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I read with a great deal of interest Toby Tatum's article entitled *Harmonic Mean Value: The Appropriate Measure of Central Tendency* in the Third Quarter 2011 issue of Business Appraisal Practice. I have long regarded Mr. Tatum as one of the industrial strength thinkers in our profession, and so I always look forward to hearing what he has to say on any valuation topic. But in this instance I must respectfully disagree with the conclusions he reached in his article, specifically his comment that the harmonic mean is "the only correct way to calculate the central tendency in a sample of transaction ratios." While the harmonic mean may be a reasonable choice as a measure of central tendency, because when compared to the arithmetic mean and the median it is the more conservative metric, as well as demonstrating less variability between actual and predicted values, it is not a necessary choice, as suggested by Mr. Tatum.

However, there are situations where the harmonic mean is a necessary choice as a measure of central tendency. For example, if I were to spend $1,000 a month for 5 months buying shares of a particular stock when the price was $4, $5, $8, $10 and $20, the dollar averaged cost of my 725 dollar averaged shares would be $6.90 computed using the harmonic mean. On the other hand, if I was to buy 145 shares a month at the same price per share given above, I would wind up with 725 shares with a dollar averaged cost of $9.40, calculated using the arithmetic mean. From this example, we can derive a general rule – for cost per share, when cost is given and is a constant, we use the harmonic mean. When the number of shares purchased is given as a constant, we use the arithmetic mean.

This same reasoning applies to rate, time and distance problems. For example, if 3 automobiles that drive at 10, 20 and 30 MPH, respectively, with each traveling a distance of 30 miles, the average rate of speed is 16.4 MPH, calculated using the harmonic mean. On the other hand, if the same 3 automobiles travel for 8 hours each, the average speed is 20 MPH, calculated using the arithmetic mean. The general rule applies here as well – when the ratio is MPH, if miles (distance) is given as a constant, then the harmonic mean is the correct measure of central tendency. However, if time (hours) is given as a constant, the arithmetic mean is the proper choice. It all depends on whether the constant factor is in the numerator or denominator of the ratio.

This is the reasoning that Mr. Tatum used in his hypothetical example of 2 businesses, each with different amounts of SDE and SDE multiples, but with both purchased for the same price of $200,000. His conclusion that the average SDE multiple should be computed using the harmonic mean is correct, as price is the constant numerator in the ratio. However, a review of any of the transaction databases will fail to turn up any industry listing where the SDE or annual revenue, never mind selling price, is ever a constant amount. And without selling price being a constant, there is no requirement to use the harmonic mean to compute a central tendency. This not to say that the harmonic mean can never be used in a business valuation setting – to the contrary, as mentioned above, it can be a superior metric to the arithmetic mean and the median for reducing dispersion, and therefore perhaps should be the selection of choice among business appraisers. But no analyst should feel that they have made a major statistical blunder by using either the arithmetic mean or the median to calculate a measure of central tendency for a pricing multiple.

Sincerely yours,

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