CAPITALIZED EARNINGS VS. DISCOUNTED CASH FLOW:
Which is the more accurate business valuation tool?

By Richard R. Conn CMA, MBA, CPA, ABV, ERP

Is the capitalized earnings[1] method or discounted cash flow (DCF) method more likely to produce an accurate estimate of a businesses' value?

Frequently business valuators will attempt to justify the use of the single period capitalized earnings method because estimating cash flows far into the distance future becomes an increasingly difficult undertaking. This is false reasoning, however, because the use of the capitalized earnings method implicitly includes all future cash flows into perpetuity. While the capitalization of one single amount may require less effort than the creation of, for example, fifty annual future earnings, it should require no less thought or analysis and is just as challenging to get right. Moreover, because the single period estimate is representative of an infinite number of future periods, it is more sensitive to estimation error than a DCF approach, as we will show.

Of course, predicting future cash outcomes, either in a single normalized average amount or in a series of individual annual cash flows is an exacting pursuit either way. We can characterize the probability of getting the valuation prediction wrong as resulting from two general areas: estimation error and risk quantification errors. Estimation error deals with not correctly predicting the annual cash flows. If we had expected the business to earn $1 million in cash in future year five and it actually generates $1.2 million in that year our estimation error is 20%. Since none of us can actually foretell the future the question is not whether there will be estimation error in our cash flow forecasts, but rather, the potential magnitude of the error made.

Risk quantification errors involve misjudging the correct capitalization rate (cap rate) or discount rate with which to apply to the forecast of future cash flows. Simplistically one could say that, with the benefit of hindsight, a business should have been valued, for example, using a 12% discount rate when prospectively a 10% rate had incorrectly been used. However, the issue is more complex than that because estimation errors and risk quantification are interrelated. If the future earnings of a business are highly stable and the range of possible variation can be estimated with a high degree of certainty, then the appropriate risk rate (either cap or discount rate) will be lower. In contrast, if the future earnings of the firm are difficult to predict and subject to a wide range of year-over-year variation, then the required risk rate will necessarily be higher.

This paper is primarily focused upon the issue of estimation error. We will assume away the difficulties of deriving an appropriate risk rate so that we can specifically concentrate upon

[1] The term 'Capitalized Earnings' will, throughout this paper, be assumed to be synonymous with the term Capitalized Cash Flow. The former is the more common usage, but we are only concerned with the capitalization or discounting of cash flows here. The use of 'earnings' or 'accounting net income' in the practice of business valuation is fraught with difficulties and imprecision. In this paper, the use of the term 'earnings' will specifically only refer to cash flows.

which valuation approach; capitalized earnings or DCF, is likely to give the more accurate prediction of true firm value.

AN EXAMPLE

Imagine that we are overseeing the work of a completely competent and entirely capable business valuator in deriving an estimate of value for a business that has generated $1 million cash flow annually for some number of years now. For some reason we are empowered with the certain knowledge that this business will continue to generate $1 million cash without variation forever. Our colleague, who is actually conducting the valuation assignment, is not imbued with our perfect foresight and can only predict that all future annual cash flows will fall somewhere within the range of $800 thousand to $1.2 million (Via a uniform distribution. That is, our colleague believes that each dollar point within that range is equally likely to occur). These cash flows are real (i.e. all future inflationary effects have been eliminated) and the firm is known to have a future real growth rate of zero. Therefore, the capitalization rate and discount rate will be the same. For now we are going to assume that the correct required risk rate is 10%.[2]

From our perspective, there is no challenge in completing this assignment. We know that the $1 million in annual cash flow goes on into perpetuity and at a 10% cap rate this dictates that the business is worth $10 million ($1/0.10). Our colleague does not have perfect knowledge of the future, however. He only knows with certainty that all future cash outcomes could range anywhere from $800K to $1,200K per year. Accordingly, using the earnings capitalization method, he then would estimate the value of the business to fall within the range of $8 million to $12 million inclusive ($0.8/0.10 to $1.2/0.10). Estimation error could have led him to either under-value or over-value the business by $2 million or settle upon any conclusion of value within that range. The random element, in this approach, has only to do with the point estimate of normalized earnings: if he chooses to capitalize a point estimate of normal earnings less than $1 million, the business will be undervalued; and, conversely, it will be overvalued if he chooses normal earnings in excess of $1 million.

What if he had decided to employ the DCF valuation approach instead? Now his individual cash flow estimates of annual earnings will still range between $800K and $1,200K, but there will be, conceptually, an infinite number of them.[3] Practically speaking, he may need to estimate 25 to 50 years of future cash flows. There are now two random elements that impact the accuracy of this valuation. The first is the estimation error – precisely the same as with the capitalization method – there now are more than just one period that could be subject to estimation error. The second relates to the time-value-of-money. When using a constant discount rate, the nearer estimates of cash flow have a bigger impact on present value (all other things equal). Cash flow

[2] Of course, since we actually *KNOW* that all future cash flows will be $1 million, the only correct risk rate that could possibly apply is the risk-free rate. However, our colleague does not know this. From his perspective, a 10% rate might be the most appropriate choice given the +/- 20% variation in expected future earnings.

[3] The monetary importance of distant future cash flows will quickly diminish with time. In this case, for example, $1 million discounted at 10% back 50 years has a present value of $8,519. By year 100, the same $1 million would only have a present value of $73.

estimates that are expected to be incurred far into the distant future have a comparatively small effect upon present value. If either by design or just by random chance our colleague forecasts more of the near-term cash flows under the actual $1 million earned, then the net result is likely to undervalue the firm. Conversely, if majority of the near term cash estimates lie within the $1.0 to $1.2 million range, then the firm will most likely be over-valued. So, with the DCF method, accuracy depends not only on estimation error, but also *when* the variations away from the 'true' cash flow are forecast to occur.

The difference between the two approaches is that the capitalized earnings method only gives the valuator one chance to get the normalized earnings estimate correct whereas the DCF method allows the forecaster to make several sequential estimation errors that, in all probability, will often partially cancel each other out in the longer term. What tends to happen in the DCF application is that the individual years of over-estimation are counter-balanced by those years of underestimation.[4] Therefore, there is a higher probably that the aggregate non-discounted average of all the annual cash estimates will be closer to the $1 million.[5] That is to say, on a non-discounted basis, the estimation error of the DCF method is likely to be less than compared with the capitalized earnings method.

In fact, if it were not necessary to discount the annual cash flows, we could state with some mathematical precision just how much more probable it would be for the DCF method to reflect the true mean of $1 million/year than just one single capitalization amount.[6] But undiscounted cash flows are not a useful metric in business valuation. Therefore, the requirement to discount the DCF annual outcomes clouds the comparison between DCF and capitalized earnings and adds another random element to analysis that defies precise mathematical quantification.

We can, however, construct an electronic model that simulates the kind of scenario we have been describing. Similar to our phantom colleague, the model will be allowed to select one capitalized earnings amount that will randomly vary between $800K and $1,200K. Juxtaposed to this, the model will simultaneously also select 50 years of annual estimates, each of which can randomly occur between $800K and $1,200K inclusive. These will be discounted at the appropriate 10% discount factor and summed in order to determine the net present value. Notwithstanding the stochastic time-value-of-money element, we would expect the DCF method to consistently be a better predictor of the 'true' $10 million value than the capitalized earnings approach.

[4] This assumes the valuator is free from bias in making the annual estimates and is just as likely to estimate above the 'true' $1 million amount as below.

[5] The statistical concept that is being expressed here relates to the law of large numbers. The capitalized earnings method is analogous to tossing a fairly weighted die once. There is only a 1-in-6 chance that a three will appear. However, if that die were tossed 1,000 times, it is almost a statistical certainty that the average of all the tosses will be very close to 3.5.

[6] To make the exposition simple, we have chosen an example where the 'true' annual cash flow is a constant amount in every year in perpetuity. This is certainly not a necessary condition to show that the DCF is a more accurate predictor of value. The actual known cash flows could be erratic and highly volatile frequently shifting from positive in one year to negative in the next. The only condition necessary is that the valuator is just as likely to over-predict cash flow in any given year as to under-predict.

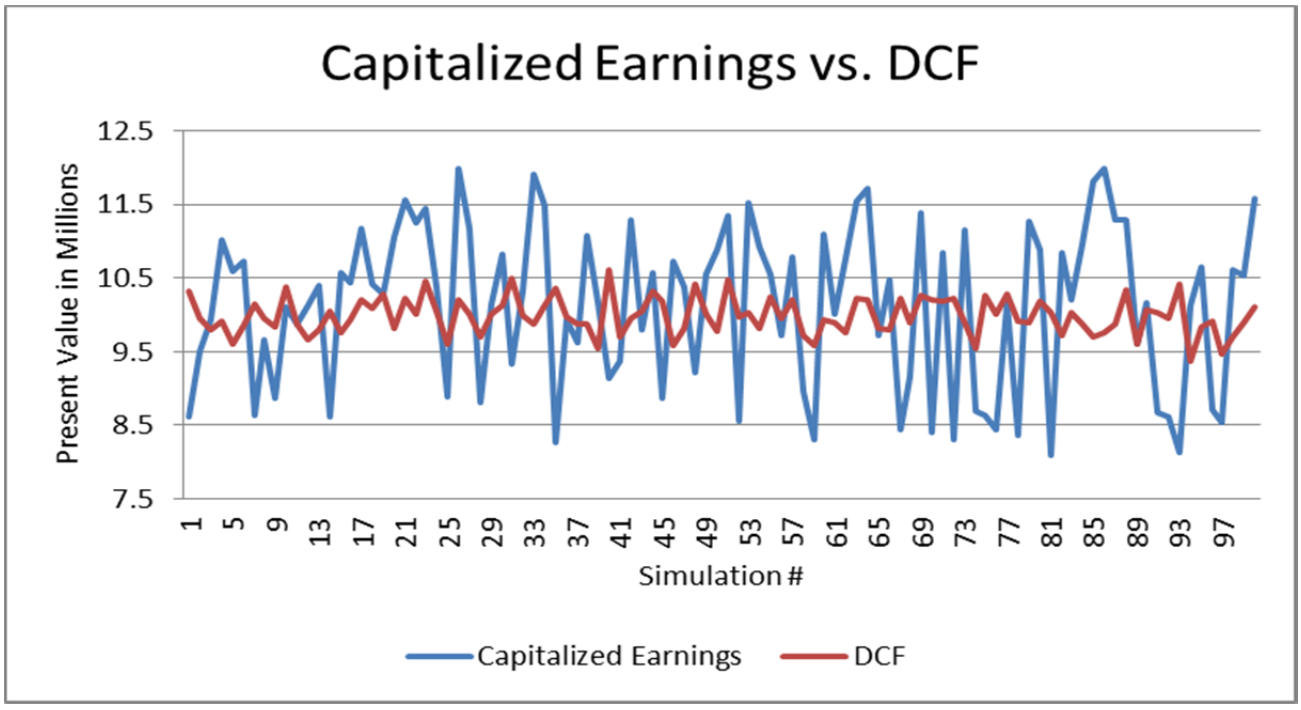
This comparison simulation was run 10,000 times and the findings definitely indicate that the DCF is an overall better predictor of present value. The average of the 10,000 outcomes is:

	Capitalized Earnings Method	DCF Method
Average of 10,000 Simulations	$ 9,989,863	$ 10,000,578

Of the 10,000 individual trials, there was a total of 1,020 times when the capitalized earnings method produced an estimate of present value closer to the known $10 million value than the DCF approach did. So, approximately 90% of the time DCF was a better predictor of value than the capitalized earnings approach.

As a visual indication of estimation precision, a random selection of 100 of the 10,000 simulations was taken and graphed in order to show how closely the DCF method was centered around the $10 million true mean value in relation to how widely dispersed the capitalized earnings approach was:

10% Risk-Rate ($10 Million 'True' Value)



The standard deviations of the 10,000 outcomes are $1.163 million (11.63% of true value) for the capitalized earnings method compared with only $0.255 million (2.55% of true value) for the DCF.

SENSITIVITY TO RISK RATES

A decrease in risk rates causes the present value of the business to increase. It will also tend to exaggerate the difference between the accuracy of the DCF approach vs. the capitalized earnings approach. This is because of the fact that, with the DCF method, the over and under estimations of annual cash flow tend to cancel in the due course of time whereas the capitalized earnings approach has only one opportunity to get the normalized estimate of cash flow correct. This 'cancelling' effect does not occur with the capitalized earnings approach and therefore any estimation errors incurred will be magnified by the lower cap rate.

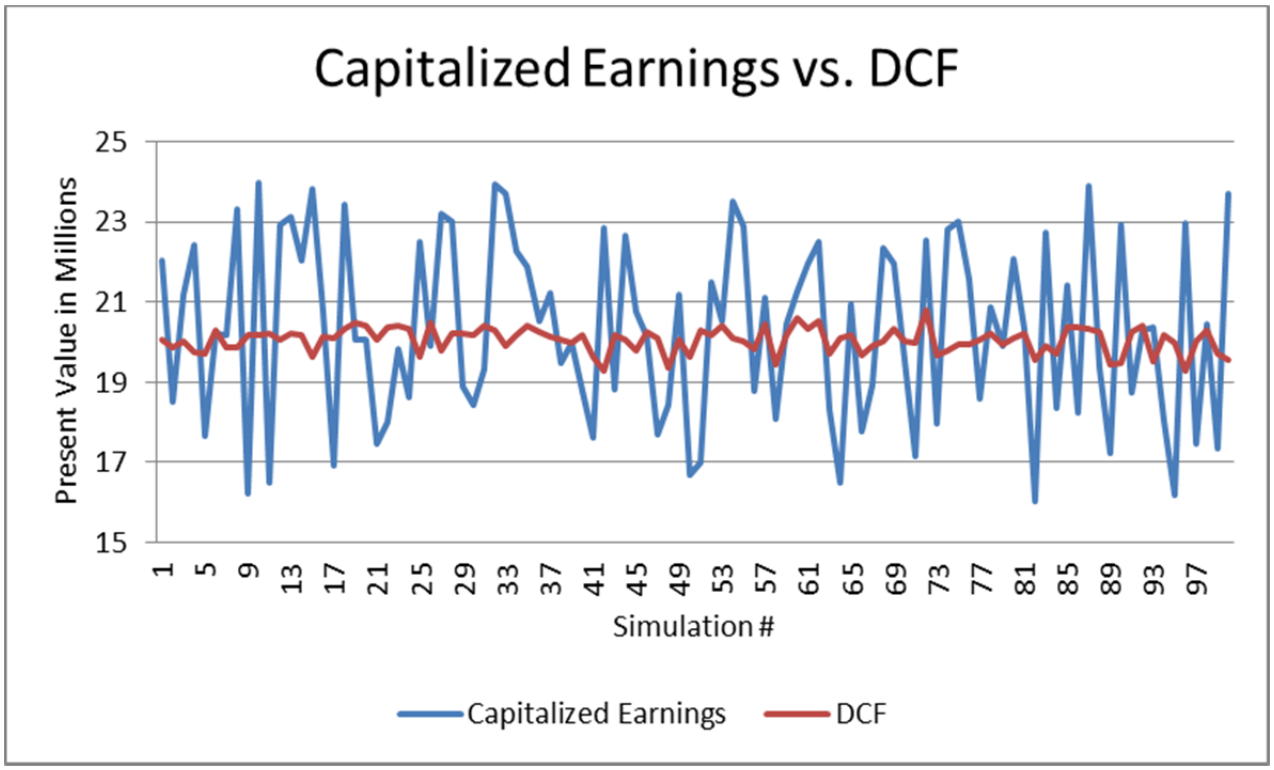
If, for example, the real, zero-growth risk rate is decreased to 5%, the boundary estimates on capitalized income become $16 million to $24 million ($0.8/0.05 to $1.2/0.05) and the 'true' estimate of business value would, of course, be $20 million ($1/0.05). If exactly the same 10,000 trials scenario is repeated with a 5% risk-rate, the number of occurrences where capitalized income turns out to be a better predictor of firm value decreases to 723 out of 10,000. 93% of the time DCF proved to be the better estimator of firm value.

The average of all 10,000 trials still indicates that the DCF method is a better predictor of 'true' business value by a margin of about $6K:

	Capitalized Earnings Method	DCF Method
Average of 10,000 Simulations	$ 19,992,562	$ 19,998,574

Moreover, the variability about the true value is:

5% Risk-Rate ($20 Million 'True' Value)



The standard deviations become $2.317 million (11.58% of true value) for the capitalized earnings method compared with only $0.359 million (1.79% of true value) for the DCF.

Conversely, the higher the risk rate becomes, the less significant the difference will be between the capitalized earnings approach vs. the DCF. This is because the proportionate impact of the longer-termed DCF estimates decreases as the discount rate increases. In essence the effective DCF term is becoming shorter as risk-rates rise and therefore this method is producing results closer and closer to a single-period capitalized earnings approach. In the extreme, perhaps with a risk-rate of 100%, it would only be the first 5 years in the DCF model that would have any measurable impact upon the present value. Therefore, the estimation error incurred in those first five years would have less opportunity to be offset by a counter-balancing estimation error in subsequent years.

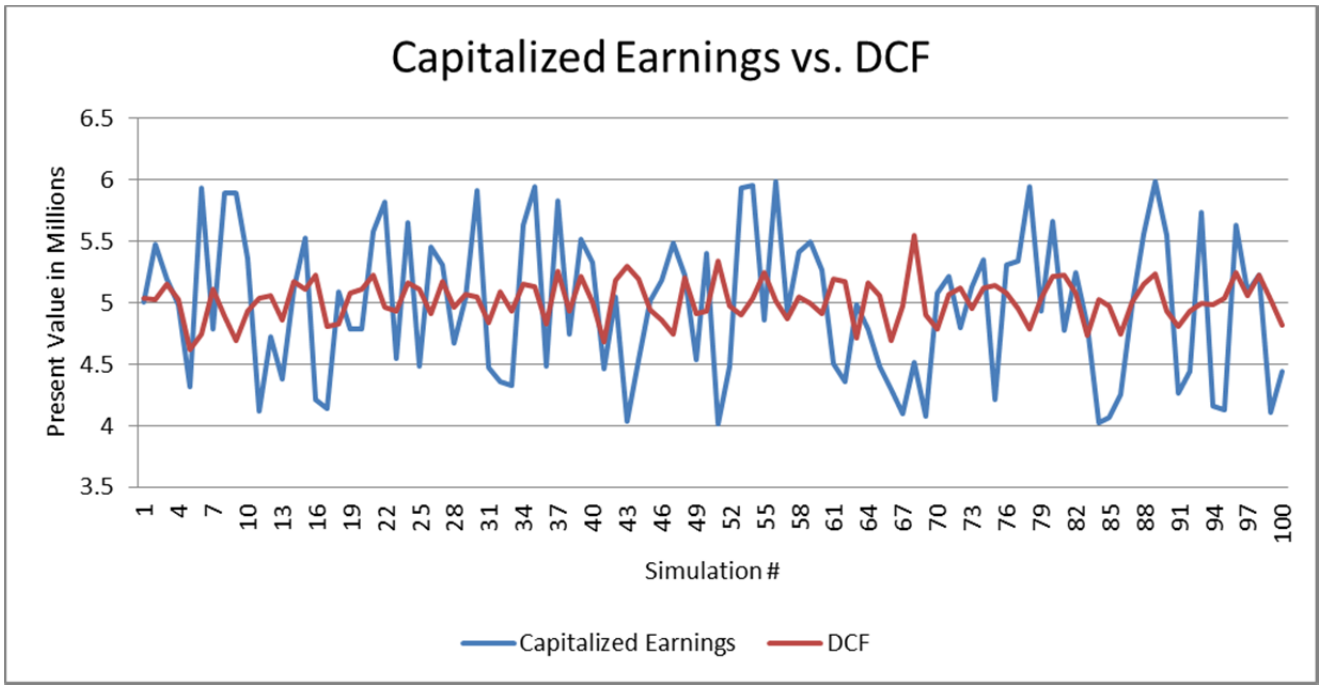
If, for example, the risk-rate is increased to 20% (i.e. the 'true' firm value is $1/0.20 = $5 million and the range of capitalized estimates becomes $4 million to $6 million [$800K/0.20 to $1,200K/0.20]), then the number of instances where the capitalized earnings approach provides a better estimate of value increases to 1,422.

The average of all 10,000 trials still indicates that the DCF method is a better predictor of 'true' business value by a margin of about $4K:

	Capitalized Earnings Method	DCF Method
Average of 10,000 Simulations	$ 5,006,465	$ 5,002,599

The overall variability of the two approaches draws closer:

20% Risk-Rate ($5 Million 'True' Value)



The standard deviations at the 20% risk-rate decreases to $0.579 million (11.58% of true value) for the capitalized earnings approach and $0.175 million (3.5% of true value) for the DCF method. As a percentage of true value, then the difference between the volatility of the capitalization approach vs. DCF has narrowed. Specifically, the volatility of the DCF has increased.

OFTEN CITED ARGUMENT IN FAVOR OF CAPITALIZED EARNINGS

The fallacious argument that is often used to support the capitalized earnings approach revolves around the difficulty of trying to foretell how distant future earnings will evolve. Valuators say: 'I know with reasonable certainty that earnings will range between $800K and $1,200K for the

next ten years – but I couldn't begin to predict what cash flow will be in year twenty-five.' So, as an apparent solution to this longer-term uncertainty, they select the expected near-term earnings amount as a proxy for the capitalization amount. These valuators are confusing current near-term earnings estimate and a normalized long-term capitalization amount – the two are not the same and are certainly not interchangeable.[7]

By design, the capitalized earnings approach assigns a normalized fixed annual amount to all future years ad infinitum. Therefore, if it is truly impossible to forecast the cash flows of the business beyond year X, then the capitalized earnings method should not be used. For example, if the valuator can only forecast earnings for the first 10 years and is then completely at a loss for what may happen in any subsequent years, the most prudent and justifiable valuation for that firm would be $6.145 million (i.e. an annuity of $1 million per year for 10 years @ 10% discount) and not the $10 million derived from a perpetuity of $1 million per year.

CONCLUSIONS

Under the assumption that the analyst does not know the future cash flows of a business, but is just as likely to overestimate any given year's cash flow as to underestimate it, there is a higher probability that the DCF method will provide a more accurate estimate of 'true' value than the capitalized earnings method. This is because capitalized earnings is dependent upon only one point estimate for all future cash flows of the business – therefore estimation error will be exaggerated. In contrast, the DCF method inherently allows for a netting of errors over time. Overestimations in one year can be mitigated by underestimations in the next. However, the DCF method is sensitive to increases in the discount rate which can lessen the advantages of the DCF approach and, at very high rates, cause it to perform more like the capitalized earnings method.

The concept that the capitalized earnings approach is appropriate in those circumstances when the long-term earnings of the firm are not determinable is a fallacy. By definition, the capitalized earnings approach is only applicable when one normalized estimate of cash flow is appropriate for all periods to infinity.

[7] The same problem is incurred when financial analysts confuse the forward earnings estimate with a normalized earnings amount suitable for use in the P/E (Price-Earnings ratio). For a further discussion on this point see: http://www.connvaluation.com/caseStudies/Price_to_Earnings_Ratio.pdf