The Financial Valuation Group

Forensic Accounting, Business Valuation and Consulting

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Articles:

Why is Valuation Trapped in the 70's?

An Alternative to the Black-Scholes Option Pricing Model as Used in the Discount for Lack of Marketability

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Since 1973, there have been great advances in science, medicine, and technology. Today the rover Curiosity glides over Mars, we have sequenced the human genome and cloned animals, we carry computers in our pockets and we have Google for heaven's sake! This begs the question: Why is valuation trapped in the '70s? Why are modern practitioners in corporate valuation using a flawed model that has its roots in an era when combustible Lava Lamps and hippie hand-made string art were found in every home?

The Black Scholes Model was most notably introduced by Fischer Black and Myron Scholes in their 1973 paper "The Pricing of Options and Corporate Liabilities" published in the Journal of Political Economy. Robert Merton expanded the model[6] and coined the name "Black-Scholes Option Pricing Model". In 1997 the Nobel Prize in Economics was awarded by the Royal Swedish Academy of Sciences to Merton and Scholes for their contributions to the field of Financial Economics.[7]

Accompanying the Black-Scholes Model are several assumptions that allow the model to simplify the confines of the real world. The folks in the ivory tower tend to be out of touch with the real world and will focus on what's commonly referred to as ***normative economics*** or "what should be". We practitioners, of course, live in the real world and make our professional judgments based on ***positive economics*** or "what is." These ***normative economics*** assumptions facilitate the mathematics within the theory, but they do not capture the mechanics of the world in which we live and work. The ***normative economics*** assumptions of The Black-Scholes Model are the following:[8]

1. The underlying stock follows a lognormal random walk with known volatility
2. Constant interest rates
   a. Liquid markets
3. Constant volatility (and drift) of the underlying stock
4. Frictionless markets
   a. No transaction costs
   b. No taxes
   c. Liquid markets
5. No dividends on the underlying
6. No arbitrage

Translating each of these assumptions to jargon free English, we might say (respectively):

1. The best predictor of a stock price tomorrow is the price today. Stock prices will revert to the mean and will not deviate far from their historical average.
2. Money is all but free (at today's rates) and will remain so indefinitely.
3. There are no tsunamis, Great Recessions or Hurricane Sandys.
4. No transaction costs or taxes…'nuf said.
5. No dividends, ever.
6. Ever heard of hedge funds?

These assumptions are required for the theoretical foundation of the pricing model to hold true yet

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each one is logically inconsistent with real world conditions.

Current market models commonly used today can be improved upon further to correct for the log-normality assumption in Black-Scholes, specifically, to allow for memory effects in volatility. These types of effects are known as Generalized Autoregressive Conditional Heteroskedasticity effects (GARCH). To put it simply, GARCH effects allow for present and future volatility to be a function of past volatility. This is also known as a mean reversion process. It is in this sense that we say GARCH effects allow for memory of volatility. Robert Engle who pioneered these kinds of models also received the Nobel prize in economics in 2003 for his work (http://www.nobelprize.org/nobel_prizes/economics/laureates/2003/).

In financial time-series data GARCH effects allow for volatility clustering. The **Figure** below shows the effects of volatility clustering, with a graph of the gross returns of the S&P 500. Notice that the returns tend towards zero (remember the random walk?), but there are huge outliers or shocks. Does it look like volatility is constant? No, absolutely not! This implies volatility clustering or, more specifically, GARCH effects.

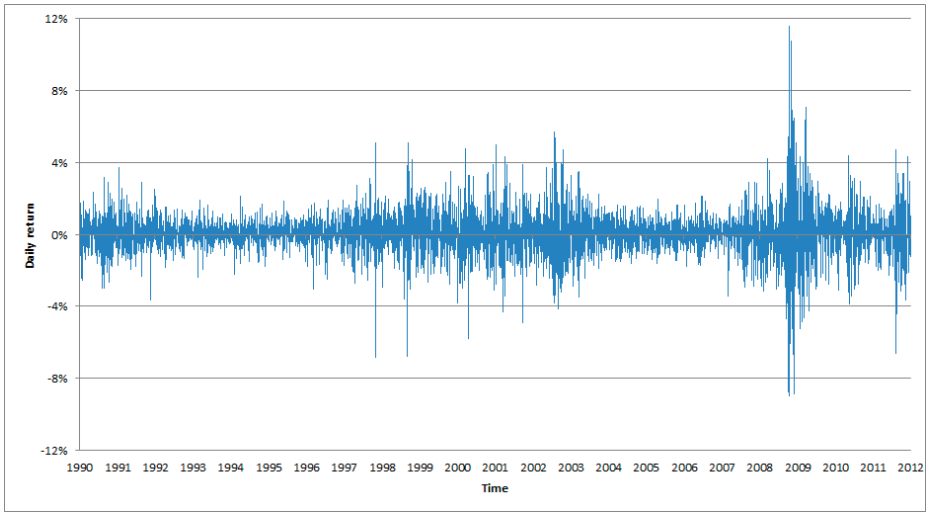
GARCH models appear in graduate finance texts and top-tier finance journals over the past 20+ years such as the Journal of Finance (https://weatherhead.case.edu/departments/banking-and-finance/Documents/Sub_REDR_2.pdf). In his financial economics textbook, Christoffersen[9] argues that it is both logically inconsistent and statistically inefficient to use volatility measures that are based on the assumption of constant volatility over some period when the resulting volatility series moves through time. We can therefore rely on GARCH effects to more accurately price options with GARCH Options Pricing Models. It is thus advantageous to leverage an option pricing model that allows for conditional volatility over the restricted time horizon.

There are many types of option pricing models and algorithms that allow for GARCH effects, including the GARCH Option Pricing Model. We have built a Conditional Volatility DLOM Model, which we believe is attractive in that it provides a discount that is be bounded between 0% and 100% and it allows for nonconstant volatility through GARCH volatility modeling.

Our Conditional Volatility Model is simple in its application. We utilize market guideline comparables to estimate the volatility applicable to the subject. As we know, the guideline approach applies a comparison of the subject company to a publicly traded company. The comparison is based on public data regarding the comparable companies' stock prices, balance sheets, income statements, and cash flow statements. Therefore, if the guideline public companies are appropriately comparable to the subject company, then the multiples derived from those comps should represent an accurate comparison. As with any valuation, the validity of the guideline approach for valuation hinges upon choosing appropriate guideline comparables for the subject company.

For our Conditional Volatility DLOM Model example, we have selected a closely held retail store as our subject. Typically, this purpose would be for minority basis, thus warrant consideration for a DLOM. In this example, we identified five guideline comparables (but not provided in this article). For comparison, we also estimated the lack of marketability discount for this subject company by employing the three commonly applied theoretical option pricing models to our market comparables; the Chaffe Black-Scholes options pricing model, the Finnerty Asian pricing model, and the "Look-Back" option model, developed by Francis A. Longstaff, which can produce unreasonably large implied discounts[10]. We have concluded a discount for lack of marketability of **40.45%** by equally weighting the average of the implied discount calculated by the Chaffe Black-Scholes Model, the average of the implied discount calculated by the Finnerty Asian Model, and the average of the implied discount calculated by the Longstaff "Look-Back" Model (untruncated).

Figure



As stated earlier, the three common DLOM models require three inputs other than the stock and strike prices. Those inputs are the length of time to sell the security, the interest rate, and the underlying volatility of the value of the business, which has the greatest impact. The first of the three inputs is the length of time to sell. For such lengths of time, we applied

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Announcements:

Valuation for Financial Reporting

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the model for 5 separate time periods; 1, 2, 3, 4 & 5 years. The second of the three inputs, which is empirical, is the interest rate. For the interest rates we used the U.S. Treasury constant maturities at the corresponding periods of time (i.e., 12 month US Treasury Yield). The final input is volatility. We calculated and applied a yearly volatility to the given guideline publicly traded company peer group over the same 5 year period of time to serve as proxies[11] for our subject company's volatility[12]. We calculated daily volatility as the standard deviation of the gross-returns of the given guideline company's stock. In order to transform the daily volatility to annual volatility, we multiplied the daily volatility by the square root of 252. Since it is typical to analyze a holding period up to T=1,2,..,5 years, it is a natural extension to scale the daily volatility estimate using a standard method scaling practice. This method requires that returns must be independent and identically distributed (i.i.d.) normal and then the standard deviation of daily returns $(\sqrt{\sigma_t^2})$ at the T-day horizon is simply $\left(\sqrt{\sigma_t^2}\sqrt{T}\right)$. (This is in contrast to our application of the GARCH model that implies that the variance today is conditional upon previous variances, which allows for proper interpretation of volatility relative to the given holding period.) This should not be taken lightly by practitioners, since the magnitude of volatility can greatly affect value.

Using our Conditional Volatility DLOM Model we compute a DLOM of **28.17%**. While our model requires subject specific computer programing of thousands of lines of code, we otherwise follow the same process of identifying market comparables and appling our analysis to an evenly weighted portfolio of those assets (for comparison with the other three methods). We believe our Conditional Volatility DLOM Model outperforms current DLOM methods because our model is more specific to the subject and thus will avoid current judicial criticisms related to benchmark studies and broad generalities from existing model usage.

While we agree with the appealing logic of using a put to estimate DLOM, we must correctly model behavior in accordance with today's complicated markets. Currently, assessed DLOMs are being challenged in courts with increasing vigor. Often is the case that the courts are requiring substantiated and targeted valuation opinions. This can only be accomplished by introducing more accurate discount methodologies. Such methods must utilize modern financial theory which is complex, quantitatively rigorous and based on today's best knowledge and research. Namely, the rigorously tested GARCH Option Pricing Model. The old models are overly simplistic and newer models have made important improvements. The message is clear. It's time for practitioners to get out of the '70s and stop using flawed models. It's time to move to the new millennium with the Conditional Volatility DLOM Model.~~

Endnotes:

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4. We thank Jose Agurcia (www.linkedin.com/pub/jose-agurcia/51/57b/8aa), Professor Richard Luger, Georgia State University, (http://www.rmi.gsu.edu/faculty/luger.shtml) and Korey Rubenstein (www.linkedin.com/pub/korey-rubenstein/8/912/b6a) for their review, comments and insight. All errors are, of course, our burden.
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6. See Merton, 1973
7. Fischer Black had passed away in 1995 and was therefore ineligible for the prize. However, his contributions to economics gained him an honorable mention by the Swedish academy.
8. Black, F., Scholes, M., 1973. "The Pricing of Options and Corporate Liabilities", JPE
9. Christofferson, P., 2003. Elements of Financial Risk Management. Academic Press
10. As a result, we assigned a lower weight to the implied discount for lack of marketability produced by this option pricing method.
11. It is generally accepted to substitute the industry volatility and/or the volatilities of public companies within the same industry for the volatility of the subject company.

On the Valuation of Businesses Held by Pass-Through Tax Entities

Michael A. Crain, CPA/ABV, ASA, CFA, CFE

A strand of academic research has made its way into the business valuation community and is stimulating some new thinking for valuing businesses held by pass-through tax entities such as S-corporations and limited liability companies. Previously, an absence of empirical evidence allowing comparisons of taxing-paying entities, such as the standard corporation, with pass-through entities (PTEs) has resulted in many theoretical discussions whether a business held in a tax-advantaged entity has a higher price (i.e., "is it worth more") than the same business held in a standard entity. IRS has argued businesses held in PTEs have higher values—a lot higher. Unsurprisingly, IRS's argument would often result in higher taxes.

IRS has argued that businesses held by PTEs should be valued based on their pre-tax earnings since these entities do not pay any taxes. By ignoring taxes on the profits, the earnings level is a lot higher from which to value a business. Assume a business has pre-tax earnings of $100 and a price-to-earnings multiple of 5. If the firm is a tax-paying entity, its value is $300 assuming a 40% tax rate ($100 minus 40% in taxes multiplied by 5). According to IRS's argument, as a PTE this business is worth $500 ($100 multiplied by 5). The effect is a value premium of 67% above the $300 value. Intuitively, does this seem true? To many, no.

Some empirical research and background may shed some light. Academic research shows stock prices are affected by taxes at both the entity level and investor level. Investors seem to make decisions based on the effect that investments have on their tax situation. This research has relatively little relevance in standard finance theory and practice since the unit of analysis is typically business enterprises that are subject to paying taxes. But in the valuation of small- and medium-sized enterprises (SMEs) that are almost always privately-owned entities rather than publicly traded, U.S. tax laws permit many SMEs to elect to have their owners pay taxes on a firm's profits rather than the business entity. This arrangement generally has economic advantages of avoiding "double taxation"—taxes paid by a business entity on its profits plus taxes paid by the firm's owners on dividends they receive. Firms that have made this kind of election are called pass-through entities since they conceptually pass their profits on to their owners to be taxed. The main economic advantage comes from PTE owners not paying taxes on any dividends they receive from the business entity.

Tax authorities, with an objective to maximize tax collections, have argued a business or business interest owned by a PTE is worth a lot more than if owned by a tax-paying entity. Extending this logic to a particular SME, say a local McDonald's restaurant, IRS's argument is this restaurant is worth a lot more if held by a PTE rather than a standard tax-paying entity.

Whether IRS's implicit argument that the marketplace places much higher prices on PTEs is an empirical question. The practical problem in resolving it is that no data currently exists allowing price comparisons of identical or similar businesses held by PTEs and tax-paying entities to examine whether market prices are indeed different.

IRS defends their argument with mathematical reasoning in the absence of empirical evidence. It essentially says since owners of a PTE have a lower overall tax burden,

$$T_{PTE\ owner} < T_{Non-PTE\ owner}$$

their expected owner-level after-tax cash flows are higher,

$$E(c)_{PTE\ owner} > E(c)_{Non-PTE\ owner}$$

and, therefore, the PTE's price is higher,

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$$P_{PTE} > P_{Non-PTE}$$

This owner-level tax effect in IRS's reasoning results in a large price premium of perhaps 67%. Thus, according to the argument, our McDonald's restaurant is worth as much as two-thirds more simply because it is held in a PTE that pays no income taxes rather than a standard tax-paying entity.

If we relied on only this mathematical reasoning and only these inputs, the argument seems plausible. But if the higher-price argument is indeed true,

$$P_{PTE} > P_{Non-PTE}$$

SME owners with tax-paying entities would have a strong economic incentive to make the tax election before selling their businesses to significantly increase its value (even if faced with some built-in gains taxes arising from the conversion). We would observe SME owners of non-PTEs and their advisors electing PTE status preparing a business for sale (assuming the business is privately owned and otherwise qualifies). We, however, do not see convincing evidence of this kind of activity and advice-giving. This observation give one pause whether such a simple argument of PTEs having significantly higher prices is indeed true.

Fair market value is the price hypothetical buyers and sellers of a business or business interest trade an asset. Valuation models are intended to be proxies for investor behavior rather than to be the markets. (The map is not the territory.) In markets, buyers may not be willing to pay large premiums for a business simply because it is held inside a tax-advantaged entity.

In the standard theory of asset pricing, prices (values) of assets, p, are a function of expected cash flows from an asset,

$$E(c)_{asset}$$

and the discount rate, k.

$$p = \frac{E(c)_{asset}}{k} \qquad (1)$$

IRS's argument indirectly shifts the equation for asset pricing to a different kind of cash flow—the expected cash flows at the owner level after every kind of tax is paid.

$$p = \frac{E(c)_{owner\ after\ all\ taxes}}{k^*} \qquad (2)$$

This change is not trivial. First, it differs from standard finance theory. It shifts asset pricing from the perspective of an asset's expected cash flows after taxes on business profits to an investor's cash flows after business and personal taxes. If this was indeed true for explaining asset pricing, then logically the denominator in the two equations must differ from each other, $k \neq k^*$. Second, the argument assumes the discount rate, k, in the standard asset pricing model in equation (1) does not already consider investor-level taxes as does k^* in equation (2).

As stated, there is no convincing empirical evidence to support IRS's argument. No evidence exists that businesses held in PTEs are priced significantly higher than those held in non-PTEs. Also, no evidence exists of widespread activity of selling businesses changing from non-PTEs to PTEs prior to sale to capture a large price premium.

Academic research has made its way into the business valuation community offers evidence that investors price both business-level and investor-level taxes into discount rates applied to expected cash flows *of the asset* (equation (1)). A long line of studies have examined the effect of investor-level taxes on dividends in explaining stock prices and returns (Elton and Gruber, 1970; Litzenberger and Ramaswamy, 1980; Kalay, 1982; Miller and Scholes, 1982; Poterba and Summers, 1985; Zodrow, 1991; Maydew, 2001; Ayers et al., 2002; Dhaliwal et al., 2003; Hanlon et al., 2003; Blouin et al., 2004; Chetty and Saez, 2004; Dhaliwal et al., 2005; Morck and Yeung, 2005; Brown et al., 2007; Guenther and Sansing, 2007; Amromin et al., 2008), the effect of investor-level capital gains taxes in explaining stock prices and returns (Bolster and Janjigian, 1991; Lang and Shackelford, 2000; Liang et al., 2002), and the effect of kinds of investors with different tax characteristics (e.g., institutional investors compared to individuals) in explaining stock prices and returns (Miller and Scholes, 1982; Sias and Starks, 1997; Erickson and Maydew, 1998; Dhaliwal et al., 1999; Gompers and Metrick, 2001; Liang et al., 2002; Dhaliwal et al., 2003; Mehra and Prescott, 2003; Dhaliwal et al., 2005; Morck and Yeung, 2005; Guenther and Sansing, 2007; Moser and Puckett, 2009). Studies provide evidence that investor-level taxes have effects in explaining stock prices and returns. Put differently, investor-level taxes affect investor behavior and behavior effects show up in the cost of equity capital in traded stocks that valuation analysts use for developing their discount rates.

Dhaliwal et al. (2005), for instance, find a positive relationship between dividend taxes and implied cost of equity capital in traded stocks. In other words, in addition to finding that stock values and the cost of equity capital are affected by investor-level dividend taxes, this study finds the relationship between dividend taxes and cost of equity capital is positive: as dividend taxes rise, so does the cost of equity capital, and vice versa.

Valuing PTEs by applying discount rates derived from returns of traded stocks already consider investor-level taxes in some degree. By shifting from equation (1) to equation (2) as IRS indirectly contends and applying a higher base of PTE earnings (without reducing for taxes) to stock-market-based dis-

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count rates, double counting occurs in valuing PTEs in some degree. The academic research suggests that simply assuming PTE profits are free of taxes, as IRS has argued, and using stock-market-based discount rates results in overstated values.

One practical approach to addressing the claim that interests in PTEs have a value premium over non-PTEs, other things being equal, is to use the findings of Dhaliwal et al. (2005). As stated, their study finds a positive relationship between dividend taxes and implied cost of equity capital. If we assume IRS's claim that PTEs have a value premium is true, one could apply Dhaliwal et al.'s (2005) findings by (1) reducing a particular PTE's cost of equity capital for the so-called avoided dividend tax that PTE owners benefit from in tax-advantaged entities and (2) reducing business cash flows for taxes on business profits since such taxes are not avoided.~~

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