

# Valuations

DSE Newsletter



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# Why Black Scholes Doesn't Work

## Overvaluations Using Black Scholes

Over the past 20 years, corporate America has become accustomed to measuring the value of a stock option using the Black Scholes Merton (“BSM”) model. The accounting guidance for options is found in the Statement of Financial Accounting Standards (SFAS) No. 123®, 133 and 157 by the FASB and in regulations pertaining to IRC Section 409A by the U.S. Treasury. FASB states that “options and similar instruments will be estimated using option-pricing models adjusted for the unique characteristics of those instruments”. Black, Scholes and Merton initially provided their closed-form, equilibrium model for valuing simple European traded options. One of their key assumptions is that option holders have the ability to trade both options and the underlying stock. The Black Scholes model fails to account for the unique characteristics associated with most options.



Typical option features included in warrants agreements, convertible debt, and employee/non-employee stock options include:

- Call features (issuer can redeem the option when specific criteria are met, thus forcing early exercise)
- Options with performance conditions (e.g., vesting or share award criteria)
- Put features (holder can force redemption at a specific price if specific criteria are not met)
- Exercise price reset features (anti-dilution or full ratchet resets)
- Purchased options (holder pays a fraction of the strike price at grant)
- Indexed options (strike price varies based upon an index)

Combining these features with the fact that most options are not publicly traded, are American style options (they can be exercised early) and typically are non-transferable, BSM is not the right model to value these options. In addition, many researchers have shown that early exercise is an empirical regularity among option holders and needs to be built into the valuation model.

A more appropriate and a much more flexible approach to valuing options is to use a lattice model. In fact, only a well executed lattice model can be readily modified to correctly value options, given their unique attributes. Furthermore, in many cases, the value of common stock and the value of options must be estimated simultaneously because of the dilutive aspects of the options. If a lattice model is not being used along with a bisection methodology for allocating value, the results may be misleading and the error in valuation can be substantial. The widely accepted BSM model typically overstates the value of an option. In our experience, this valuation error typically is 30% to 100% overstated.

## ***Why Black Scholes Doesn't Work (continued)***

### **Lattice Model**

Consistent with International Financial Reporting Statement (IFRS) 2, the FASB establishes a preference for the “Lattice Model” over the Black Scholes model. Black Scholes is generally more user friendly simply because it has only six inputs and lattice models are far more flexible to offer more precise indications of value. The lattice model analyzes possible outcomes over periods of time (months, quarters, years) with as many as 20 different assumptions instead of 6 found in Black Scholes. Each of these outcomes is probability weighted and the value of the option is based on the summation of the values at the end of the periods. This process can be replicated over multiple scenarios, where the stock's value can be estimated based on the stock's historical volatility, marketability, liquidity, growth projections or capitalization rates.

Stock options can be exercised subject to specific conditions outlined in a company's option plans/agreements and may be exercised depending on the characteristics of the contract or the expectations of the holder. These conditions and characteristics affect the value of the option and can be directly accounted for using a scenario based Lattice Model.

The use of a lattice model has broad implications. Auditors and corporate executives must understand the variables that are used to calculate the fair value of options. They must also understand how changes in the required variables drive options' fair value and the resulting effect on value. Finally, the additional record-keeping responsibilities created by implementing SFAS 133, 123R and 157/159 require significant changes on the part of corporate finance executives for modeling resources, data requirements, and record-keeping capabilities.

### **Compliance and Conclusions**

For those companies or auditors in the process of evaluating which type of model to employ, we offer this guidance:

1. Review your option agreements, option plans, and option valuation history to-date.
2. Talk to your auditors or valuation experts on the front end about how strongly they feel about which option pricing model works best given the specific features incorporated in your option agreements.
3. Do a formal comparison of your option expense using different models to determine whether the difference in valuation is material.
4. Have the valuation firm develop a model, including the derivation of inputs to the model. Perform sensitivity analysis to determine the key variables that drive the option value.
5. If applicable, make a presentation to your Board of Directors to go over your protocol and plan for compliance with SFAS.

Don't be afraid to ask for help. DSE has extensive experience in valuing options using both modified BSM and lattice models.

# What FAS 157 Means to You

## *Defining Fair Value Measurements*

FAS 157 is the fair value rule put into effect by the Financial Accounting Standards Board (FASB). It requires that certain assets and liabilities held by companies be marked to market. In other words, you have to value the assets at the price you could get for them if you sold them right now on the open market.

Both the Financial Accounting Standards Board (FASB) in the United States and the International Accounting Standards Board (IASB) have been dealing with the issue for a number of years and have promulgated a number of standards requiring fair value accounting for selected (largely financial) assets and liabilities. Some of those standards have been controversial. The question is whether fair value accounting should be extended to a wider set of assets and liabilities now carried at historical cost.

### **FAS 157**

Fair values have actually been introduced into GAAP piecemeal over many decades in a large number of standards, including, those dealing with inventory, investments, financial instruments of all kinds, business combinations and stock options. Furthermore, it has also long been required to write impaired assets down to a fair value less than their original cost or book value. FASB developed Statement no. 157 to bring uniformity and consistency to the literature and, more importantly, to the practice of fair value determination and related disclosures. FAS 157 does not change any accounting rules or require any new fair value accounting. However, it does change how fair value is measured in the accounting standards.

There are two primary components of FAS 157:

- First, a single definition of fair value and a framework for measuring that fair value.
- Second, expanded financial statement disclosures that are required with respect to assets and liabilities that are measured at fair value.

The standard states that “fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date.” It resolves the long-standing controversy of whether fair value should be based on what the owner would receive upon selling an asset (exit value) or what it would pay to buy a new one (entry value). Fair value is intended to be an exit price rather than an entry price. In many markets, this may be the same. The market is the principal (or most advantageous) market where the asset or liability is transacted. FAS 157 places greater emphasis on fair value as a market-based measurement, as opposed to an entity specific measurement.



## What FAS 157 Means to You (continued)

To increase consistency, FAS 157 has established a fair value hierarchy to rank the reliability of inputs, that reflect assumptions, used as a basis for determining fair value:

- *Level 1*—refers to quoted prices for identical assets or liabilities in an active market.
- *Level 2*—when quoted prices are not available, fair value estimates are based on observable inputs that a market participant would use.
- *Level 3*—this is the group that is reliant on management estimates.

FAS 157 emphasizes that valuation techniques (income, market, and cost) used to measure the fair value of an asset or liability should maximize the use of observable inputs, that is, inputs that reflect the assumptions market participants would use in pricing the asset or liability developed based on market data obtained from sources independent of the reporting entity. The FAS 157 accounting standard requires companies use actual market data, when available or models, when unavailable. When using models, FAS 157 provides guidance on appropriate valuation techniques and addresses the inherent valuation issue of risk.

### Risk and Uncertainty

A fair value measurement, using present value techniques, is made under conditions of uncertainty because the cash flows used are estimates rather than known amounts. In many cases, both the amount and timing of the cash flows will be uncertain (including risk of default). Risk-averse market participants generally seek compensation for bearing the uncertainty inherent in the cash flows of an asset or liability (risk premium).

A fair value measurement should include an adjustment for risk if market participants would include one in pricing the related asset or liability, even if the adjustment is difficult to determine. FAS 157 clarifies that a fair value measurement for a liability reflects its nonperformance risk (the risk that the obligation will not be fulfilled). Because nonperformance risk includes the reporting entity's credit risk, the reporting entity should consider the effect of its credit risk (credit standing) on the fair value of the liability in all periods in which the liability is measured at fair value under other accounting pronouncements.

### Disclosure

FAS 157 requires disclosures about the fair value of assets and liabilities (including discount rates and assumptions) recognized in the statement of financial position in periods subsequent to initial recognition, whether the measurements are made on a recurring basis (i.e. trading securities) or on a nonrecurring basis (i.e. impaired assets). Quantitative disclosures using a tabular format are required in all periods (interim and annual). Qualitative (narrative) disclosures about the valuation

## What FAS 157 Means to You (continued)

techniques used to measure fair value are required in all annual periods.

Disclosures should enable users of its financial statements to assess the effects of recurring fair value measurements on earnings (or changes in net assets) for the period and should include those significant unobservable inputs for Level 3 based measurements.

### Compliance and Conclusions

FAS 157 can help in two ways; not only does it assist in providing better information to shareholders but also can serve as a control mechanism to expose risks and irrational bets, such as the present real estate crisis. The accounting rules require a clear designation of assets based on a firm's intention. If a holding is short term, it stands to reason that its price be determined in the market place if there is a market for such assets. The market price exists and shareholders would rather know its impact now on their shares. Forcing firms to take a write down on assets that have declined in value does not seem unreasonable, and it responds to the many earlier shareholder outcries for greater transparency. Firms are being compelled to write down asset values by FASB, but the source of these write downs is the declining value of their own investments.



Here are the practical implications of FAS 157:

- Various valuation techniques must be considered and used to measure fair value.
- The nature of the item being valued, as well as the availability of reliable data, will determine the valuation approaches and methods to be used.
- Appropriate adjustments for risk must be incorporated into the valuation methodology.
- Appropriate levels of disclosure regarding the valuation methodologies and critical inputs must be made in both quarterly and annual filings.
- Implement these methods and disclosures for:
  1. Holdings by Business Development Companies
  2. All short-term financial assets and liabilities
  3. Purchase price accounting
  4. Impairment of all intangibles

This new standard emphasizes consistency and comparability in all applications of fair value measurements, including FAS 123R, 133, 141, 142, 144 and 157. Because of its far reaching impact, fair value measurements and disclosures will come under close auditor scrutiny as FAS 157 expands.



## PHIL SCOTT, CFA

### PRINCIPAL

Twenty years of financial, valuation, corporate advisory, merger and acquisition and restructuring experience. In addition to his research and valuation work, he currently serves as the interim CFO for two public companies. Mr. Scott is a Chartered Financial Analyst designee. Mr. Scott has also served as the CFO for SurgiCare, Inc., PSX, Inc. and The Camden Group and has led these companies through successful restructuring and equity sales. Mr. Scott has also served as Vice President of Development for Health Care Partners, Ltd. and Heritage Provider Network, Inc., completing numerous acquisitions. He has an MBA (Summa Cum Laude) from the University of San Diego and a BS Degree in Chemical Engineering from California Institute of Technology.

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[www.dotyscott.com](http://www.dotyscott.com)

12707 High Bluff Drive, Suite 200 ♦ San Diego, CA 92130

Office: (858) 350-4207 ♦ Fax: (775) 369-6073

[pscott@dotyscott.com](mailto:pscott@dotyscott.com)