
VALUE WIZARD INSIGHTER - September 2000

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1. Dilution

The total number of shares of common stock outstanding for a company is an important figure due to its effect on per-share figures. The number of shares varies with changes in capitalization of the company. Speculators typically place undue emphasis on non-economic dilative events, while investors often overlook the significance of economic dilative events.

There are two potential effects on per-share figures due to economic dilution: the obvious effect on the denominator and the other effect on the numerator. For example, a company pays some of its employees with incentive stock option grants in addition to salaries and benefits. One effect on earnings per share (EPS) is an increase in the number of shares of common stock outstanding when the grants are exercised, the denominator effect. The other effect on EPS is a decrease in earnings due to an increase in employee compensation expense associated with the stock option grants, the numerator effect. Therefore, in this case an investor should be concerned not only with *diluted* EPS, but also with diluted EPS *adjusted* for the cost of employee stock options.

Under current generally accepted accounting rules (GAAP), companies aren't required to deduct the cost of stock options as employee compensation to calculate profits. Rather, the costs of employee stock options (based on standard option pricing models such as Black-Scholes) only have to be mentioned in a footnote in the companies' annual audited financial reports. For an apples-to-apples comparison between companies, or for a more accurate economic measure of earnings, the diluted EPS figure reported by companies should be adjusted for stock option expenses as disclosed in the footnotes. The *adjusted diluted* EPS figures are often materially lower than the unadjusted figures for companies in the technology and Internet sectors and also surprisingly for the large blue-chip S&P 500 companies.

Number of shares and dilution are addressed frequently throughout Graham and Dodd's *Security Analysis: The Classic 1934 Edition* (reprint 1996). You are encouraged to studiously read this book from cover to cover. Selected excerpts follow:

p 12: Speculation Not a Satisfactory Substitute for Investment. [T]he psychology of the speculator militates strongly against his success. For, by relation of cause and effect, he is most optimistic when prices are highest and most despondent when they are at bottom. Hence, in the nature of things, only the exceptional speculator can prove consistently successful, and no one has a logical right to believe that he will succeed where most of his companions must fail.

p 263: The value of a common stock is said to be diluted if there is an increase in the number of shares without a corresponding increase in assets and earning power. Dilution may arise through split-ups [splits], stock dividends, offers of subscription rights at a low price, and issuance of stock for property or services at a low valuation per share.

pp 456-59: Adjustments for Changes in Capitalization. Allowances for Changes in Capitalization. In dealing with the past record of earnings, when given on a per-share basis, it is elementary that the figures must be adjusted to reflect any important changes in the capitalization which have taken place during the period. In the simplest case these will involve a change only in the number of shares of common stock due to stock dividends, split-ups, etc. All that is necessary then is to restate the capitalization throughout the period on the basis of the current number of shares.

When the change in capitalization has been due to the sale of additional stock at a comparatively low price (usually through the exercise of subscription rights or warrants), or to the conversion of senior securities, the adjustment is more difficult.

A corresponding adjustment of the per-share earnings must be made at times to reflect the possible *future* increase in the number of shares outstanding as a result of conversions or exercise of option warrants.

p 552: Warrants to by stock, even at a price above the market, therefore detract from the present value of the common stock.

A Dangerous Device for Diluting Stock Values.--The option warrant is a fundamentally dangerous and objectionable device because it effects and indirect and usually unrecognized dilution of common-stock values. The stockholders view the issuance of warrants with indifference, failing to realize that part of their equity in the future is being taken from them. The stock market, with its usual heedlessness, applies the same basis of valuation to common shares whether warrants are outstanding or not.

p 585: Evidently the processes by which the securities market arrives at its appraisals are frequently illogical and erroneous. These processes, as we pointed out in our first chapter, are not automatic and mechanical, but psychological, for they go on in the minds of people who buy and sell. The mistakes of the market are thus the mistakes of groups or masses of individuals. Most of them can be traced to one or more of **three basic causes: exaggeration, over-simplification or neglect**. [bold-face added].

pp 589-93: Chapter L Discrepancies between Price and Value. The inveterate tendency of the stock market to exaggerate extends to factors other than changes in earnings. Overemphasis is laid upon such matters as dividend changes, stock split-ups [splits], mergers, segregations [spinoffs and divestitures], and what not. The excited responses often made to stock dividends are even more illogical, since they are in essence nothing more than pieces of paper. The same is true of split-ups, which create more shares but give the shareholder nothing he did not have before.

The exaggerated response made by the stock market to developments which seem relatively unimportant in themselves is readily explained in terms of the psychology of the speculator. He wants "action," first of all; and he is willing to contribute to this action if he can be given any pretext for bullish excitement. (Whether through hypocrisy or self-deception, brokerage-house customers generally refuse to admit they are merely gambling with ticker quotations, and insist upon some ostensible "reason" for their purchases.) Stock dividends and other "favorable developments" of this character supply the desired pretexts, and they are fully exploited by the three elements: (1) an item to be averaged, in this case the number of shares of common stock, (2) a basis for determining weights, in this case time duration, and (3) a method of weighting, which can vary from the simple to the complex.

In FASB Statement No. 128, Paragraph 45, the example on pages 56-65 shows the calculation of weighted average number of shares on a monthly basis, quarter by quarter, for a full fiscal year. Few companies have many dilative events during one fiscal year, and actual weighted average shares are often calculated on a days-outstanding basis. There are several factors that make it difficult to reconcile the reported numbers in Forms 10-Q and 10-K. For example, sequencing of dilative events by their incremental dilative impact continues until any antidilative event is reached, and the sequence may change from one quarter to the next.

In response to an inquiry to the Controller of Yahoo, Inc., I received the following explanation dated 4 August 2000 of how they calculated weighted average shares: "When we calculate the weighted portion, we do not base it on a beginning and ending; instead, each stock issuance is weighted based on the actual number of days outstanding."

Thus, in order to reconcile the number of weighted and non-weighted shares reported in Forms 10-Q and 10-K, it would be necessary to have the record of individual stock issuances by date of issuance with the number of shares issued.

The following hypothetical simplified example is illustrative of the method of calculating a weighted average number of shares in compliance with FASB 128 for a company with a fiscal year the same as the calendar year, and beginning 1999 with 900,000 million shares outstanding. To simplify presentation, the weights are months instead of days. The overhang of potential share equivalents is due to exercise of incentive stock options, exercise of stock warrants, and conversion of senior securities such as preferred stock.

Quarter and Date	**Shares Issued**	**Reason for Issuing Shares**
1Q: 1 February 1999	15,000	exercise of stock options
2Q: 1 April 1999	120,000	conversion of preferred stock
3Q: 1 September 1999	60,000	exercise of stock warrants
4Q: 1 November 1999	30,000	exercise of stock options
4Q: 1 December 1999	15,000	exercise of stock options

First Quarter Weighted Average (3 months):
(900,000*3 months) + (15,000*2 months) / 3 months = 910,000 shares

Second Quarter Weighted Average (3 months):
(915,000*3 months) + (120,000*3 months) / 3 months = 1,035,000 shares

Third Quarter Weighted Average (3 months):
(1,035,000*3 months) + (60,000*1 month) / 3 months = 1,055,000 shares

Fourth Quarter Weighted Average (3 months):
(1,095,000*3 months) + (30,000*2 months) + (15,000*1 month) / 3 months = 1,120,000 shares

Qtr	Beginning	Issued	Ending	%Change	Wt Average	%Change
1Q	900,000	15,000	915,000	1.7	910,000	1.1
2Q	915,000	120,000	1,035,000	13.1	1,035,000	13.1
3Q	1,035,000	60,000	1,095,000	5.8	1,055,000	1.9
4Q	1,095,000	45,000	1,140,000	4.1	1,120,000	2.3

A comparison of the Ending and Wt Average columns, or alternatively the associated %Change columns, reveals the different effects of overhanging shares and the timing of their exercise or conversion during the period.

The weighted averages for cumulative 3-, 6-, 9- and 12-month periods are calculated the same way as for the non-cumulative averages. The difference between the actual number of shares outstanding on any given ending date and the weighted average number of shares outstanding over any given period is due to the lagged issuances of new increments of common shares that do not always occur on the first day of the period. This is reflected in the difference between the percentage change based on shares on an ending date and the percentage change based on weighted average shares.

The smaller a dilative event is as measured in number of shares, the smaller its impact on the weighted average. It addition, the later a dilative event is after the first day of the period, the less it will skew the resulting number of weighted average shares outstanding.

For economic valuation, the most important total shares number is often irrelevant because the total company is evaluated rather than one share. When the pro rata economic value of each share of common stock outstanding is needed, the most important total shares number is generally the total maximal diluted number of shares outstanding as a forward-looking upper bound. The current total number of shares outstanding can serve as a lower bound.

For investment decision making, the most important total shares number is the same figure for which the current market price is quoted. In this manner, the calculation of safety margin is made on the same basis both for value and for price. The market price theoretically reflects the expected dilution that is implied by any overhang of common stock equivalents.

Obviously, a larger amount of overhang will result in a larger weighted-average number of shares. Less obviously, a lead in timing of the exercise or conversion of share equivalents into actual shares outstanding also will result in a larger weighted-average number of shares for most methods of calculating the weighted average. In some cases, the effect of lead time can outweigh the effect of the size of the overhang. For example, 50,000 share equivalents on the last day of a quarterly (90 days) or longer period will have less impact on the weighted-average number of shares than 1,000 share equivalents on the first day of the same period. Thus, 50,000 shares multiplied by 1 day is less than 1,000 shares multiplied by 90 days.

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3. Composite Real-Value Annuity

How can we evaluate a composite real-value annuity? An annuity is a contract for a series of periodic constant nominal payments to begin on a given date and end on a subsequent given date or event. A real-value annuity is an annuity with constant real-value payments instead of constant nominal-value payments. Real values are nominal values adjusted for the expected rate of price-level inflation. Thus, real values are expected to have constant purchasing power in terms of some metric such as year-2000 dollars.

Two or more real-value annuities in sequence that increase in their level amount from one annuity to the next, i.e., with each subsequent annuity having an increased level amount of purchasing power, is a composite annuity that is referred to here as a "sequentially-escalating real-value annuity." It is sequential in the sense that the payments from the first annuity are followed by the payments for the second annuity, which in turn are followed by the payments for the third annuity, etc.

Such a composite real-value annuity can be evaluated using the Value Wizard Investment Models at Numeraire.com, but the procedure is somewhat tricky and thus requires extra careful attention. The procedure will be explained with a hypothetical example.

This procedure can serve as an interim method for those who can't find a model specifically designed for evaluating composite real-value annuities. The example calculation results are reported with full decimals to enable replication and verification, although the implied precision is spurious due to assumptions about uncertain future inflation rates and investment returns. The calculation is followed by a theoretical explanation.

Investments and returns can be expressed as stocks and flows. Stocks are equivalent to lump sum payments, and flows are equivalent to annuities. Annuities can be either a constant real amount or a constant nominal amount. A rate of increase in price-level inflation (exponential growth rate) translates constant (no growth) real values to non-constant (growing) nominal values.

The Value Wizard Investment Models are designed for exponential cashflow growth patterns. They are not designed for non-exponential increases in cashflow in discrete steps such as sequential annuities. Also, they are not designed for a growth pattern beginning with an initial period of annual cashflows equal to zero. Yet a stream of constant real values is equivalent to a stream of non-constant exponentially growing nominal values. Furthermore, leading zero cashflow years can be handled with additional calculations of present value. In general, two types of transformation are required:

First, decompose the composite annuity into separate component annuities.

Next, transform each constant-level annuity to the equivalent lump sum at a given date based on rate of return and inflation assumptions.

Last, transform each lump sum at a given date to the equivalent lump sum at a prior date based on rate of return and inflation assumptions.

For example, a woman and her husband wish to invest a lump sum now to provide real-value payments after taxes, transactions costs, and trust fund management expenses to their 11-year old granddaughter beginning when she reaches 21 years of age. The payments total $2.2 million over 50 years as follows.

Stage	**Holding Period**	**No. Years**	**Annual Payment**	**Total Payment**
1	Years 1 - 10	10	-0-	-0-
2	Years 11 - 20	10	$30,000	$ 300,000
3	Years 21 - 30	10	$50,000	$ 500,000
4	Years 31 - 50	20	$70,000	$1,400,000

The lump sum is assumed to be invested and generate a return net of taxes and costs equal to an average nominal 8% per year over the 50-year investment horizon, and inflation is assumed to average 4% per year over the same period.

The questions is, How large a lump sum at the beginning of Year 1 would be equivalent to this stream of annual real-value payments?

To answer this question, the Value Wizard 1-Stage Value model can be used in two sequential steps for each of the four stages of constant annual cashflow: the first step to calculate the present value (PV) of the positive cash flows as of the first year of positive cash flow, and the second step to calculate the present value of this intrinsic value (IV) as of the first year of the investment holding period. With compounding and discounting over continuous time as opposed to discrete-interval time, the present value at the beginning of each stage is equal to the present value at the end of the prior stage. Once all four stages have been evaluated, the four present value sub-totals at the beginning of Year 1 can be added to get the total present value of the lump sum required to generate the stipulated future payments. Each calculation using the 1-Stage Value model is listed in the following table:

Stage	**Step 1: PV Date**	**Step 2: IV Date**	**Step 3: IV Date**
1	Beginning of Year 1	(not applicable)	(not applicable)
2	Beginning of Year 11	Beginning of Year 1	(not applicable)
3	Beginning of Year 21	Beginning of Year 1	(not applicable)
4	Beginning of Year 31	Beginning of Year 16	Beginning of Year 1

The third step is required because the Value Wizard models are designed with a maximum 20-year investment horizon. Therefore, the 30-year period prior to Stage 4 is divided into two equal 15-year periods.

In the first step of calculating the present value of each stage, the question is, What initial lump sum investment will generate the given constant real-value annuity with zero final value? In step one, therefore, the initial "Base FCFE" is equal to the constant real-value cash payment, the

Growth Rate is equal to the rate of inflation, and the Discount Rate is equal to the rate of net return on investment. In addition, the Price/FCFE ratio is equal to zero because the ending value or selling price is equal to zero.

In the second step of calculating the present value of each stage, the question is, What initial lump sum will generate the given ending value or selling price with zero annual cash payments in the interim period? In step two, therefore, the Price/FCFE ratio is set equal to the intrinsic value calculated in the first step, and the initial Base FCFE is set equal to a vanishingly small near-zero unit-value number such as $1. In addition, the Growth Rate is set equal to zero, and the Discount Rate is set equal to the net rate of net return on investment, calculated from the gross rate of net return and the rate of inflation.

For greater precision, the Price/FCFE can be set equal to the intrinsic value with the scale units multiplied by 1,000 or set equal to 1,000 and the initial cash flow divided by 1,000 or set equal to $0.001. The important point is that the product of the Price/FCFE ratio multiplied by the ending year FCFE be equal to the intrinsic value from the first step. The product of either $1.00 or $0.001 FCFE per year times the number of years is insignificant even before discounting and thus can be ignored.

The example is evaluated below to illustrate the method using a scale unit of 1 and total shares outstanding of 1. In step 1, the nominal growth rate (GR) is 4% (set equal to the inflation rate), and the nominal discount rate (DR) is 8% (required rate of nominal net return). The ratio (1+DR)/(1+GR) = 1.08/1.04 = 1.0384615. In steps 2 and 3, to adjust for inflation in terms of the initial reference year for constant money and to adjust for the real initial investment to return the ending real "selling price," the real growth rate is set equal to 0% to maintain a constant unit-value annuity, and therefore the real discount rate is set equal to 3.84615% so that the ratio (1+DR)/(1+GR) has the same value as in step 1. The calculation of the real discount rate is tricky.

Stage	**Step 1: Date & PV**	**Step 2: Date & PV**	**Step 3: Date & PV**
1	Begin of Year 1 $ -0-	n/a	n/a
2	Begin of Year 11 $245,201.18	Begin of Year 1 $168,127.85	n/a
3	Begin of Year 21 $408,668.63	Begin of Year 1 $280,211.69	n/a
4	Begin of Year 31 $964,415.19	Begin of Year 16 $547,553.25	Begin of Year 1 $310,881.92

Total PV at Beginning of Year 1 = $168.1 + $280.2 + $310.9 = $759.2 ($759,221.46 for exact replication).

In Step 2 of Stage 2, multiplying the Price/FCFE ratio by 1,000 to $245,201,180 and simultaneously dividing the Base FCFE by 1,000 to $0.001, decreases the Beginning of Year 1 PV to $168,122.12, a difference of a minuscule $5.73 ($10.00 minus 0.01 or $9.99 before discounting). This has no impact on the rounded final result.

SUMMARY:

Stage	Annual Payments	Total Payments	Lump Sum PV at Begin of Year 1
1	$ -0- x 10 years	$ -0-	$ -0-
2	$30,000 x 10 years	$ 300,000	$ 168,100
3	$50,000 x 10 years	$ 500,000	$ 280,200
4	$70,000 x 20 years	$1,400,000	$ 310,900
Total	**50 years**	**$2,200,000**	**$ 759,200**

The present value of the stipulated composite real-value annuity is $760,000. Thus, an investment of $760,000 today will generate cash payments of $2,200,000 over 50 years, which is a return-to-investment ratio of 2.90:1. This specific hypothetical example is covered more generally by the following theoretical explanation.

The Value Wizard Investment Models are based on growth patterns. The 1-Stage and 2-Stage models differ in the number of growth stages. Growth stages are not interpreted the same as cashflow stages. In both cases, a stage here refers to a vertical division of the investment time horizon or holding period.

Growth stages assume a stipulated initial or base cashflow in year zero which increases exponentially for a stipulated number of years in the first stage at a stipulated growth rate and then for a stipulated number of years in the second stage at a second stipulated growth rate. The transition between the first and second stage is multiplicative, not additive, in its effect on the cashflow. Therefore, an initial cashflow of zero will result in zero annual cashflows throughout both the first and second stages because zero cashflow in stage one *multiplied by* any positive growth rate is zero.

In contrast, cashflow stages assume a stipulated constant cashflow per year for a stipulated number of years in the first stage and then at a stipulated constant cashflow per year for a stipulated number of years in the second stage. The transition from stage one to stage two has an additive, not multiplicative, impact on cashflow. Thus, a first-stage annual cashflow of zero can incrementally increase to a second-stage positive annual cashflow because zero cashflow *plus* any positive cashflow is positive.

For intrinsic valuation applications where expected future cash flow investment returns are projected in order to calculate a net present value, growth stages are more intuitive to interpret than are cashflow stages. For financial planning applications where expected future cash needs are projected in order to calculate a financially equivalent initial lump sum investment, cashflow stages may be more practicable.

If an initial lump sum investment is projected to earn a compound rate of return throughout a holding period that spans two or more discrete cashflow stages, then it is no longer a straightforward discounting of future values to a present value. There are two factors that simultaneously determine the required initial lump sum: cash returns on the initial lump sum investment, and discounting annual future cash flows to the present.

In such a case, the cash flow stages can be converted to growth rate stages, and the Value Wizard 1-Stage Value model can be used to estimate the size of the lump sum investment that is monetarily equivalent to stipulated annual cash flows under an assumed expected rate of return on investment. To convert cashflow stages into growth stages, it is necessary to decompose the overall pattern into components.

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