

Exchange of Ideas 2006

An Interactive Spreadsheet Lesson on Rate of Return on Assets and Rate of Return on Equity

Presented by

Wayne Pike

Rate of Return on Assets and Rate of Return on Equity Spreadsheet plus Weighted Cost of Capital Analysis

This spreadsheet is designed to be an interactive exercise for the farm business management student and instructor who are interested in understanding more about Rates of Return on Assets and Rates of Return on Equity.

The examples given are designed to work together with the Finan farm business analysis program, but would work with any analysis program or record system.

The Weighted Cost of Capital exercise emphasizes the link between returns to borrowed capital and owned capital. It can be used to illustrate the weak link between the actual interest rate paid to lenders and the actual RROA and RROE.

Suggestions:

A. Immediately save this spreadsheet with a different title before manipulating any numbers. This will allow you to quickly restore the various examples should you find that necessary.

B. Each worksheet is entirely protected except where cells are designed to be changed for recalculations. To unprotect a worksheet go to Tools, click on Protection, Unprotect Sheet. There is no password.

C. Proceed worksheet by worksheet in numerical order:

1. RROA Defined includes a definition of RROA plus some notes on how it may be used.

2. RROE Defined includes a definition of RROE plus commentary on how it may be used and abused.

3. So What is further discussion on how RROA and RROE may be used in farm analysis interpretation.

4. Dairy Example is an illustration comparing two simple dairy situations that vary only on the amount of net farm income each earns. Variables can be changed to show the effect of management changes.

5. Land Example is an illustration showing the impact of two different methods of valuation on RROA and RROE.

6. Nasty RROA - RROE Tricks shows the shortcomings of placing too much emphasis on RROA & RROE in decision making.

7. Finan Profitability follows the profitability section of the Finan farm analysis. The producer with a Finan can input their own information into the cells and then manipulate them to see the effects.

8. Weighted Cost of Capital repeats the Finan Profitability worksheet and adds the Weighted Cost of Capital Calculation at the bottom.

D. Users are encouraged to learn about and use the Goal Seek feature of Excel located under Tools. This is an excellent way to answer the What-If questions raised in this analysis interpretation tool.

This spreadsheet is based on information derived from the Finpack User's Manual and Dr. David Kohl's "Weighing the Variables."

This spreadsheet was designed by Wayne Pike, Riverland Community College, for NFRBMEA Exchange of Ideas program. June 2006.

If you have questions or comments, please contact wcpike@myclearwave.net or 507-251-1937.

Definition of Rate of Return on Assets

Rate of return on assets is a profitability measure that compares profit generated in the business to the amount of assets used to generate that profit.

Rate of return on assets is often described as, in effect, the interest rate earned in the past year on all money invested in the business.

Rate of return on assets (RROA) is calculated as follows:

$$\text{RROA} = \text{Return on Farm Assets} / \text{Average Farm Investment}$$

Where:

$$\text{Return on Farm Assets} = \text{Net Farm Income} + \text{Interest Paid} - \text{Value of Operator's Labor \& Management}$$

and:

$$\text{Average Farm Investment} = (\text{Beginning Total Farm Assets} + \text{Ending Total Farm Assets})/2$$

When assets are valued at market value, the RROA can be looked at as the "opportunity cost" of investing in the farm instead of alternate investments.

When assets are valued at cost (cost - depreciation), the RROA represents the actual return on the average dollar invested in the business.

A reasonable goal may be to attain a RROA higher than the average interest rate paid on debt. If this goal is attained, your investment is earning enough to pay your interest expense with some left over for debt retirement, family living and capital expenditures.

Agriculture, and farm land in particular, have had historically low RROA. Farm businesses have survived with these lower returns because, on average, farms businesses carry low debt loads. Even though RROA have been lower than interest rates, low debt loads mean low interest payments leaving some residual returns to the farmer's equity.

Farmers must be cautious of the relationship between RROA and interest rates. If you expand your business using debt capital or if your debt to asset ratio increases over time, profitability takes on added importance.

Note the connection between RROA, operating profit margin and asset turnover rate:

$$\text{RROA} = \text{operating profit margin} \times \text{asset turnover rate}$$

So if operating profit margin and asset turnover rate are the building blocks of the farm's level of profitability, then RROA is the measure of how well these two factors are working together.

See the Financial Standards Measures in Finan:

Under "Efficiency" you will find the asset turnover rate (market).

Asset turnover rate times Operating Profit Margin under "Profitability" will yield the RROA also listed under "Profitability"

Definition of Rate of Return on Equity

Rate of return on equity is a profitability measure that compares profit generated in the business to the amount of owner equity used to generate that profit.

Rate of return on equity is often described as, in effect, the interest rate earned in the past year on the owner's equity invested in the business.

Rate of return on equity (RROE) is calculated as follows:

$$\text{RROE} = \text{Return on Farm Equity} / \text{Average Farm Net Worth}$$

Where:

$$\text{Return on Farm Equity} = \text{Net Farm Income} - \text{Value of Operator's Labor \& Management}$$

and:

$$\text{Average Farm Net Worth} = (\text{Beginning Farm Net Worth} + \text{Ending Farm Net Worth})/2$$

When assets are valued at market value, RROE can be compared to returns available if the equity capital were to be liquidated and invested in alternate investments.

When assets are valued at cost, RROE represents the actual return to the amount of equity capital you have invested in the farm business.

When the RROA is higher than the average interest rate paid, then RROE will be still higher, reflecting that there are residual returns to equity capital after paying all interest expenses. This is positive use of financial leverage.

When RROA is lower than the average interest rate paid, then RROE will be still lower, reflecting that borrowed capital did not earn enough to pay its interest cost. This is negative financial leverage.

As debt to asset ratios increase, these relationships become even more critical. Profitability becomes an increasingly key concern as debt level increases.

Dr. David Kohl, "Profit in business is like breathing in humans; it is a necessity, not an option."

Dr. Kohl also says, "Rate of return on equity is the most dangerous of the ratios used to assess profitability because it can be artificially inflated by low equity. This is one of the main reasons that heavily leveraged main street businesses go out of business: in good times it pays to leverage, but in bad times equity must be utilized to overcome financial problems through refinancing strategies."

Spreadsheet by Wayne Pike, Riverland Community College, wcpike@myclearwave.net

RROA and RROE - So What?

RROA and RROE are profitability measures based on net farm income.

RROA and RROE link the results of the income statement (net farm income or NFI) to the balance sheet. They help make NFI a more useful figure when compared to the assets required to generate that income.

Net farm income is always accrual basis.

RROA and RROE can be calculated using cost or market balance sheet values.

Cost basis may be more compatible with trends and non-farm businesses. This is the "typical" non-farm method and results in higher RROA because of lower valuations.

Market basis may be more "real world". If you are not selling your farm at these prices today, then you are buying it. This is the "typical" farm method and results in lower RROA. Optimistic asset values result in conservative returns. Conservative asset values result in high returns.

What should RROA and RROE be?

It can be safely said that RROA should always be higher than the average rate of interest paid and accrued. When RROA is higher than the average interest paid and accrued, then RROE will be higher than RROA and this is a good situation.

Wayne Pike's
comments
underlined.

It can be safely said that RROE should always be higher than the next best alternative investment.

Having made these safe statements, there seems to be no hard and fast rules of thumb because of the interplay of debt, asset valuation, value of operator's labor and management and asset turnover.

The following worksheets give examples of how these factors work together.

In general:

When RROA is greater than the average interest rate paid, then RROE will be greater than RROA.

When RROA is less than the average interest rate paid, then RROE will be less RROA.

When RROA is equal to RROE then possibly there is no debt.

Information derived from Finpack User's Manual and Dr. David Kohl's "Weighing the Variables"

In this example we compare the effect of net farm income on RROA and RROE.
 Note that the only factor that is different in the default example is that there is \$600 less net farm income per cow.
 That represents about 3500 pounds of milk at \$17 per hundredweight.

(Do not type in red cells)

Rate of Return on Assets and Rate of Return on Equity Examples

Cow at	2000 per head	Cow at	2000 per head
Net Farm Income	805 per head	Net Farm Income	205 per head
Percent in debt	0.623	Percent in debt	0.623
Interest Rate	0.065	Interest Rate	0.065
Value of Labor & Mgmt	202.52 per head	Value of Labor & Mgmt	202.52 per head
Rate of Return on Assets		Rate of Return on Assets	
	34.1735		4.1735
Rate of Return on Equity		Rate of Return on Equity	
	79.90450928		0.328912467
Debt per cow	1246	Debt per cow	1246
Interest per cow	80.99	Interest per cow	80.99

In this example we compare the effect of differences in valuations of assets.

Note that the only difference in the default example is the value of an acre of land. (Cost vs. Market Values)

(Do not type in red cells)

Rate of Return on Assets and Rate of Return on Equity Examples

	Cost		Market
Land at	500 per acre	Land at	2500 per acre
Net Farm Income	50 per acre	Net Farm Income	50 per acre
Percent in debt	0.8	Percent in debt	0.16
Interest Rate	0.065	Interest Rate	0.065
Value of Labor & Mgmt	25 per acre	Value of Labor & Mgmt	25 per acre
Rate of Return on Assets		Rate of Return on Assets	
	10.2		2.04
Rate of Return on Equity		Rate of Return on Equity	
	25		1.19047619
Debt per acre	400	Debt per acre	400
Interest per acre	26	Interest per acre	26

Nasty RROA - RROE Tricks

RROA and RROE can be dangerous as Dr. Kohl points out. We have to be careful before drawing conclusions.

Consider the two following examples concerning Fred Farmer and Portia Producer. Fred and Portia are fenceline neighbors. They are equally good producers on equally productive farms. The only difference between them is their debt levels.

Fred Farmer		Portia Producer	
Total assets =	180000	Total assets =	180000
Total liabilities =	171000	Total liabilities =	9000
Equity =	9000	Equity =	171000
Interest pd & accrued=	15000	Interest pd & accrued=	1000
Last Year's Net Farm Income	36000	Last Year's Net Farm Income	50000
Value of labor & mgmt =	22132	Value of labor & mgmt =	22132
What were Fred's RROA & RROE?		What were Portia's RROA & RROE?	
Return on Assets	28868	Return on Assets	28868
RROA =	16.04%	RROA =	16.04%
RROE =	154.09%	RROE =	16.30%

If you were the lender, and had to finance one or the other, would you rather finance Fred or Portia?

If you were to look just at RROA and RROE you might arrive at a credit decision that could be detrimental to your institution's financial standing. Fred is doing well as indicated by his RROA. His outstanding RROE is to be commended, but it is meaningless because of his low equity. You might like to finance Fred because he borrows more money, but in a poor price or production year, you might be taking on more risk than you are comfortable with.

Dr. Kohl says, "Rate of return on equity is the most dangerous of the ratios used to assess profitability because it can be artificially inflated by low equity. This is one of the main reasons that heavily leveraged main street businesses go out of business: in good times it pays to leverage, but in bad times equity must be utilized to overcome financial problems through refinancing strategies."

Spreadsheet by Wayne Pike, Riverland Community College, wcpike@myclearwave.net

Finan Profitability Section Reference

(Type in yellow cells only)

	Cost	Market	
Net Farm Income	65118	65118	Line J Cost Side
Value of Operator Labor & Mgmt	31500	31500	Line N
Change in Market Valuation	XXXXXXXX	10547	Line K Market Side
	Cost	Market	
Average Farm Assets	870480	1020593	Line P
Average Farm Liabilities	331243	331243	(Market value net worth and cost value net worth may be different because of deferred liabilities.)
Average Net Worth	539237	607481	Line R
Interest Paid(Accrual Basis)	16327	16327	Line M (Accrual)
Overall Interest Rate on Liab.	4.9	4.9	
Opportunity Cost	6	6	(Finan uses 6%)
Rate of Return on Assets	5.7	5.9	(Should be higher than the overall interest rate.)
Return on Assets	49945	60492	
Rate of Return on Equity	6.2	7.3	(Will be greater than RROA if RROA is greater than the Overall Interest Rate on Liabilities)
Return on Equity	33618	44165	

Finan Profitability Section Reference with Weighted Cost of Capital

(Type in yellow cells only)

	Cost	Market	
Net Farm Income	65118	65118	Line J Cost Side
Value of Operator Labor & Mgmt	31500	31500	Line N
Change in Market Valuation	XXXXXXXX	10547	Line K Market Side
	Cost	Market	
Average Farm Assets	870480	1020593	Line P
Average Farm Liabilities	331243	331243	(Market value net worth and cost value net worth may be different because of deferred liabilities.)
Average Net Worth	539237	607481	Line R
Interest Paid(Accrual Basis)	16327	16327	Line M (Accrual)
Overall Interest Rate on Liab.	4.9	4.9	
Opportunity Cost	6	6	(Finan uses 6%)
Rate of Return on Assets	5.7	5.9	(Should be higher than the overall interest rate.)
Return on Assets	49945	60492	
Rate of Return on Equity	6.2	7.3	(Will be greater than RROA if RROA is greater than the Overall Interest Rate on Liabilities)
Return on Equity	33618	44165	

Weighted Cost of Capital

Borrowed Capital Weight	38.05	32.46	(Percent of all farm capital borrowed)
Equity Capital Weight	61.95	67.54	(Percent of all farm capital owned)
Borrowed Cost of Capital	1.88	1.60	(Proportional interest rate on borrowed capital)
Equity Cost of Capital	3.72	4.05	(Proportional interest rate on equity capital)
Weighted Cost of Capital	5.59	5.65	(Weighted cost of all capital.)

What does this tell us? In this example, RROA is higher than the average interest rate paid and accrued.(Cell D21 & F21) But, that does not tell us if the RROA is adequate to cover the interest paid and accrued plus opportunity costs. We really need to know if our returns are greater than our costs of using the lender's capital plus our own.

In this example, RROA and RROE are both higher than the Weighted Cost of Capital of 5.59 cost basis and 5.65 market basis.(Cell D41 & F41) The interest rate used for opportunity cost relative to the interest rate actually paid and accrued has a major effect on this analysis.