Improving Certainty in Valuations using the Discounted Cash Flow Method

C.P. "Salty" Schumann, CPA, CVA, CFFA
2902 Hillcrest San Antonio, Texas 78201
(210) 736-3955 e-mail: salty@stic.net

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BIOGRAPHICAL INFORMATION

C.P. "SALTY" SCHUMANN, CPA, CVA, CFFA.

C. P. "Salty" Schumann, a Business Honors graduate of the University of Texas at Austin is the managing director and founder of his firm which offers both traditional accounting services in San Antonio, Texas and advisory services in business valuation, litigation support and fraud deterrence nationally; it's website is www.cpschumannco.com. His experience includes acting as an expert witness, consultant, nationally known speaker and writer on business valuation, fraud detection, lost earnings, economic damages, taxation, asset impairment, intangible asset recognition as well as mergers & acquisitions.

A holder of both the Certified Valuation Analyst and the Certified Forensic Financial Analyst designations from the National Association of Certified Valuation Analysts (NACVA.) Salty has been: chair of the Texas Society of Certified Public Accountants Litigation Member Services Section; chair of the NACVA Professional Standards Committee; member of the AICPA Litigation Support & Dispute Resolution Sub Committee as well as the AICPA National Litigation Conference Committee.

Together with James P. Catty, MA, CA, CPA, CFA, CBV, CFE and Dita Vadron BA, he wrote the book "Fair Value for GAAP, A Valuation Compendium" to be published by The Center for Economic and Industry Research (CEIR) , which covers all uses of fair value including asset impairment, intangible assets, and stock options. .

UNCERTAINTANY

All business transactions have many uncertainties, which unfortunately are not often satisfactorily recognized in a typical business valuation. Although we are asked to give an opinion of value as a single amount, the truth is that the value of a security, business, or asset is more property considered a probability distribution with a range of values.

Traditionally, the most common method of valuing a business has been to capitalize past profits based on the concept that they are the best predictor for the future. Discounting projections of the most likely cash flows for a period of years and establishing a terminal amount (the Discounted Cash Flows – DCF Method) is now considered preferable as it is totally forward looking. However, it has its limitations. In particular, it is not good at valuing many forms of intangible assets especially intellectual property that have potential rather than demonstrated future cash flows. Such items have option characteristics such as the ability to delay, expand, or abandon and are best dealt with by option pricing techniques such as the Black-Scholes or Binomial Model. In this article it is assumed that the DCF method is appropriate and suggests ways to improve its certainty.

In 2000, my friend Jay B. Abrams, a distinguished valuation analyst, published "Quantitative Business Valuation, A Mathematical Approach for Today's Professionals". This treatise shows how to improve our valuation by considering risk, which can be assessed in terms of statistical probabilities determined by sampling. In a 2004 article named "Accuracy of Your Valuation", Jay states, "The real question is not whether there is error in your valuation, but how much". His work is focused on calculating a reasonable range around an amount with a specific probability that the result is a true fair market value.

Uncertainty stems from the fact that essential variables such as the true cost of equity cannot be observed, but only estimated with a quantifiable certain degree of statistical confidence, which itself can be quantified. Errors occur when analysts' error in forecasting variables such as cash flows, growth and discount rates. Jay has demonstrated that errors in estimating the last two cause much greater distortions than in forecasting the first, a conclusion that many of us find incredibly unsettling. Since there is very little authoritative literature on the topic of uncertainty in valuing businesses, I recommend Jay's book for your library.

Fortunately, there are several techniques such as: The First Chicago method, Expected Cash Flows Method; Probabilities Cash Flows Method and Monte Carlo simulations which improve on the single point estimates generated by the classic DCF method. The following information regarding the three are excerpted from "Fair Value for GAAP: A Valuation Compendium" by James Catty, Dita Vadron and myself to be published by The Center for Economic and Industry Research (C.E.I.R) in mid 2006.

THE FIRST CHICAGO METHOD

The First Chicago Method is a variant of the standard capitalization method. It is often applied when valuing entities in a development stage and may be used to value a reporting unit for goodwill impairment testing purposes. Popularised in the 1970s by the Equity Group of the First Chicago National Bank, the method looks forward from three to five years and establishes a future value by capitalizing the projected Net Incomes at that time for several different scenarios. These amounts are then converted to their "present values" as of the valuation date using a rate of return required by venture capitalists.

Normally, at least three different "Outcome Scenarios" are prepared: "Success", "Survival" and "Failure". The “Success” Scenario is normally compliance with the Business Plan. “Survival” is based on less growth and delays in bringing the project to completion, necessitating higher costs, while “Failure” (which must never be omitted) relates to a continuation of the status quo, or perhaps worse. Sometimes the planned operations may involve initial losses and occasionally result in a value below the additional capital needed.

The present value for each Scenario is weighted by the probability of it occurring and then the three are added together. An estimate of the additional equity required is then deducted to determine the Net Income Value. This can also be considered a variant of the Discounted Cash Flows Method, which assumes no cash flows during the projected period and relies solely on the net income values, under several different sets of circumstances as the terminal amounts.

EXAMPLE

In valuing a reporting unit that is an Emerging Activity, the First Chicago Method is often appropriate. Consider a small, recently acquired subsidiary of a security company. Its business is to supply Internet protection to customers already served by the parent. Losses were incurred in 2005, the first year of operations under the new ownership, and are also expected for 2006, with profits envisaged thereafter. The valuation date is February 28, 2006, the end of the parent’s first fiscal quarter.

As annual growth in revenues of more than 20% is anticipated for at least the next five years, and the business has high Operational Gearing (in the “Success” Scenario, only 20.5% of costs are variable), a Capitalization Rate of 5.7% (a PER of 17.5 times) was computed using the Build-up method.

The tables below contain the processes required by the First Chicago Method to obtain the fair value of the reporting unit for each Scenario. The first stage is to project the 2007 Income Statements. The 25% discount rate is based on the return required by venture capitalists for early-stage businesses.

Year to November 30, 2007	Success	Survival	Failure
		$ '000	
Revenue	6,000	5,000	4,500
Fixed Costs	3,500	3,500	3,500
Variable Costs	900	750	675
Operating Costs	4,400	4,250	4,157
Pre-tax Profit	1,600	750	325
Income Tax	(640)	(300)	(130)
Net Income	960	450	195

The second is to capitalize the net incomes, establish their present values and deduct the estimated future capital required to determine their current fair values.

Capitalized at 5.7%	16,838	7,893	3,420
25% Discount Factor	0.512	0.512	0.512
Present Value	8,621	4,041	1,751
Capital Required	(1,250)	(1,250)	(1,250)
Current Fair Value	7,371	2,791	501

Management has determined that the most likely outcomes of the various Scenarios were: Success (70%), Survival (20%) and Failure (10%), as shown below. Combining them result in $5,766,000 at the high end of the range of fair value.

$ '000

	Success	Survival	Failure
Fair Value	7,371	2,791	501
Probability	70%	20%	10%
Contribution to Fair Value	5,158	558	50

The worst scenario also according to management, has probabilities of 40%, 35% and 25%, which results in $4,039,000 as the low end of the range.

$ '000

	Success	Survival	Failure
Fair Value	3,352	2,782	497
Probability	40%	35%	25%
Contribution to Fair Value	2,941	974	124

Using the First Chicago Method, the fair value of the reporting unit is between $4,050,000 and $5,775,000 (rounded) with a mean of $4,900,000, plus or minus 18%. For an early-stage or turnaround situation, a normal range of fair values by different methods could be as high as plus or minus 20%. Applied to a more stable entity, the spread should be closer, perhaps plus or minus 10%.

EXPECTED CASH FLOWS METHOD

In Appendix E of Statement of Financial Accounting Standards (SFAS) 141 "Excepts from Concepts Statement No. 7" FASB defines Risk-Adjusted Expected Cash Flows and makes the following comments regarding the Discounted Cash Flows method.

"Accounting applications of present value have traditionally used a single set of estimated cash flows and a single interest rate, often described as "the rate commensurate with the risk." In effect, although not always by conscious design, the traditional approach assumes that a single interest rate convention can reflect all the expectation about the future cash flows and the appropriate risk premium."

"The Board found the expected cash flow approach to be a more effective measurement tool rather than the traditional approach. In developing a measurement, the expected cash flow approach uses all expectation about possible cash flows instead of the single most-likely amount. For example, a cash flow might be $100, $200, or $300 with probabilities of 10 percent, 60 percent, and 30 percent, respectively. The expected cash flow is $220. The expected cash flow approach thus differs from the traditional approach by focusing on direct analysis of the cash flows in question and on more explicit statements of the assumptions used in the measurement."

While many accountants do not routinely use the expected cash flow approach, expected cash flows are inherent in the techniques used in some accounting measurements, such as pensions, other postretirement benefits, and some insurance obligations. They are currently allowed, but not required, when measuring the impairment of long-lived assets and estimating the fair value of financial instruments. The use of probabilities is an essential element of the expected cash flow approach, and one that may trouble some accountants. Accountants may question whether assigning probabilities to highly subjective estimates suggest a greater precision than, in fact, exists. However, the proper application of the traditional approach requires the same estimates and subjectivity without providing the computational transparency of the expected cash flow approach.

Those familiar with statistical analysis may recognize the cases above as simple descriptions of (a) uniform, (b) triangular, and (c) discrete distributions. In each case, the estimated expected cash flow is likely to provide a better estimate of fair value than the minimum, most likely, or maximum amount taken alone.

Applying the Expected Cash Flows method requires the valuation analyst to determine the following components of a present value measurement set out in Concepts Statement 7 based upon items 1-5 below. In FASB's view they " together capture the economic differences between various assets and liabilities".

1. An estimate of the future cash flows, or, in more complex cases, a series of such estimated future cash flows at different times.

2. Expectations about possible variations in the amounts or timings of those cash flows.

3. The time value of money, represented by a risk-free rate of interest.

4. The price for bearing the uncertainties inherent in the assets or liabilities.

5. Other, sometimes unidentifiable, factors, including illiquidity and market fluctuations.

These five components comprise the concept of the Expected Cash Flows Method, taking into account not only their amounts and timings in the same way as in the traditional version, but also uncertainties by using most likely, best and worst cases. In applying this method, management should be requested to identify the relative probabilities of each case.

In applying the above, FASB points out that it is important that the valuation analyst

- ❑ Does not leave anything out.
- ❑ Uses consistent assumptions and does not count the same thing twice.
- ❑ Remains unbiased.
- ❑ Aims for the average of a range, rather than a single, most-likely minimum or maximum amount.
- ❑ Is factual, and not opinionated.

EXAMPLE

In a FASB publication, *Understanding the Issues* (Vol. 1, Series 1), Edward R. Trott, a Board member, and Wayne S. Upton, then a senior staffer, demonstrate the Expected Cash Flows method. They use an example of a liability that can be settled for $500,000 in five years (the minimum amount - best case), $1,000,000 in ten years (most likely), and $5,000,0000 in 25 years (maximum amount - worst case). Management believes that the most likely case is about twice as possible to occur as the best, while the worst is only a third as conceivable as the best. This produces probabilities of 30%, 60% and 10% respectively. The calculation of the expected present value of the liability is as follows:

Case	Years	Amount	Present Value @ 5%	Prob.	Expected Present Value Cash Flow
		$'000	$	%	$
Best	5	500	391,763	30	117,529
Most-Likely	10	1,000	613,913	60	368,348
Worst	25	5,000	1,476,514	10	147,651
Total					633,528

Using the assumptions in the above example, there is little difference between the most likely estimate and the expected present value. However, in practice, the numbers will vary greatly, depending on how the probabilities affect both the timing and amounts of the cash flows.

PROBABILITIES CASH FLOWS METHOD

Ideally, the cash flows rather than the discount rate should reflect the risks involved. This is illustrated with the Probabilities Cash Flow method, which is mainly applicable to Emerging Activities. It is based on the "decision tree analysis" technique, which is a means of examining sequential decisions that are subject to uncertainty. It creates a visual road map indicating decision points, their uncertainties, alternative outcomes and probabilities. The tree includes successive discounted cash flow analyses, providing alternative net present values for the major decisions with uncertain outcomes, based upon their probabilities.

The base of the tree is the immediate choice to make or wait out an investment, including the cost. In the traditional Discounted Cash Flows method, the assumption is that all decisions in a project's life have already been made, whereas a decision tree shows that management has the flexibility to say no to various further expenditures, depending on the results incurred to date. In this method, the risks are included in the probabilities of the various outcomes at each decision point. As a result, the discount rate used should be a risk-free equity rate.

EXAMPLE

A decision tree with alternate outcomes is illustrated below for an Emerging Activity, a regional rollout of a new consumer product. For simplicity, only four outcomes have been used and a steady state, without any expansion, assumed for each of them after the first year, even though there is a 40% probability that an "excellent outcome" will result from the expansion allocated.

On day one, the entity invested $9.0 million, as follows: plant $5.0 million; working capital, $2.5 million; and committed advertising and promotions, $1.5 million. At the end of the first year, there could be four possible outcomes:

				$ million
	EXCELLENT	GOOD	ACCEPTABLE	POOR
Probability	10%	40%	30%	20%
Sales	>18.2	2.5 to 18.2	6.8 to 12.5	<6.8
Contribution Margin	17%	15%	13%	11%
Decision	Expand 40% Continue 60%	Continue	Reduce	Terminate
Profit	3.1	1.9 to 2.7	0.9 to 1.6	0.7
Remaining Life	7 years	5 years	5 years	nil
PV at 5% of Cash Flows	13.4 to 18.8	8.2 to 11.7	3.9 to 6.9	0.6 to 0
Investment	(2.0)	(1.0)	-	-
Terminal Amount	3.4	3.4	3.4	4.3
Total	14.8 to 20.2	10.6 to 14.1	7.3 to 10.3	4.3 to 4.9
Average Return	17.5	12.4	8.8	4.6

Legend: < means less than > means more than

Multiplying the average return for each outcome by its probability provides a total of $10.7 million after the first year, with a Probabilities Cash Flows Value of $9.8 million on day one. Applying this method is complex, as there will be a minimum of two, more likely three or four potentially different outcomes at every decision point.

MONTE CARLO SIMULATION

An excellent way to reduce uncertainty and bias is to run a series of simulations in a spreadsheet with software, which uses a Monte Carlo (MC) method. These are stochastic techniques--meaning they are based on the use of random numbers and probability statistics to investigate problems and are used widely for nearly everything from economics through nuclear physics to regulating the flow of traffic.

Monte Carlo methods were originally developed for the nuclear industry. Credit is usually given to Stainislaw Ulam, a Polish born mathematician who worked with John von Neumann on the Manhattan Project and is primarily known for helping designing the hydrogen bomb with Edward Teller in 1951. He created the first MC method in 1946 while pondering the probabilities of winning a card game of solitaire.

The best way to remove uncertainty and bias is to run a series of simulations to your Excel spreadsheet with a version of software, which uses the Monte Carlo technique.

How Do Monte Carlo Simulations Work?

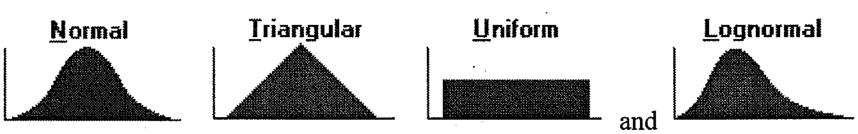
The term "Monte Carlo" comes from the city in Monaco whose main attraction is a casino, which runs games such as roulette, dice and slots. These provide entertainment by exploiting the random behavior of each game. Monte Carlo methods randomly select values to create scenarios. They are taken from a fixed range and selected to fit a probability distribution [e.g. bell curve, linear distribution, etc.]. This is similar to rolling a die. The outcome is always within the range of 1 to 6 and follows a linear distribution - there is an equal opportunity for any number to be the outcome.

In a MC simulation, the random selection process is repeated many times to create multiple scenarios. Each time a value is randomly selected, it forms one possible scenario. Together, they give a range of possible solutions to the problem, some of which are more probable than others. When repeated 10,000 or more times, the average solution will give an approximate answer to the problem. The accuracy of this answer (which is proportional to the square root of the number of scenarios) can be improved by more iterations.

Without running multiple examples a spreadsheet model can only reveal a single outcome, generally the most likely or average scenario. Combining a spreadsheet model with many thousand simulations automatically analyzes the effect of varying inputs on outputs of the modeled system.

How to deal with uncertain variables

Many variables, for example sales growth, in a spreadsheet model are uncertain in that they have a range of possible values. For an MC simulation they are defined by a range together with a probability distribution. The type of distribution selected (such as the examples shown below) depends on the conditions surrounding the variable.

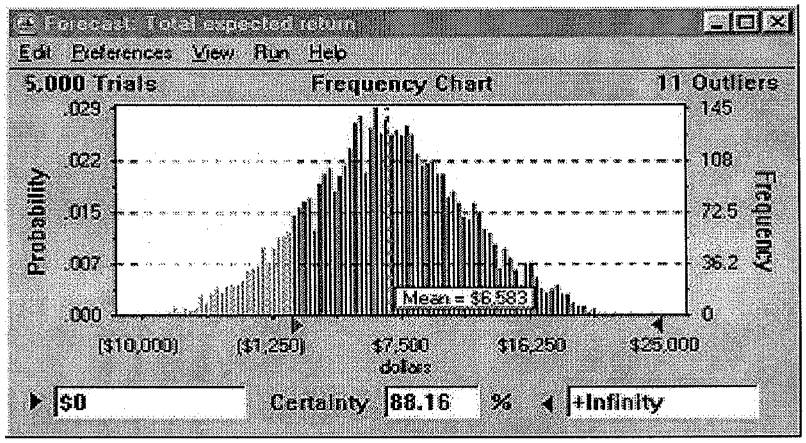


What happens during a simulation?

A simulation calculates multiple scenarios of a model by repeatedly sampling values from the range and shape of the probability distributions for each uncertain variable and using them for the appropriate cells. Software simulations consist of as many trials (or scenarios) as you want – usually many thousands - and take only a few seconds to run.

How do you analyze the results?

Every spreadsheet model has a set of important outputs, such as totals, net profits, or gross expenses that needs to be simulated and analyzed. Each such cell will then be a forecast. During the simulation, you can view a histogram of the results, referred to as a Frequency Chart, developed for each forecast. While the simulation runs, all forecasts stabilize toward a smooth frequency distribution. After thousands of trials, you can view the statistics of the results (such as the mean forecast value) and the certainty of any outcome. The graph below (from Crystal Ball 2002 Software) is a Forecast for Total Expected Return.



What is certainty?

Certainty is the chance that a particular forecast will fall within a specified range. The chart above, demonstrates the chance breaking even (results better than $0) by entering that amount as the lower limit. Of the 5000 trials 4408 (88.2%) had a positive total expected return, so 88% is the certainty of breaking even? The outputs not only show the different resulting values for each forecast, but also the probability of any value occurring.

Other charts allow you to examine different facets of your model. For example a Sensitivity Chart analyses the contribution of the assumptions (the uncertain variables) to each Forecast, indicating which have the greatest impact. An Overlay Chart displays multiple Forecasts on the same axis, even when they are from separate spreadsheet models. When asked, "Which of six potential new projects has the highest expected return with the least variability (smallest range of values surrounding the mean)?" Chose an Overlay Chart to compare them and select the best alternative. Finally a Trend Chart facilitates stacking forecasts to examine trends and changes in a series, showing how risks change over time?

EXAMPLE

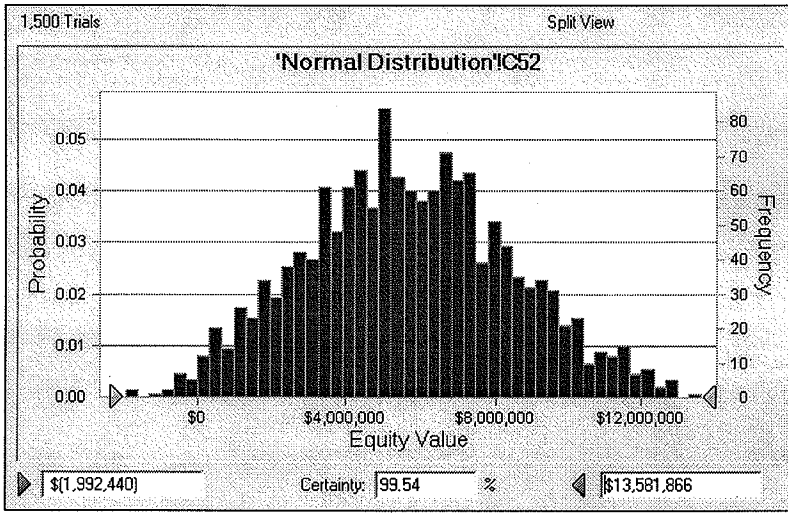
In the traditional discounted cash flow model, forecast earnings rely on single point estimates. To account for the uncertainty in the estimates for revenue and cost increases, the analyst makes a separate calculation for each combination of revenue, and cost. Through the technique known as Monte Carlo simulation, Crystal Ball® forecasts the entire range of results possible for a given situation. In the example below we have determined the total invested capital of the entity based on a discounted cash flow method using a normal distribution with the following assumptions:

Revenues would vary between 90% - 110% of the most likely amount.

Cost of Sales would vary between 33% - 37% of sales.

Administrative Expense would vary between 97% - 103% of the most likely amount.

Below are the results of our simulation using a normal distribution curve:



Statistic	Forecast values
Trials	1,500
Mean	$5,675,217
Median	$5,565,109
Mode	---
Standard Deviation	$2,838,368
Variance	$8,056,330,100,993
Skewness	0.0980
Kurtosis	2.80
Coeff. of Variability	0.5001
Minimum	$(3,634,497)
Maximum	$14,536,447
Mean Std. Error	$73,286

A spreadsheet follows:

Determination of Total Invested Capital

Normal Distribution

	2005	2006	2007	2008	2009
Total Revenue	$ 6,902,000	$ 8,126,200	$ 9,347,520	$ 10,555,572	$ 11,824,104
Cost of Sales	$ 4,311,848	$ 5,210,089	$ 6,052,488	$ 6,903,344	$ 7,780,260
Gross Profit	$ 2,590,152	$ 2,916,111	$ 3,295,032	$ 3,652,228	$ 4,043,844
Gross Profit Margin	37.53%	35.89%	35.25%	34.60%	34.20%
Administrative Expense	$ 1,753,069	$ 1,851,493	$ 1,942,359	$ 2,039,704	$ 2,141,866
Interest	$ 18,000	$ 22,000	$ 20,000	$ 19,000	$ 17,500
Depreciation	$ 151,000	$ 75,000	$ 54,337	$ 39,258	$ 30,085
Total Net Income Before Tax	$ 668,083	$ 967,618	$ 1,278,336	$ 1,554,266	$ 1,854,393
Tax Provision (40%)	$ (267,233)	$ (387,047)	$ (511,334)	$ (621,706)	$ (741,757)
After Tax Net Income	$ 400,850	$ 580,571	$ 767,002	$ 932,560	$ 1,112,636
CONVERT TO CASH FLOW					
Add: Depreciation	$ 151,000	$ 75,000	$ 54,337	$ 39,258	$ 30,085
Interest Expense	$ 18,000	$ 22,000	$ 20,000	$ 19,000	$ 17,500
Net of Tax (40%)	$ (7,200)	$ (8,800)	$ (8,000)	$ (7,600)	$ (7,000)
Increase in Working Capital	$ (75,000)	$ (75,000)	$ (75,000)	$ (75,000)	$ (75,000)
Fixed Asset Additions	$ (50,000)	$ (50,000)	$ (50,000)	$ (50,000)	$ (50,000)
Net Cash Flow	$ 437,650	$ 543,771	$ 708,339	$ 858,218	$ 1,028,221
WACC (Rounded)	17.00%	18.00%	18.00%	19.00%	19.00%
x Present Value Factor	0.85470	0.71818	0.60863	0.49867	0.41905
Discounted Cash Flow	$ 374,060	$ 390,528	$ 431,117	$ 427,966	$ 430,875
Cash Flows (Years 2005-2009)	$ 2,054,546				
TERMINAL VALUE COMPUTATION					
Year 5 EBITDA	$ 1,901,978				
x Multiple	5				
	$ 9,509,888				
x PV Factor	0.41905				
Terminal Value	$ 3,985,113				
Cash Flows (2005-2009)	$ 2,054,546				
Total	$ 6,039,658				
Less: Interest bearing debt	$ (370,355)				
Equity Value	$ 5,669,303				
Per Monte Carlo Mean	$ 5,675,217				
Difference	$ (5,914)				

Note: Illustration is for academic purposes only.

Next we ran another simulation based on a triangular distribution curve, with the following variables:

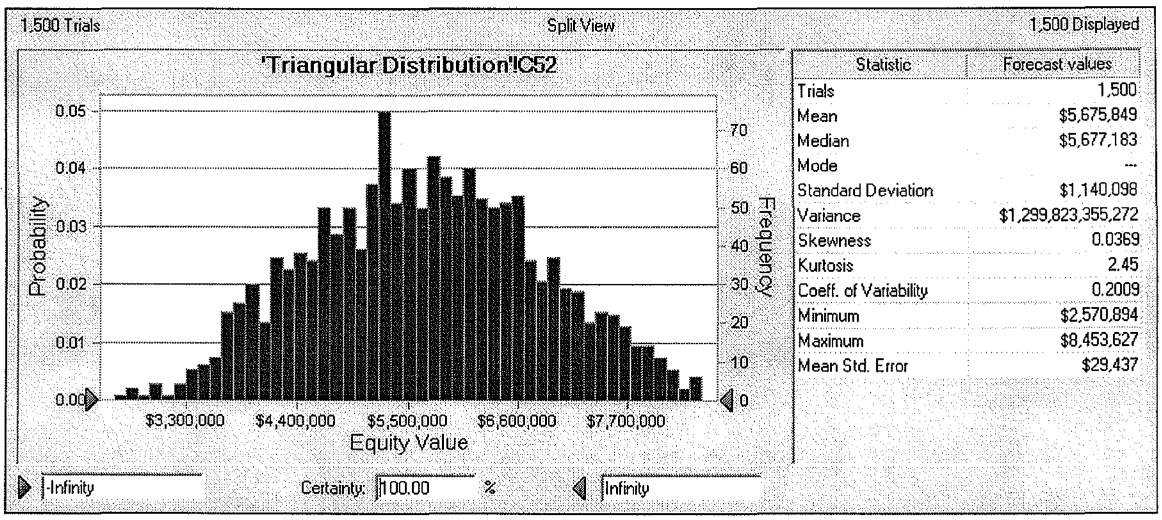
The most likely amounts are the amounts shown in the spreadsheet.

The minimum revenue would be 90% of the most likely amount and the maximum would be 110% of the most likely amount.

Cost of Sales would vary between 33% - 37% of sales.

The minimum Administrative Expense would be 97% of the most likely amount and the maximum Administrative Expense would be 103% of the most likely amount.

Below are the results of our simulation using a triangular distribution curve:



A spreadsheet follows:

Determination of Total Invested Capital
Triangular Distribution

		2005	2006	2007	2008	2009
	Total Revenue	$ 6,902,000	$ 8,126,200	$ 9,347,520	$ 10,555,572	$ 11,824,104
	Cost of Sales	$ 4,311,848	$ 5,210,089	$ 6,052,488	$ 6,903,344	$ 7,780,260
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	Increase in Working Capital	$ (75,000)	$ (75,000)	$ (75,000)	$ (75,000)	$ (75,000)
	Fixed Asset Additions	$ (50,000)	$ (50,000)	$ (50,000)	$ (50,000)	$ (50,000)
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Per Monte Carlo Mean		$ 5,675,849				
Difference		$ (6,546)				

Note Illustration is for academic purposes only.

As can be seen from the Excel spreadsheet above, there is a small difference between the single point estimate of $5.669 million and the Monte Carlo Method mean of $5.676 million.

When comparing the results of the normal distribution with the results of the triangular distribution, you will notice that the mean results are not that much different. However, the standard deviation in the triangular distribution is less than half of the standard deviation in the normal distribution. The comparison of both methods is an excellent way to demonstrate any statistical significance between them.

Recommended Distribution To Use

Nick French and Laura Gabrielli in a paper titled "Discounted Cash Flow: Accounting for Uncertainty" states while it was recognized that the normal distribution was the most statistically robust, it was argued that the triangular distribution was a more appropriate approximation of the thought process of a valuation analyst. Analysts tend not to conceptualize uncertainly in the form of standard deviations around a mean. Instead, they think in terms of "most likely" figure, the "best" and the "worst". This is a triangular (3-point) distribution. In other words, once the analyst has determined the most likely input, it would be possible for them to quantify their uncertainty on each variable by asking them what they believed that the corresponding best and worst figures could be. If there is sufficient market evidence, the analyst will feel more certain of the market conditions and thus more confident in most likely figure for each variable and thus the best and worst may not deviate significantly from this figure. However, where there is less market information, there will be more uncertainty and the corresponding range, above and below the adopted figure, will be proportionally higher than the pervious range. Thus the triangular distribution is recommended for presentation analysis. The use of the triangular distribution not only mirrors the thought process of the analyst, but also mirrors executive behavior. Perhaps it's best use for the present time is for litigation and mergers and acquisitions where a range of value is acceptable.

Conclusion

Bias and uncertainty are inherent with the use of a single point method. Mallinson and French suggest that the following six items of information should be conveyed on reporting uncertainty with your report.

1. The single figure valuation – Fair Market Value
2. The range of the most likely observation (say, 5% either side of FMV)
3. The probability of the most likely observation
4. The range of higher probability
5. The range of 100% probability

6. The skewness of probability

French and Gabrielli suggest a slight modification to this set of information as follows:

1. The certainty range at 5%, 10%, 50% and 100%
2. The skewness of the distribution (reported as % at either end range)

Valuation analysts believe that they are able to isolate themselves from the impact of bias by using decision aides in the from of expert systems and decision analysis tools. It has been my goal to add these techniques to your practice.