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REAL OPTION ANALYSIS: AN OVERVIEW OF THE PROCESS AND HOW IT CAN BE APPLIED TO AGRIBUSINESS: PART I

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- *Capital Investment Decisions: Traditional or New Methods?*
- *Passive versus Active Management Strategies*
- *Is There a Value to Waiting?*

This is the first part of a three part series describing Real Option Analysis (RO).

Large commercial producers continue to gain in size and influence in U.S. agriculture. Indeed, the largest two percent of agricultural producers account for more than half of agricultural sales (NASS, 1997). These producers devote considerable effort to assessing new investments such as the addition of land, storage facilities, or value-added products. Capital investment assessment tools traditionally include four methods: payback, simple interest rate, discount or net present value (NPV), and internal rate of return (IRR). Although the NPV and IRR methods of evaluation both incorporate the time value of money and have thus been the preferred investment approaches, producers often choose to use the more easy-to-understand payback method (if any method at all) demonstrating a need for education on capital budgeting techniques.

Traditional NPV analysis fails to explicitly model the changing volatility of underlying variables including revenues. Instead, managers that use NPV consider risk either by converting after-tax cash flows to certainty equivalents, by assessing discrete probabilities, or by adjusting the discount rate. Real Option (RO) analysis, on the other hand, explicitly captures the flexible nature of capital investments and the changing risk environment in which decisions to expand, contract, eliminate, or begin a project are all potential alternatives.

RO analysis is fast becoming the preferred investment analysis tool used by business managers demonstrating the need for its inclusion in agribusiness education and outreach programs (Mun, 2002).

What is Real Option Analysis (RO)?

A real option exists if we have the right to take a decision at one or more points in the future (e.g. to invest or not to invest, or to sell out or not to sell out). Between now and the time of decision, market conditions will change unpredictably, making one or other of the available decisions better for us, and we will have the right to take whatever decision will suit us best at the time (Howell, et al, 2001).

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RO analysis is a tool for assessing investment decisions or developing strategic plans under uncertainty, and perhaps more importantly, provides a quantitative method for monitoring, measuring, and adjusting decisions as economic conditions change. Successful managers develop comprehensive strategic business plans, and then adapt those plans in expectation of a response to change. By contrast, passive managers who make capital budget decisions or strategic plans and do not effectively monitor and alter plans will not be as successful. Yet, traditional methods of investment valuation assume the future is known with certainty implying a passive approach to investment analysis. Traditional models such as NPV assume that managers have no flexibility to make changes—that the investment choice is an all or nothing decision. The traditional discount method of valuation, while serving as a good starting point in the capital budgeting process, is actually a deterministic tool attempting to model a volatile environment.

In traditional NPV analysis (see Figure 1, Box A), the future cash flow of an investment is calculated and discounted to the present. If the present value minus the capital outlay is greater than zero, the investment generates the required rate of return, and should be a “go,” all else equal. This NPV trigger implies that the manager is finished with this project and cannot make any changes if things don’t progress as planned. Many investments, however, may be reversible, abandoned, or expanded, and it might also be better to “wait and see” if the uncertainty can be resolved. This situation is described in Figure 1, Box B, where the NPV values at the end of the decision tree indicate that the project could either fall to \$0.50 or potentially increase by a factor of four. RO analysis is an important capital budgeting tool because it captures the potential to avoid deeper losses or generate greater profits as important underlying variables change.

Financial Options:

Financial options are similar in many respects to real options, and can be used as a starting point for explaining the latter. An important feature of financial options is flexibility, just as is the case with RO. The owner of a financial option purchases it at a predetermined price (the premium), in order to have the flexibility to buy or sell an asset if it is profitable to do so. The predetermined price at which the purchase (sale) is made is called the exercise price, with a call option as

the right to buy and the put option as the right to sell. For example, if a call option on a stock has an exercise value of \$100, any time the stock’s price is over \$100, the option would have value and be “in-the-money.” For any stock price under \$100, the option would not have value and would be “out-of-the-money.” Financial option holders are under no obligation to exercise an option, regardless if it is in-the-money or out-of-the-money.

So why do investors buy and sell out-of-the-money options for a premium? The answer is that in an uncertain world, the option may at some point in time be in-the-money prior to its expiration date. In this context, the premium value of an option reflects the level of uncertainty – the greater the likelihood of the option becoming in-the-money, the greater its value and its premium. The option holder also has the flexibility to abandon (sell) the option, exercise it, or “wait and see” until the uncertainty is at least partially resolved. As a tool for investment decisions, RO analysis excels at quantifying uncertainty and correctly modeling managerial flexibility to abandon, exercise, or to wait. For example, suppose that a group of beef producers wants to join a vertically coordinated alliance in order to differentiate their product. A negative NPV may show it as a “no go,” but RO analysis could indicate that the alliance could be profitable at a later date giving the producers the option to wait and see.

A final note is needed on the relationship between an RO approach and NPV. The RO approach is more comprehensive than that of NPV because it considers the value of waiting, a value placed on managerial flexibility. For this reason the RO approach is preferred. Yet, the practical starting place of an RO methodology is to determine the project’s NPV assuming a risk free discount rate. In fact, if uncertainty does not exist, there is no value in waiting, and the RO and NPV triggers are identical.

The next part of this three-part series will include an agricultural application of RO analysis.

References:

USDA-NASS. 1997 Census of Agriculture.

Howell, S., A. Stark, D. Newton, D. Paxson, M. Cavus, J. Pereira, and K. Patel. (2001) *Real Options*. Prentice Hall, Great Britain.

Figure 1

