

A flawed model

What's the value of employee share options? Investors and their advisers will soon be seeing interim accounts prepared under international financial reporting standards (IFRS), which include a requirement under IFRS 2 *Share-based Payment* that profits are reduced by the value of all payments using share-based instruments (such as employee share options). IFRS 2 is one of the standards that listed companies have to apply for accounting periods commencing 1 January 2005. All AIM companies will be affected for years commencing after 1 January 2006, when the equivalent UK standard (FRS 20 *Share-based Payment*) becomes mandatory.

There is a practical problem with implementation of this standard. Employee share options are a form of remuneration, but I do not accept that there is a reliable method of valuing those options which is sufficiently 'accurate' to justify putting a charge into a company's accounts. The solution should be full disclosure of details of the options. The accounting standard effectively leaves it to the market to identify generally accepted option valuation models, and Black-Scholes is being adopted by default.

For investors this has the advantage that you can go to one of the websites that incorporate a Black-Scholes valuation calculator and, by playing around with the input assumptions, see how sensitive the valuation provided by the company is to changes in those assumptions. The other valuation model that you are likely to see will be a binomial model, but here, unless you have access to a valuations expert who can replicate the version of the model being used, you will usually not be able to determine the sensitivity of the valuation to changes in input assumptions.

These valuation models produce nice numbers for academics, but do they mean anything in the real world?

THE BASIS OF THE BLACK-SCHOLES MODEL Black-Scholes was derived in the early 1970s to provide a way of valuing short-term traded European call options. European call options are options to buy an underlying asset on a set exercise date – by contrast, US-style options are exercisable at any time up to a final exercise date.

The Black-Scholes model assumes that a risk-free portfolio can be constructed through a combination of selling underlying assets short and buying call options over a different quantity of identical assets,

Executive summary

- Dispute remains whether there is a reliable method of valuing options.
- IFRS 2 *Share-based Payment* leaves it to the market to identify generally accepted option valuation models.
- Black-Scholes model is being adopted by default but key assumptions are often invalid for smaller quoted companies.
- Accounting rules could deter the use of options as an appropriate part of employee incentive packages.

without any transaction costs. The ratio between the number of units of the underlying assets sold short and the number of options acquired is determined by the sensitivity of the option price to a movement in the price of the underlying asset, such that any change in value of the assets sold short is exactly offset by the change in value of the number of options.

The main assumptions on which most existing option valuation models are based are:

- liquid market;
- small spreads;
- negligible transaction costs;
- ability to sell short; and
- stock prices follow a Markov process (i.e. only the present value of a variable is relevant for predicting the future – the past history of the share price and the way that the present price has emerged from the past are irrelevant).

And for Black-Scholes, in particular, the main assumptions are:

- the expected percentage return required by investors from a stock is independent of the stock price and constant over the time period (also a common simplifying assumption for binomial models and Monte Carlo simulations);



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- the volatility of the stock is constant over the time period (also a common simplifying assumption for binomial models and Monte Carlo simulations);
- the risk-free rate of return is constant over the time period (also a common simplifying assumption for binomial models and Monte Carlo simulations); and
- the dividend yield is constant (i.e. dividends increase in line with share prices).

In reality, especially for employee share options in smaller quoted companies, many of these assumptions are invalid as:

- shares are often tightly held reducing liquidity;
- spreads can be considerable – a 10% spread is not uncommon;
- shares are only available in small parcels, increasing transaction costs;
- institutional shareholdings are small or non-existent, restricting availability of stock to be lent and sold short and increasing the cost of borrowing stock;
- share prices tend to have step changes with a degree of overshoot on the changes between steps, therefore the way the present price has emerged is relevant to future prices (are prices on a step or between a step?);
- investors expect significant, irregular, changes in stock prices over their stock-holding period and invest with a view to the potential

- return at the end of their investment period. They do not expect a constant level of return over the intervening period;
- volatility is not constant in part due to imperfect markets, changes in liquidity over time and changes in risk perceptions over time;
- the time period is such that the risk-free interest rate varies over the period; and
- dividend policies often bear no correlation with share prices – more often they correlate with inflation.

IMPOSSIBLE TO VALIDATE ACCURACY My view is that there are so many variables affecting the valuation of employee share options that it is not possible to produce a model to value them, and, since we have no way of knowing the real value of these options (as there can be no market in them), it is anyway impossible to validate the 'accuracy' of the output from any existing or future model. Models may give similar answers from the same input assumptions, but this will usually be because the models are based on the same underlying principles and not because the valuation is any more 'accurate'.

Existing models are complex and not understood by virtually all preparers and users of accounts. Where Black-Scholes gives a valuation that is not material to the accounts, companies will use this without worrying that the number being used is meaningless. Companies with large numbers of share options will need to devote significant thought to the method and assumptions that they use to value those options. There is a real risk that the accounting tail wags the commercial dog and deters the future use of options as part of appropriate employee incentive packages.

Nevertheless, IFRS 2 requires a value to be calculated, and I am working with the Quoted Companies Alliance (QCA) to develop a valuation model the basis of which, unlike Black-Scholes, is understandable by preparers and users of accounts. The challenge we face is to devise a model within the constraints set out by IFRS 2 that can be:

- understood by preparers and users of accounts;
- used by most finance directors without having to call in expensive professional advice;
- is easy to audit; and
- used by interested investors to assess the sensitivity of the valuation to changes in the input assumptions.

The evolving QCA option valuation model is based on traditional discounted cashflow techniques and incorporates a normal distribution to model the random element of share prices at the exercise date. We still have a problem with determining the appropriate measure of volatility to be used in the model, since the measure required in the appendix to IFRS 2 is not appropriate for this type of model. Also, IFRS 2 requires the use of a risk-free interest rate, but since ours is not a risk-free model, this assumption too is not appropriate.

The Quoted Companies Alliance (QCA) is a not-for-profit membership organisation promoting the cause of 2,000+ quoted companies outside the FTSE 350 (including those on AIM and OFEX) representing 85% of UK quoted companies by number. This article was first published in Professional Investor Magazine.

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