

# Weighted Cost of Capital on Florida Dairy Farms

Albert De Vries<sup>1</sup>, Karun Kaniyamattam<sup>1</sup>, and David Galligan<sup>2</sup>

<sup>1</sup>Department of Animal Sciences, University of Florida, Gainesville, FL 32611-0910

<sup>2</sup>School of Veterinary Medicine, University of Pennsylvania, Kennett Square, PA 19348  
[devries@ufl.edu](mailto:devries@ufl.edu)

## What is the Weighted Average Cost of Capital?

A dairy farm consists of assets that are either owned by the owner (equity) or financed (debt). From these total assets, a return must be made to 1) meet the debt obligations, and 2) grow equity at a desirable rate. Proper analysis of investment opportunities on dairy farms requires that the expected changes in cash flow need to be discounted by the cost of capital. The preferred discount rate is the weighted average cost of capital ( $r_{wacc}$ ) which is calculated as  $r_{wacc} = r_{debt} * (1 - r_{tax}) * D/(E + D) + r_{equity} * E/(E + D)$  where  $r_{debt}$  is debt rate,  $D$  is debt /cow,  $E$  is equity/cow and  $r_{equity}$  is the desired equity rate (Brealey and Myers, 2000). The expected return from any investment opportunity (money from equity or debt) must be judged against this  $r_{wacc}$ . If this desired return rate is met or exceeded, the return on equity and return on assets will grow.

For example, if debt/cow  $D = \$3000$  and equity/cow  $E = \$3000$ , then total assets are valued at \$6000. If the debt rate  $r_{debt} = 9\%$  and tax rate  $r_{tax} = 0\%$ , then the  $r_{wacc} = 4.5\%$ . In this example, the debt obligations are met if the return on assets is 4.5%. However, equity is not grown, and the tax rate is not considered. Adding a 33% tax rate decreases the  $r_{wacc}$  to 3.02% because these debt costs are tax deductible. The assets now have to work less hard to meet the debt obligations. Further adding a 5% desired return on equity now increases the  $r_{wacc}$  to 5.52%. For example, these equity dollars might yield 5% somewhere else so in order to be put into the dairy business they should yield at least 5%. The final  $r_{wacc}$  should be the discount rate that is included in the investment analysis. (This is the traditional approach. More complicated investment analysis methods exist.)

Because debt and equity are farm specific, the  $r_{wacc}$  is farm specific. With grant support from the Southeast Milk, Inc. Dairy Check-off program, we studied the weighted average cost of capital on Florida dairy farms from 2000 to 2008 (Kaniyamattam et al., 2011).

## Weighted Average Cost of Capital on Dairy Farms in Florida

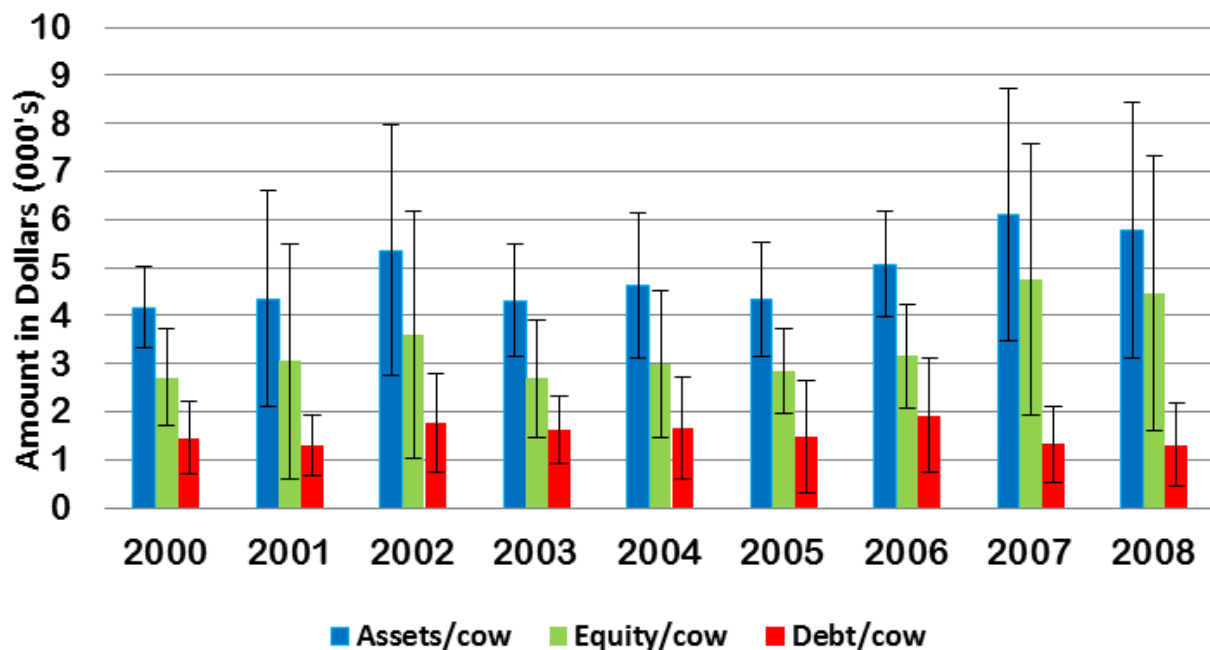
Financial farm-year records from 2000 to 2008 for dairy farms in Florida ( $n=80$ ) were obtained from the Dairy Business Analysis Project (DBAP) database. DBAP was a financial benchmarking project executed between the Universities of Florida and Georgia from 1996 to 2009 (De Vries et al., 2010). Participation by dairy producers in Florida and Georgia was voluntary. Financial survey data were collected annually and balance sheets, income statements, and cost of production measures were calculated for each participating farm. In addition, benchmark reports were generated for each farm to compare the farm specific results with the average and most profitable dairy farms.

Using the DBAP data, realized equity rates  $r_{equity}$  were calculated from the relative differences of farm equity on January 1 of each year. Only realized equity rates between -30% and +30% were

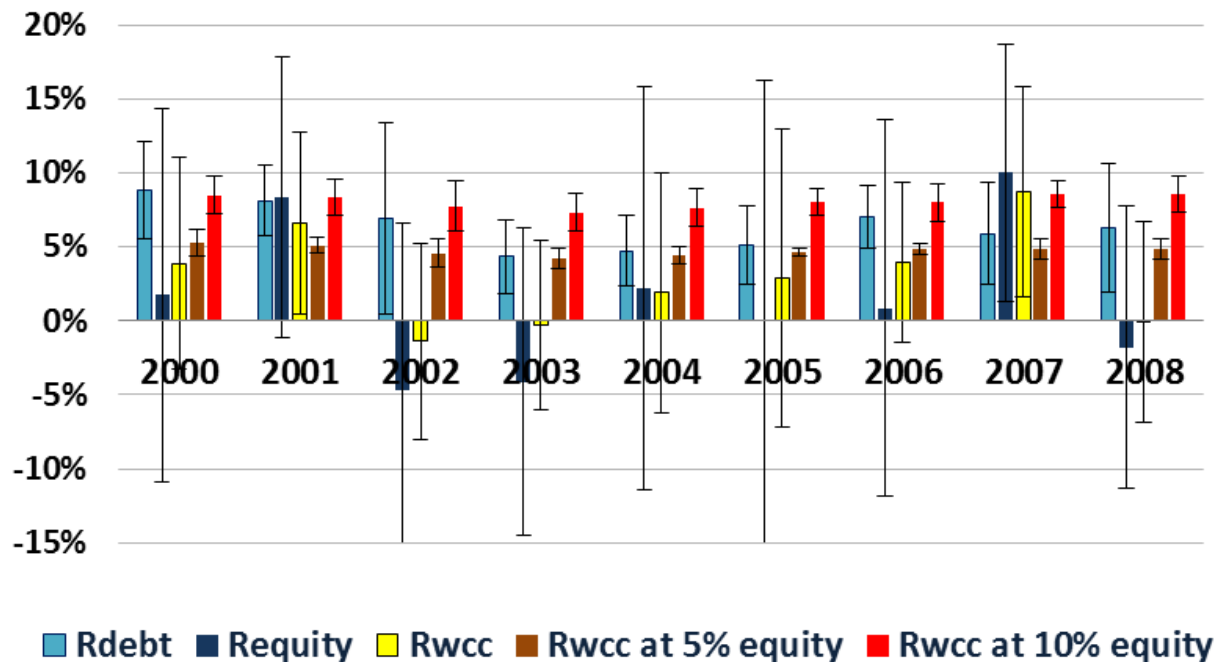
included. Desired equity rates were also set at 5% and 10%. Debt rates  $r_{\text{debt}}$  were calculated as interest expenses / average outstanding loan amounts at December 31. Tax rate  $r_{\text{tax}}$  was set at 33%. The cash flow imbalance for each farm-year was between -5% and 5%. The number of dairy cows in each farm-year was limited to herds with at least 200 cows.

Average  $\pm$  standard deviation for assets/cow, debt/cow, and equity /cow were  $\$4,896 \pm 1,775$ ,  $\$1,536 \pm 906$ ,  $\$3,361 \pm 1,882$  respectively (Figure 1). Average debt rate and equity rates were  $6.4 \pm 3.3\%$  and  $1.4 \pm 11.6\%$ , respectively (Figure 2) with large swings within and between years. The realized weighted average cost of capital  $r_{\text{wacc}}$  was  $2.9\% \pm 7.0\%$ , whereas at a desired 5% return on equity, the  $r_{\text{wacc}}$  was  $4.8 \pm 0.6\%$ , and at a desired 10% return on equity, the  $r_{\text{wacc}}$  was  $8.1 \pm 1.2\%$ . The variation between farms was smaller at the desired rates of equity because there is no variation in the equity rates between farms.

The Pearson correlation coefficient between assets/cow and equity/cow was 0.90. The correlations between debt/cow, and equity rate and equity/cow were -0.25 and -0.30 respectively. Other correlations were not significant.



**Figure 1.** Average assets/cow, equity/cow and debt/cow (from left to right) from 2000 to 2008 for 80 dairy farms in Florida that participated in the Dairy Business Analysis Project. The vertical lines are the standard deviations showing the amount of variation within a year.



**Figure 2.** Average debt rate (Rdebt), equity rate (Requity), realized weighed average cost of capital (Rwcc), and the weighted average cost of capital at 5% desired equity rate (Rwcc at 5% equity) and at 10% desired rate of equity (Rwcc at 10% equity) (from left to right) from 2000 to 2008 for 80 dairy farms in Florida that participated in the Dairy Business Analysis Project. The vertical lines are the standard deviations showing the amount of variation within a year.

The regression analysis of  $r_{wacc}$  (5% desired equity rate) with year, assets/cow, debt/cow, milk sold/cow, average number of cows showed significant effects of year and average number of cows ( $R^2 = 0.37$ ). At 10% desired equity rate, greater assets/cow and greater milk sold/cow were associated with greater  $r_{wacc}$  ( $R^2 = 0.72$ ). In conclusion, the weighted average cost of capital for dairy farms in Florida for desired equity rates between 5% and 10% were on average similar to textbook cost of capital of 5% to 10% per year.

### Online Tools

Dr. David Galligan has developed a visual analytic tool that lets users quickly calculate the weighted average cost of capital. Visit <http://www.dgalligan.com/galliganx/visualanalytics/wacc.html> (username and password are both: guest). An introduction video by Dr. Galligan explains the concepts of weighted average cost of capital and the visual analytic tool. This video is at YouTube: <http://www.youtube.com/watch?v=eOcVyabz55c>

## Reference

Brealey, R. A. and S. C. Meyers. 2000. Principles of Corporate Finance. 6<sup>th</sup> Ed. Irwin McGraw-Hill, Boston, MA.

De Vries, A., M. Sowerby, L. Ely, and R. Giesy. 2010. Dairy Business Analysis Project: 2008 Financial Summary. EDIS Document AN249. Available at <http://edis.ifas.ufl.edu>

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## NOTES

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