

Asset Valuation: Not a Trivial Pursuit

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Financial models are used all the time to generate asset values. Knowing how they work is a cornerstone of effective financial reporting and risk management. Internal auditors challenged with reviewing these advanced-level operations can benefit from a working knowledge of the valuation process.

INTERNAL AUDITING IS A TOUGH JOB at any time but perhaps more now than ever before. A plethora of corporate bankruptcies, financial statement problems, and adverse market conditions have investors on edge. Bondholders and equity owners alike demand more transparency when it comes to asset values. Even reluctant organizations must heed the call as new regulations come into play.

Financial Services Institutions Are Different

Financial institutions face some unique challenges. For one thing, they are typically regulated by multiple authorities and rules are often different. Second, the asset mix for banks, insurance companies, hedge fund and mutual fund companies, and other financial service organizations is broad. Moreover, they often invest in complex securities that are harder to value. Third, reported asset values are used for a variety of reasons, including but not limited to, financial reporting, capital adequacy determination, and risk management. An incorrect number that misleads financial statement users is bad enough. When it is used to determine statutory reserves or to hedge open positions, the potential for loss is significant.

Internal auditors must be able to understand the model-validation process with respect to both concept and application, to validate a model for its accuracy and suitability.

Valuation Model Basics

Financial models are a mainstay in valuation. Some are widely used. Others are modified for specific situations. Some are proprietary. Some are made public. In

all cases, however, a model is considered effective if it provides consistent, cost-effective, and accurate asset-valuation results, and is based on sound financial theory and practice. Additionally, a good model depends on plausible assumptions, is insensitive to outliers, and appears logical.

Beyond that, the model must be simple enough for others to understand and replicate. Someone unfamiliar with computational finance is going to have a hard time documenting a complicated model, let alone using it to test results for auditing purposes.

Model Risk

Model risk occurs for many reasons. A model may be inappropriately applied, such as using a dividend discount model that assumes a certain pattern of growth in cash dividends, which makes no sense for a start-up venture that pays erratic dividends, if any at all. Another example includes recent discussions by financial experts about employee stock options, which focus on applicability of the Black-Scholes pricing model. Though widely used and well documented, many analysts feel that the Black-Scholes model is ill equipped to handle the long-term nature and lack of marketability of this type of compensation. Another limitation is the model's assumption of constant volatility of underlying stock prices.

Model risk can also arise because of a flaw in the model's structure so that it produces vastly different results for different data forms. Risk is also imminent when there are big swings in the range of data values. As history has shown several times, a model that fails in the event of a market meltdown is of no use. In fact, it can exacerbate an already bad situation. Modelers should look at possible events that have a low probability of occurrence but can be devastating to a financial organization if they do occur.

Faulty assumptions play a role as well. Ignoring transaction costs may be acceptable if a security trades frequently among a large number of investors. When bid-ask spreads are large or market barriers show up in the form of high fees, ignoring transaction costs is folly. Overlooking taxes is another area that invites review, especially if institutional trade patterns can be directly tied to tax benefits. Evaluating when assumptions are likely to be violated — and what happens when they are — is prudent practice.

Model Validation

One way to avoid model risk is to kick the proverbial tires by stress-testing the model. Stress tests permit an evaluation of the model using any number of "what-if" situations to see how it behaves for various scenarios.

The applications depend on the objective, the type of holdings, and the

constraints faced by a financial institution. A fixed-income investor might allow interest rates to drop in increments of 10 basis points and evaluate the bond valuation model results. An organization with a large position in collateralized mortgage obligations may adopt a more complex approach, first evaluating the impact of lower rates on prepayment behavior and then comparing valuation model results based on the prepayment possibilities. A life insurance company could test its actuarial model by altering demographic characteristics. An international bank may employ alternative currency rate scenarios to determine the influence of foreign exchange exposure on profitability.

If a model behaves differently across scenarios, its stability is questionable and needs to be addressed. Can an alternative model be used instead? Can modifications be made to the model already in place without sacrificing its integrity?

Back testing is another approach. The goal is to evaluate whether a model produces results that parallel historical performance. Using historical information, a good model will verify what has already occurred.

In both cases, documentation of the process must be as detailed as possible. Someone outside the process should be able to understand the model-validation process with respect to both concept and application. At a minimum, stress-testing documentation requires a description of scenarios and reasons for their selection. A write-up of the back testing procedure must include data type, data source, and the way errors are measured vis-à-vis actual realized results.

Internal Auditor's Role

Although stress testing and historical analysis are worthwhile, they are just a few of the many tools available to validate a model for its accuracy and suitability. Some financial organizations hire professionals to build and validate models. Others outsource the process. Whatever the course of action, internal auditors are still responsible for documenting and verifying results. This requires a working knowledge of valuation processes and an ability to ask the right questions of the quantitative specialists.

In addition, an internal auditor must feel comfortable enough with the modeling process to replicate results provided by the finance staff for a representative sample of trades. Although not exhaustive, the list below summarizes some of the steps involved in the verification process. Not all items will apply to every audit. Much depends on the scope of the audit and what is being verified.

1. **Gain an intuitive understanding of the model.** What is it supposed to do? What results would be immediate red flags that the model is not working properly? For example, a model that generates negative returns is

acceptable. A model that generates negative prices presents a problem. What are the underlying assumptions and do they make sense for the task at hand?

2. **Ask questions of the model builders.** Who else uses this model? What do they perceive to be its limitations? What modifications, if any, are proprietary to the firm? Why were they made? What is the form of modification made? Have the traders tested the model themselves? If so, what are some of the problems they encountered, if any? Was the model tested for extreme market scenarios?
3. **Determine whether or not a model meets regulatory requirements.** If not, why not? What modifications are needed to put the financial institution in compliance?
4. **Inquire whether or not different models are being used for tax reporting versus financial statement presentation.** If so, why and what are the differences?
5. **Understand the data issues.** Where does the data come from? How often is it updated? Does data quality differ by vendor? If so, how? Does the financial organization use data that is easy to obtain? Has the method of data capture changed at all over time? If so, how? Is there a written description of the data being used and reasons for its use over alternative sources?
6. **Ask about model access.** Who has the authority to modify the model and related computational programs? Who oversees the changes to the model? Are changes documented, including a reason for a change?
7. **Evaluate the asset portfolio mix.** Does the model consider correlations among holdings or evaluate a position on a standalone basis? For the portfolio approach, how are correlations computed and what is the frequency of recalculation?
8. **Ascertain the extent to which a model incorporates embedded derivatives.** Is the value of the embedded derivative reported as a separate item on the model output sheet, even though it cannot be stripped out and sold separately?
9. **Determine the simulation approach used to value path-dependent securities.** What are the statistical assumptions that underlie the simulation process? Do they make sense, given the assets being valued?
10. **Enlist senior management to assign someone from the finance team to work closely with the auditing team.** Have that person walk the auditor through several examples.

Only the Beginning

Internal auditors who work for or with financial institutions face an increasingly more complex world. Financial engineering has opened the doors to a wide array of choices for investors with the end result that valuation — and the related verification — is seldom a quick and easy task. Regulations sometimes require

the use and evaluation of multiple models, requiring the internal auditor to have more than a superficial understanding of the process. The message is clear. As long as financial innovation and regulatory changes persist, an internal auditor's work is never done.

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Pop Up Text:

1. An outlier is defined as a data point that does not seem to fit the statistical distribution of a specified random variable, such as security returns. There are formal tests for determining whether a data point qualifies as an outlier. An outlier might arise from incorrect data measurement or could represent an extreme value. Knowing why it exists is an important part of the model validation process.
2. The Nobel Prize in Economic Sciences was awarded to Robert C. Merton and Myron S. Scholes for their seminal work on pricing financial options. Though not awarded posthumously, the contributions of Fischer Black were recognized as vital to the process. See <http://www.nobel.se/economics/laureates/1997/press.html> for more information.
3. Different input paths are generated usually with the use of some type of statistical simulation. An output value is then determined for each of the input paths and then weighted to arrive at an estimated security value.