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INCOME AND DEBT COMPONENTS OF FARM FINANCIAL STRESS: A NATAL EXAMPLE.

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Uittreksel

Met hierdie studie word beoog om die huidige finansiële prestasie van boere in Natal te ondersoek en om swak finansiële prestasie (finansiële stres) te verdeel tussen inkomste, hefboomfinansiering en rentekoerse. Dit word gedoen deur die inkomstekoerse, hefboomverhoudings en rentekoerse van plase wat finansiële stres ondervind, te vergelyk met 'n gemiddelde hefboomverhouding en rentekoers vir daardie plase wat finansieel suksesvol is. Die resultate dui aan dat 65.4% van finansiële stres 'n inkomsteprobleem is, terwyl 25.6% 'n hefboomprobleem is en 9.0% 'n rentekoersprobleem. Beleidsrigtings wat op die inkomste probleem gerig is, sal waarskynlik die effektiefste wees.

Abstract

This study allocates farm financial stress into an income problem and a debt problem (leverage and interest rate) for a selected sample of Natal farms. This is done by comparing leverage and interest rates for farms experiencing financial stress (negative rate of return to equity) with a target leverage ratio and interest rate for those farms which are financially successful (positive rate of return to equity). The results show that some 65.4% of financial stress, for sample farms, is due to an income problem, 25.6% to leverage and 9.0% to an interest rate problem. Policies which alleviate the income problem will therefore be the most effective for these farms.

1. Introduction

Aggregate farm sector solvency weakened during the 1980's with the debt to asset ratio rising from 13% in 1980 to 27% in 1986 (Agri Review, 1990). Although the ratio improved to about 23% by 1990, the current drought (especially in the summer rainfall regions) and high nominal interest rates have again focussed attention on what causes farm financial stress.

Financial stress results from a perceived inability to meet planned cash flow commitments which stem from family living needs, cash farm expenses and debt servicing (Brake, 1983:953). This is due to an income problem (relatively low returns) and/or a debt problem (relatively high debt use) (Jolly *et al*, 1983; Brake and Boehlje, 1985). Symptoms of farm financial stress in South Africa are the current debt burden (approaching R20 billion), cash flow and low profitability problems. Louw (1986:11) attributes these, inter alia, to drought, high interest rates, inflation, high input costs, government policy and poor strategic and operational decisions by farmers.

Previous studies on farm financial stress in South Africa have used financial ratio analysis and farm simulation models. Janse Van Rensburg and Groenewald (1987) used financial ratio analysis to show that Western Transvaal farmers with poorer returns to equity incurred larger costs relative to revenue and also invested more. Darroch and Fuller (1989) identified a reliance by less liquid summer crop producers on operating credit reserves in particular to fund liquidity shortfalls. One drawback of financial ratio studies is that they analyse financial stress in a static context. Simulation models of typical farm units have recognised the time dimension of farm financial stress by assessing impacts of interest rates, drought, inflation and aid measures on farm liquidity at the micro level (Van Zyl *et al*, 1989; Mostert and Van Zyl 1989; Swart and Loubscher 1991).

This study differs from past studies by analysing the relative effects of the income problem and debt problem on farm financial stress using actual time series data for selected Natal farms. Following Featherstone *et al* (1988), income statement and balance sheet data are used to decompose farm financial stress into income and debt components over time. Farm financial stress is measured by each farm's geometric mean real rate of return to equity. This accrual based measure of income is superior to cash-based measures for classifying farms as stressed or non stressed as it considers the time dimension. Study farms are classified as financially successful (non-stressed) or unsuccessful (stressed) on the basis of their geometric mean real rate of return to equity over time - successful (unsuccessful) farms have positive (negative) estimated rates of return to equity. The income problem is due to business management decisions, while the debt problem reflects financial management of leverage (debt to asset ratio) and the cost of debt (interest rate). Study results show the potential impact on farm financial stress of alternative policies designed to alleviate liquidity problems.

Section one outlines research methodology, while section two derives formulae for quantifying the components of farm financial stress. Study data are described in section three and results reported in section four. A concluding section discusses the policy implications of the results.

2. Method

The geometric mean real rate of return to equity (Re) is estimated from income statement and balance sheet data, and measures the rate of change in net worth over time due to variations in earnings and the value of assets and liabilities.

A definition of Re can be derived by first expressing it as a function of the real rate of return to assets (Ra) and the cost of debt (k) as follows (Barry *et al*, 1988:70):

$$Re(\frac{E}{A}) = Ra - k.(\frac{D}{A}) \tag{1}$$

where E is equity, A is assets and D is debt. Since (E/A) =(1 - D/A), equation (1) is equivalent to

$$Re = \frac{(Ra - k.l)}{(1-l)} \tag{2}$$

where l is the leverage ratio (D/A). From equation (2), leverage has an explicit effect on Re, via l, while liquidity has an implicit effect through it's impact on Ra, l and/or k. As Re is a function of Ra, k and l, financial stress can be allocated into income and debt components. The next section explains how this was done by classifying financially successful and unsuccessful farms using Re.

2.1 Financial success classification

The Re is used to separate poor financial performers (negative Re) from those more successful performers (positive Re). An average (target) leverage ratio and interest rate is determined from the financially successful farmers in order to quantify the proportion of poor performance due to leverage, high interest rates and low rates of return to assets for the less succesful group. For farms with a positive real geometric mean rate of return to equity, equation (3) is estimated to determine target leverage (l') and interest rates (k').

$$Rei = aRai + b + ei \tag{3}$$

Rei is the real geometric mean rate of return to equity for the ith farm with a positive mean rate of return to equity. Rai is that farm's real rate of return to assets and ei is the random error term. The parameter a is equal to 1/(1 - l) from which the target leverage can be estimated. Parameter b, which is equal to -k.l/(1 - l), is used to estimate the target interest rate.

Equation (4) below is then estimated for each individual farm to approximate the actual interest rate and leverage ratio for that farm.

$$Reij = cjRaij + dj + eij \tag{4}$$

Reij and Raij are simply the actual rates of return to equity and assets respectively for each individual farmer i in the jth year. Actual interest rates and leverage ratios are calculated as above using parameters c and d.

3. Quantifying the components of financial stress

The target leverage and interest rate can be used with the actual interest rates and leverage ratios for each farm to decompose farm financial stress into its component causes for unsuccessful farms (negative Re).

3.1 Estimating the components of financial stress

To estimate the proportion of the problem due to a low rate of return to assets, it is neccessary to exclude the proportion of the problem due to leverage and high interest rates. This is done by defining rate of return to equity (ReiA) for the unsuccessful farm assuming it has l' and k' as:

$$ReiA = \frac{(Rai - k'.l')}{(1-l')} \tag{5}$$

where Rai is the observed geometric mean real rate of return to assets. As the parts of the problem due to leverage and interest rates have been removed by using l' and k', the remaining part of the problem may be attributed to an income problem. To estimate this proportion, it is neccessary to divide ReiA by Rei, the latter being the actual observed geometric mean real rate of return to equity. The resulting ratio may be less than zero, between zero and one or greater than one. Bearing in mind that Rei is negative for less successful farmers, a negative ratio implies that if the farm had the target leverage ratio and interest rate it would have realised a positive rate of return to equity. Thus none of the problem can be attributed to an income problem but must rather be due to a debt problem. If the ratio is greater than one (ie numerator is a larger negative than denominator), then the farm has a better leverage and interest combination than the target combination and hence the entire problem can be attributed to a return on assets problem (as the debt problem has effectively been excluded). Finally, if the ratio is between zero and one, the proportion of the problem attributed to a return to assets problem is equal to the ratio.

3.2 Estimating the debt problem

Estimating the proportion of the debt problem due to a leverage component and an interest rate component is achieved in three stages. Firstly, a return on equity assuming there is no leverage problem (ReiL) is estimated by equation (6). It uses the actual geometric mean real rate of return to assets together with the target leverage and actual interest rate. ReiL is then effectively the part of the problem that can be attributed to a combined return on asset and interest rate problem as leverage has been excluded.

$$ReiL = \frac{(Rai - k.l')}{(1-l')} \tag{6}$$

In equation (7) the farm's actual geometric mean real rate of return to assets, actual leverage ratio and the target interest rate are used to estimate the rate of return to equity assuming no interest problem (ReiI). ReiI thus represents a combination of the return to assets problem and leverage problem.

$$ReiI = \frac{(Rai - k'.l)}{(1-l)} \tag{7}$$

Finally, the proportion of the farm's problem not due to a return to assets problem is allocated to an interest rate problem and a leverage problem using equation (8). Farm i's leverage problem (Li) is,

$$Li = [\frac{(Rei-ReiL)}{(Rei-ReiL)+(Rei-ReiI)}] * [\frac{(Rei-ReiA)}{Rei}] \tag{8}$$

where the first term shows the proportion of the debt problem due to leverage and the second term is the proportion of the total problem due to the debt problem. The remaining portion of the negative return to equity can be allocated to an interest problem.

4. Data

Rates of return to assets and equity were estimated from income statements and balance sheets prepared for management purposes for 37 farmers in the Natal Midlands and East Griqualand by financial consultants. Annual data for the period 1982 - 1991 were available for these farmers whose main enterprise was dairy. All variables were converted to real terms (1985 rands) using the consumer price index (CPI) (Abstract of Agricultural Statistics, 1992:95).

The real annual return to assets for each farm is calculated by adding interest paid and unrealised capital gains on land to (or subtracting capital losses from) net farm income and subtracting a management charge of 5% of gross farm income. Capital gains on land are calculated by first subtracting from land values net transfers resulting from purchases or sales of land. A nominal capital gain/loss is then calculated as the difference between land values of successive years. Real capital gain/loss is computed by adjusting the nominal capital gain/loss for change in the purchasing power of funds tied up in land (Melichar, 1979:1085-6; 1984:14), as reflected by the CPI.

The real return to equity is calculated by subtracting interest paid from, and adding capital gains on debt to, the real return to assets. Adding capital gains on debt accounts for the declining real value of debt during inflationary periods (principal payments in cheaper rands).

The rate of return to equity for each year is determined by dividing real return to equity by the average of beginning and ending equity. The rate of return to assets is determined by dividing real annual return to assets by the average of beginning and end year real asset values. The geometric mean rate of return to assets and equity are calculated using the annual rate of return to assets and equity for each farm.

5. Results

5.1 Rate of return, leverage and interest components

The geometric mean real rate of return to equity ranged from -6.00% to 18.80% for the sample farms. Thirty-two farms had a positive geometric mean real rate of return to equity, while five had a negative rate of return. The geometric mean rate of return to assets varied from 11.90% to a minimum of -2.90%. One of the unsuccessful farms had a positive return on assets but a negative return on equity. For all farms, the lowest estimated leverage was 0.40% and the highest 56.00%. Estimated real interest rates ranged from -11.10% to 39.20%. Table 1 summarises rate of return, leverage and interest components for successful and unsuccessful farms.

Succesful farms generally have higher rates of return to assets (mean 4.60% versus mean -0.69%), higher leverage ratios (mean 28.39% versus mean 23.60%) and lower interest rates (mean 3.53% versus mean 7.41%) than unsuccessful farmers. This could reflect better leverage management ability, as they generate mean returns to assets above the mean cost of debt.

5.2 Target leverage ratio and interest rate

The target leverage ratio and interest rate for successful farmers were estimated by applying ordinary least squares to equation (3) to give equation (9):

$$Rei = 1.396638\ Ra - 0.014029 \qquad (9)$$
$$(15.905) \qquad (-3.040)$$

where the t statistics in parentheses are highly significant at the 1% level. The overall F for equation (9) of 259.95, was also highly significant at the 1% level. The adjusted R-square was 0.89. A target leverage ratio of 28.39% and a target interest rate of 3.53% are implied for successful farmers (positive Re) by equation (9).

5.3 Relative importance of financial problem components

The target leverage ratio and interest rate in section 5.2 are used to decompose the financial problem of unsuccessful farmers (negative Re) into component parts as shown in Table 2. The major problem for financially unsuccessful farms is a rate of return to assets or income problem.

The rate of return to assets problem relative to the total financial problem increases as the rate of return to equity decreases. The interest rate component of the total financial problem increases relative to the leverage ratio as the rate of return to equity declines.

5.4 Implications for alleviating financial stress

Table 3 shows Re values of unsuccessful farms under different leverage and interest rate scenarios. Results emphasise that the main problem for this group of farmers is an income problem, rather than a debt problem. Policies to reduce leverage by one-third alone, for example, improve the financial position of all farms, but only farm 2 records a positive rate of return to equity.

Strategies which subsidise interest rates to target levels alone, improve rates of return to equity for all five farms, but do not produce positive returns. Debt reduction and interest rate subsidy policies together assist all farms, but again only farm 2 recovers to a positive rate of return to equity. This suggests little benefit, for sample farms, of simultaneously reducing leverage and interest rate.

6. Conclusion

The major concern for financially stressed farmers in the sample is an income problem. Policies aimed at alleviating this problem, such as income assistance, would therefore be the most beneficial in improving their cash flows. This supports simulation results of Mostert and Van Zyl (1989), which showed that income assistance best improved liquidity for typical Western Transvaal farm units.

Interest rate subsidies would not have markedly improved the financial position of unsuccessful farmers. A one-third reduction of the leverage ratio had a similar effect. Policies such as debt reductions, debt rescheduling and debt standstill would seem to be as ineffective as an interest rate subsidy in this case. Unsuccessful farmers gained little benefit from reducing interest rates and leverage ratios simultaneously.

Results were not representative of the whole farm sector as the sample related to selected Natal farmers only. Further research will be done to compare components of financial stress and assess relative effectiveness of different policies in different areas of South Africa. The study does, however, emphasise the need to stabilise farm income which is vital to the maintenance of liquidity and a sound cash flow position. Issues such as the cost of different policies and which group of farmers would benefit most also need be addressed.

Table 1: Mean and standard deviation of the rate of return to equity, rate of return to assets, leverage ratio and interest rate for Natal farms

Variable	Observations	Mean	Standard deviation
Successful Farms (Re>0)			
Re	32	5.10%	3.70%
Ra	32	4.60%	2.50%
l	32	28.39%	1.34%
k	32	3.53%	1.05%
Unsuccessful Farms (Re<0)			
Re	5	-3.41%	1.90%
Ra	5	-0.69%	1.60%
l	5	23.60%	2.10%
k	5	7.41%	1.40%

Table 2: Relative importance of return to assets, interest rate and leverage for financially stressed Natal farmers.

	Return to assets problem	Leverage problem	Interest rate problem
All Farms Re < 0	65.40%	25.60%	9.00%
-2.5% < Re < 0%	50.00%	46.90%	3.10%
Re < -2.5%	75.72%	11.50%	12.81%

Table 3: Re values of financially unsuccessful farms at different leverage and interest rate values

Farm	Actual k with actual l	Actual k with l reduced by one-third	Actual l with target k	Target k with l reduced by one-third
1	-1.075%	-0.865%	-0.658%	-0.595%
2	-1.140%	0.246%	-0.825%	0.410%
3	-2.475%	-1.651%	-2.216%	-1.491%
4	-4.771%	-3.602%	-2.419%	-2.055%
5	-5.911%	-4.989%	-3.390%	-3.244%

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