Dynamic Risk-Based Modeling™ Services

In the realm of data analysis, specifically as it relates to an analysis of a particular business, there are two broad methods for understanding how a business will function under a given set of circumstances. The first method for understanding a business's ability to survive challenging conditions or flourish in favorable economic conditions is known technically as "deterministic modeling", or more commonly, spreadsheet modeling. The second method is known technically as "stochastic modeling" or, as Decision Innovation Solutions refers to it, Dynamic Risk-Based Modeling™.

Dynamic Risk-Based Modeling™ services have several distinct advantages over traditional spreadsheet modeling, the most important of which is the ability to capture historical variability and the relationships among key variables. When a farm manager has a better understanding of the variables which have the most impact on their specific farm, they can allocate their finite resources in the areas which will yield the best risk-reducing outcome. The correct allocation of resources will then demonstrate to their stakeholders, such as lenders, that they have a sound understanding of their risk environment and have planned accordingly. Following is a more in-depth discussion regarding the pros and cons of both types of modeling. We illustrate these differences using the dairy industry as an example.

Spreadsheet Modeling

Most business plans and feasibility studies are prepared and analyzed with the spreadsheet modeling approach. Spreadsheet modeling, at its core, attempts to understand how a business functions with respect to the presumed key variables which impact profit or loss. In the context of a dairy farm, variables which would be presumed to be key would be:

1) Milk price
2) Ration ingredient cost
3) Milk production variability
4) Total replacement rate (death and normal culling)
5) Public policy

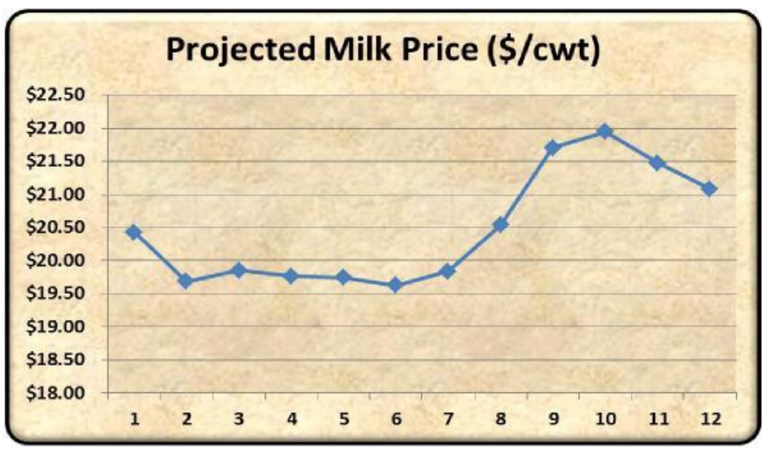

Figure 1, Example of a Deterministic Projection

Note that these variables are both financial and production related. Taken together, each variable would then have an analyst's best estimate of what is most likely to occur assigned to it over the selected time frame of analysis. Figure 1 is an example of what a deterministic projection would look like for the price of milk over the course of twelve time periods (months). While there is visible fluctuation in the projection from one period to the next, it does not account for the historical volatility that has existed within each of the time periods.

In an effort to understand the impact of differing price levels on a farm's ability to remain profitable, a creator of a spreadsheet model may input differing levels of the milk price and review the results from the change in inputs. While this process would be time-consuming, many iterations of this practice would then give the model's audience the ability to understand the impact of milk price on profitability. However, in the process of adjusting certain variables in a spreadsheet model, there would still be the absence of the accounting for historical volatility.

Additionally, relationships, or correlation, among variables are not typically considered with spreadsheet modeling. For example, in the context of a dairy farm, it is very difficult for a spreadsheet model to account for the high correlation between two variables such as milk price and the price for replacement heifers. Changing one of these correlated variables without equal consideration for the other can lead to inaccurate results and interpretation. If neither historical volatility nor correlation among variables is incorporated into the model, the results will not adequately characterize the risks of the project or business. As a result, decisions based on spreadsheet modeling are often riskier in comparison to those made with Dynamic Risk-Based Modeling™.

Dynamic Risk-Based Modeling™ Services

Similar to spreadsheet modeling, the method for analyzing a business with Dynamic Risk-Based Modeling™ services begin with the identification of the variables that would be presumed to be key, which would continue to be:

1) Milk price
2) Ration ingredient cost
3) Milk production variability
4) Total replacement rate (death and normal culling)
5) Public policy

Once the key variables have been identified, an analysis commences regarding the relationship among the selected variables. This phase of the analysis requires the use of an appropriate statistical software package to fully understand how each variable has historically behaved with respect to the others under consideration, as well as the variables' respective occurrence and magnitude of volatility. In our experience with this type of modeling, the analysis conducted on the presumed key variables will oftentimes yield the identification of other variables with considerable importance to the business in question. If this occurs, these additional variables would then be considered for the duration of the analysis.

When comfortable with the identified set of key variables, we then create a series of financial statements to include, at a minimum, an income statement, cash flow statement, and balance sheet for all time periods under consideration. The primary purpose for constructing financial statements is because it is the most logical and straightforward way with which to judge the ability of a business to withstand or flourish under differing economic and/or production environments. Notably, if a ratio or other financial measure can be calculated from a set of financial statements, it can also be simulated and analyzed under this modeling framework.

After a sound understanding of how the key variables have behaved in the past is achieved, we then create a trend line projection for each of the variables for the duration of the time frame being analyzed. This is like the spreadsheet modeling example illustrated in Figure 1 and would represent the approximate average of all potential outcomes. Once an adequate comfort level has been attained with the trend line projection, we then sample random draws, or realizations, from the historical relationships identified and associate them with the trend line projection. This then produces one random realization for each of the key variables, while still accounting for historical volatility and correlation among variables.

Just like the average trend line projection does not adequately characterize risk, neither is a single random draw sufficient to understand the most probable outcome. In fact, our work has shown that in order to allow a model to adequately allow all outcomes to be sufficiently manifest, a series of 500 random draws is necessary.

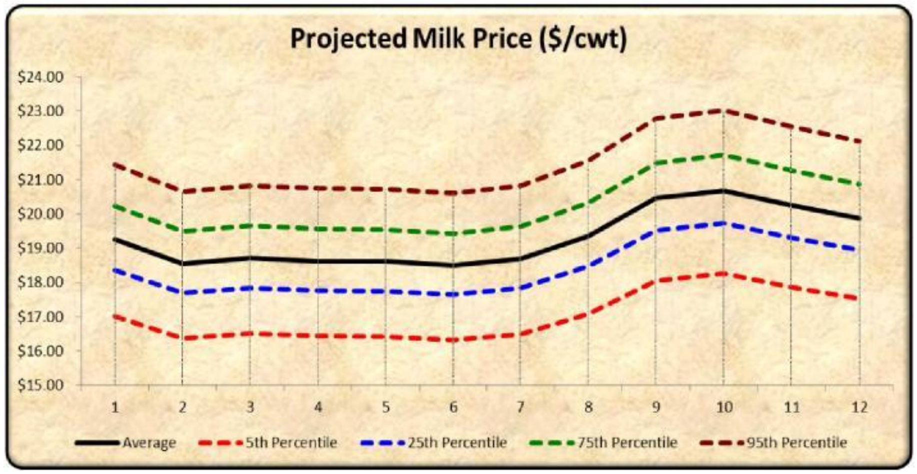

Figure 2, Random Milk Price Draws

Again using a statistical software package, we have the ability to capture and store the realizations from each of the 500 random draws for future analysis. After we have captured the realizations of each of these random draws, we can then use graphing tools to visually show the likelihood of certain events occurring. Using milk price again as an example (Figure 2), we again see the trend line (solid black line) manifesting a pattern similar to that in Figure 1. However, a key difference in the graph in Figure 2 versus Figure 1 is the dashed lines above and below the trend line. These dashed lines represent percentiles, or more generally, the likelihood of observing certain levels of milk prices for a given time period.

In terms of interpreting the dashed lines, the dashed blue line represents the 25th percentile, or more specifically, 25% of the time we project milk prices will be at that line or below for a given time period; conversely, 75% of the time we would project milk prices would be above the dashed blue line. Similar to the graph in Figure 2, we could, and often do, produce graphs similar to this for the other key variables.

In addition to producing visual depictions of the behavior of the identified key variables, we also create graphs and other charts to illustrate the effects of the sum total of all key variables on the success (or failure) of a particular business. One chart often used is known as a “stoplight graph”. This graph easily conveys the probability of a favorable outcome in terms of something we’re all familiar with, a stoplight. Figure 3 shows the likelihood of achieving certain levels of net present value (NPV). We have arbitrarily defined a good NPV for this particular dairy as something greater than $9 million. Referring to the chart, we see that out of all the random realizations (which were then propagated through the financial statements), 18% of the time we achieved a NPV of at least $9 million.

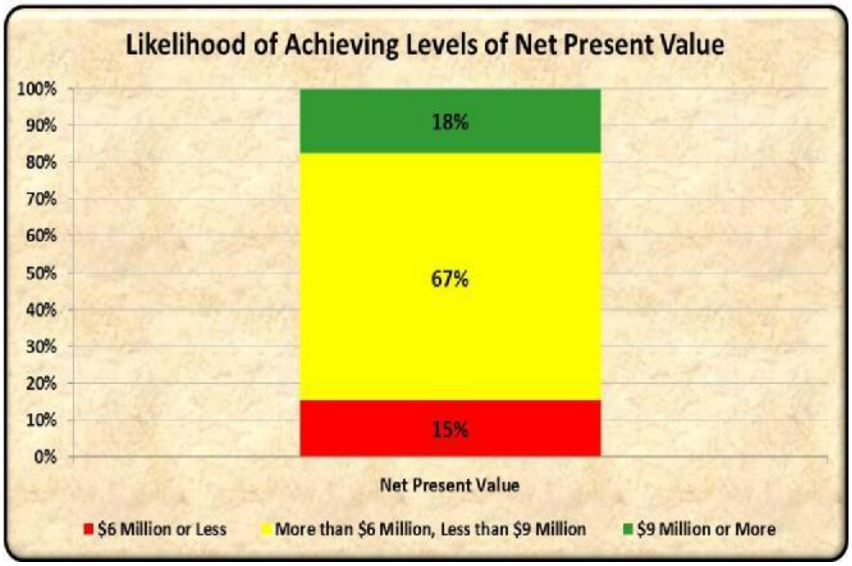

Figure 3, Net Present Value Stoplight Chart

The sum total of the above analysis contributes to what we call the baseline outcome and implies we have made our best effort to accurately depict the actual system which, in this case, a dairy operates. From this baseline, we can then conduct sensitivity and scenario analyses in a manner which is only limited by the analyst's ability to accurately define and characterize the unique circumstances under study.

Scenario Analysis with Respect to Baseline Projections

Scenario analysis is a potent method for determining the outcomes of certain events occurring that have implications for a particular business. These events could be either within or out of the control of management. Again using the example of a dairy farm, by defining a scenario of an average 10% reduction in the price of milk or a 10% average increase in the cost of a key ration ingredient, such as corn, we can understand what impact that may have on the dairy. Along the same lines, a third scenario would be if the lower milk price and higher feed cost occurred at the same time. One example of what this scenario analysis could answer would be whether the dairy became stressed, or more specifically, when, how frequently, and for what duration the stress occurred. If the stress is deemed excessive by either management or lender, a plan of action could then be devised to mitigate the risk and reduce exposure to its occurrence. This would then give both management and lender the ability to have a higher degree of confidence in the ability to remain a viable business.

Figure 4 shows, in terms of NPV, what the impact of these scenarios would be on a dairy farm. The baseline, which is the same as depicted in Figure 3, is compared to the results from the other three scenarios. As shown, both a lower milk price and a higher ration cost have an adverse effect on the NPV and both should be managed accordingly.

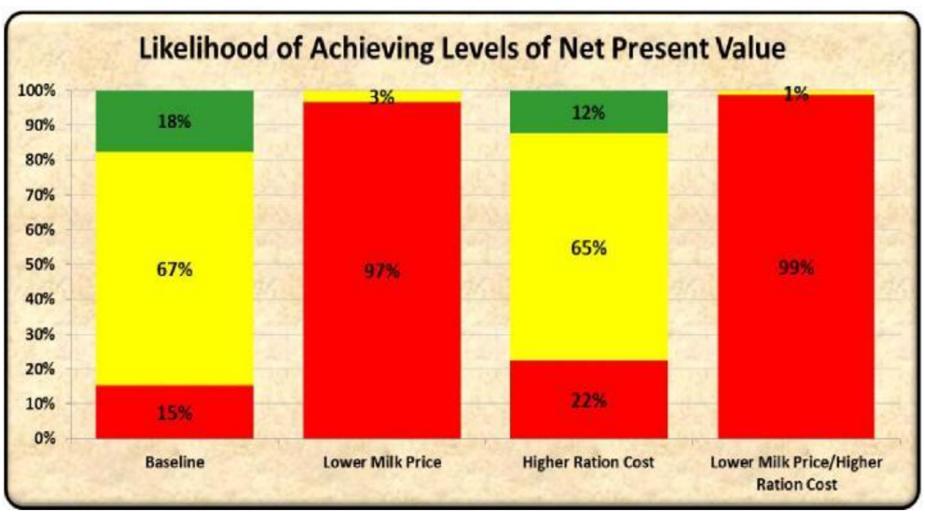

Figure 4, Stoplight Chart Depicting Scenario Analysis

However, the occurrence of a lower milk price has several times the impact on NPV than a higher ration cost. Therefore, sufficient time should be spent on mitigating the risk of milk price before turning attention to other variables. While financial scenarios are very illustrative of the impact of such things as milk price and ration cost on the success of a dairy, there are other scenarios related to livestock management which can be analyzed. Examples of livestock management scenarios in a dairy context would be:

1) Milk production levels/cow under various management techniques
2) The impact of the ratio of replacement heifers to cows from existing herds on milk production and cash flow
3) Analyzing the tradeoffs between a higher cost ration or treatment and expected milk production improvements and/or enhancement in herd health
4) The expansion of a dairy and its impact on the long-term viability of the business
5) The impact of feeding different rations to various groups of cattle
6) Whether to purchase or raise replacements
7) The impact the sale of manure as a commercial fertilizer substitute would have on profitability
8) A reduction in the overall replacement rate
9) What the implementation of a milk sale contract has on stabilizing income
10) What impact federal dairy policy (i.e., Milk Income Loss Contract) has on a dairy

Summary

As described above, our Dynamic Risk-Based Modeling™ services have several distinct advantages over traditional spreadsheet modeling, the most important of which is the ability to capture historical variability and the relationships among key variables. When a farm manager has a better understanding of the variables which have the most impact on their farm, they can allocate their finite resources in the areas which will yield the best risk-reducing outcome. The correct allocation of resources will then demonstrate to their stakeholders, such as lenders, that they have a sound understanding of their risk environment and have planned accordingly.

Dynamic Risk-Based Modeling™ services include, but are certainly not limited to, dairy farm producer services including business risk assessment services, business risk management, and business risk management consultation services. Many other applications exist for adapting this robust methodology.

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