real assets during observed period,
L	real value of used land,
θ	value of real assets,
T	marginal income tax rate, calculated for each farm,
$y\Gamma$	tax relief from agricultural investments,
Δ	total accounting depreciation,
F	owner's non-paid contribution for sole proprietor farms,
r	real cost of debt capital, calculated for every farm.

The central variable in this model is debt-to-asset ratio. The equation of optimal capital structure, a target to which farmers continually adjust their capital structure, is (Jensen and Langemeier, 1996):

$$\delta = 1 - \rho \frac{(1-T)^2\sigma_\pi^2 + 2(1-T)(L+\theta)(1-T)\sigma_{\pi rg} + (1-T)^2(L+\theta)^2\sigma_{rg}^2}{(L+\theta)\{\pi(1-T) - F + r_g(L+\theta)(1-T) + y\Gamma + \Delta\theta T + r(T-1)(L+\theta)\}} \qquad (2)$$

Optimal level of leverage is chosen as a dependent variable while treating all other variables in the equation as independent ones. In tests of the empirical model, the signs provided by the theoretical model are used for comparison. We tested the empirical model for evaluating adjustment from the observed leverage to the (unobservable) optimal level according to Ahrendsen et al. (1994) and Jensen and Langemeier (1996), using multiple linear regression models of the following structure:

$$\delta = f(\pi, r_g, L, \theta, \Delta, \sigma^2_\pi, \sigma^2_{rg}, T, y\Gamma, F, r) \qquad (3)$$

σ^2_π standard deviation of profit (indicator for business risk)

σ^2_{rg} standard deviation of growth of real assets,

The other symbols have been defined previously.

Some specific issues should be additionally considered. Unpaid labor is included only for family farms, and capital gains are not included, which is non-typical under Estonian conditions. We considered in specific terms the differences in accounting systems as the basis for the records of companies and private farms. We additionally tested if ownership type played a role in decisions about leverage, including dummy for owner's unpaid contribution for sole proprietors.

Debt-to-asset ratio δ is defined in the multiple linear regression model as follows:

$$\delta_{jt} = \beta_0 + \beta 1\pi_{jt} + \beta_2 r_{gjt} + \beta_3 L_{jt} + \beta_4 \theta_{jt} + \beta_5 \sigma^2_{\pi t} + \beta_6 \sigma^2_{rgt} + \beta_7 \sigma_{\pi rgt} + \beta_8 T_{jt} + \beta_9 y\Gamma_{jt} + \beta_{10}\Delta_{jt} + \beta_{11} F_{jt} + \beta_{12rt} + e_{jt} \qquad (4)$$

Data Description

The base data used in the empirical tests are obtained from the governmental investment support database. Two-year data (1998 and 1999) are from 114 farms in the 4 southern counties. All farms applied for investment support in 1999. Farm record data included

balance sheets, income statements, and information about production, labor and land. Average size per farm was 185,4 ha arable land.

The estimates of means and standard deviations for some key variables are shown in Table 1.

Table 1. Descriptive statistics of some major variables

	Pooled		1999		1998	
Variable	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
	0,178	0,160	0,181	0,153	0,176	0,166
π *(t.kr)*	207,522	283,428	201,713	259,284	213,331	306,722
rg (%)	16,660	18,715	17,599	19,184	15,721	18,269
L (t.kr)	809,380	944,385	844,972	959,698	773,788	931,688
θ (t.kr)	1471,760	1327,380	1601,180	1407,520	1342,340	1234,740
T	0,011	0,045	0,015	0,050	0,006	0,039
$y\Gamma$(t.kr)	3,196	14,401	5,084	18,820	1,307	7,432
Δ	0,149	0,153	0,159	0,143	0,139	0,162
F (t.kr)	15,532	22,700	16,505	23,054	14,559	22,400
r	0,085	0,089	0,095	0,099	0,076	0,076
σ^2_{rg}	1,668	2,358	1,668	2,363	1,668	2,363
σ^2_{π}	87,833	109,901	87,833	110,144	87,833	110,144

Empirical results

In order to explain the leverage position with farm financial characteristics, Tobit regression was used. For 9.87 percent of all farms, the debt-to-asset ratios was zero. So, a Tobit model for limited distributions is applicable, since efficiency measures are bounded by a lower and upper limit (0-100), (Greene, 2000). The regression was performed using LIMDEP statistical software.

In running the Tobit regression, the data was left censored. Regression results for observations are given in Table 2.

The regression coefficients are mostly positive. Several of the coefficients are statistically significant. All variables that were significant at the 10 percent level had signs that were consistent with the theoretical model except for the tax relief variable.

Table 2. Tobit regression estimates of factors affecting leverage.

Variable	Coefficient	Standard error	P[|Z|>z]
π (t.kr)	0,00123	-0,00057	0,0339
rg (%)	0.01835	0,04550	0,6867
L (t.kr)	-0,00004	0,00093	0,9645
θ (t.kr)	-0,00001	0,00012	0,9207
T	0,81300	0,39400	0,0391
yΓ(t.kr)	-0,02440	0,01328	0,0663
Δ	0,15025	0,88470	0,0895
F (t.kr)	0,00320	0,01229	0,7945
r	0,91751	0,12861	0,4756
σ^2_{rg}	0,02691	0,05488	0,6239
σ^2_{π}	0,00098	0,00132	0,4550

Empirical results show that leverage δ, firm profitability π, and the growth rate in the value of assets r_g are positively related. Consistent with the theory, and previous empirical results, financial leverage is increasing as profitability grows. Profitability is a precondition on order to get financed with loans.

By theory, variance of returns to operating income $\sigma^2_{\pi,}$ and leverage variables should be related negatively, indicating that business and financial risk should have opposite signs – increase in one should cause decrease in the other. In our analysis variance of returns to operating income σ^2_{π} with incorrect positive sign was not significant.

In conditions of transitional economy about 20% level of business risk, measured as variance of profitability, is commonly considered as acceptable. During the observed period business risk was 58,4 percent for small farms, and 22,8 percent for large firms. Financial risk, defined as debt-to-asset ratio, was 84,2% for small businesses, and 66,2% for large firms. These numbers are observed for companies in all economic sectors (Raudsepp, 1999). So, financial risk is extremely high, and we observed that all

firms use business credit and short-term bank loans extensively, in particular small firms.

A well-known general rule is that the higher the degree of operating leverage from breakeven point, the closer it approaches the value of one. Therefore the higher the sales turnover, the smaller should be the volatility of operating leverage. But, at the moment the situation in Estonia is the other way round. Many firms operate at breakeven point, and this causes high business risk. So, profitability is strongly influenced by even a little change in net sales. In general, highly profitable slow-growing firms should generate the most cash, while less profitable fast-growing firms will need significant external financing. In addition, earnings before interest and taxes and net income grow at the same rate. It means that the degree of total leverage is also very high (i.e., close to one). Powerful companies with strong traditions can afford such a risk, in contrast to young comparably weak firms in the agricultural sector. Cost structure should be restructured to become less dependent on the availability of bank loans. One possible way is to increase fixed costs instead of operating costs, for instance replacing more expensive labor with machinery.

Income tax rate T shows a significant positive sign. The higher the income tax rate, the more firms prefer outside financing. In theoretical analysis this sign was indeterminate. The investment tax relief variable yΓ has a negative sign, not consistent to theory. This variable was significant at 10% level. Obviously, increasing levels of income tax limited the farmers in using external capital. The accounting depreciation variable Δ was a significant positive sign, consistent to theory. Signs for land L and other assets θ were not defined in theory and the empirical model had both coefficients negative and insignificant.

Real interest rate r was insignificant with positive sign, showing that leverage increased with an increase in interest rates – which was not consistent with the theory.

Average cost of capital for small firms was about 3 percent points higher than the average internal rate of return of investments (accordingly 14% and 11%). There is obvious lack of operating capital, and main reasons are limited access to money markets and owners' lower levels of risk-aversion. Although risk-aversion levels were not considered in this analysis, we have knowledge that risk-aversion levels in transitional economy are somehow lower than in countries with a developed financial system.

Conclusion

Consistent with previous studies, debt ratios seem to be affected the same way and by the same type of variables as in other countries. According to results we can conclude that the higher the profits and depreciation, the higher the leverage in farm sector. Leverage decisions are also influenced by governmental tax policy. Empirical works support theory in general, although not always, therefore connections between capital structure, profitability and variance of returns are not absolutely clear yet. There is little experience in prediction of future developments in the Estonian economy that is based on multivariate accounting and appropriate evaluation criteria. There are systematic differences in the way these ratios are affected by country factor, such as inflation rate, GDP growth rate, and the development of capital markets. According to our experience, managers who are planning future actions need to work with 8-12 percent annual growth rates for individual firms.

References

Ahrendsen, B.L., Collender,R.N., Dixon B.L. 1994 "An Empirical Analysis of Optimal Farm Capital Structure Decisions" *Agricultural Finance Review* 54:108-19

Barry, P.J, Ellinger, P.N., Hopkin, J.A., Baker, C.B, 2000 "Financial Management in Agriculture" Danville 6-th. ed.

Collins, R.A. 1985 "Expected Utility, Debt-Equity Structure, and Risk Balancing." *Amer. J. Agr. Econ*. 67:627-29

Greene, W.H. 2000 Econometric Analysis. Prentice Hall International 4-th ed. 1004p

Jensen F.E., Langemeier, L.N. 1996 "Optimal Leverage With Risk Aversion: Empirical Evidence" *Agricultural Finance Review* vol. 56:85-97

Raudsepp, V. 1999 "Väike omakapital ja risk teevad elu raskeks" *Ärielu 2(1999): 14-15*

Raudsepp, V. 1997 Finantsjuhtimine otsustajale. Külim

Robison, L.J., Barry, P.J. 1987 "The Competitive Firm's Response to Risk". New York McGraw Hill.

Maire Nurmet is a Ph.D student of agricultural finance and accounting in the Department of Economics, Estonian Agricultural University

Jüri Roots is assistant professor in the Institute of Informatics, Estonian Agricultural University.

Ruud Huirne is professor of farm management, Department of Social Sciences, Wageningen University.