Relating Stock Prices to Earnings

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Many years ago a statement in the book, *Learn to Earn* (Fireside, 1995), by the famous fund manager Peter Lynch caught my attention. He asserted that there was a strong correlation between a firm's share value and its earnings that was fundamental to profitable investing. In his words, "This simple point – that the price of a stock is directly related to a company's earning power – is often overlooked, even by sophisticated investors ... This is the starting point for the successful stock picker: Find companies that can grow their earnings over many years to come."

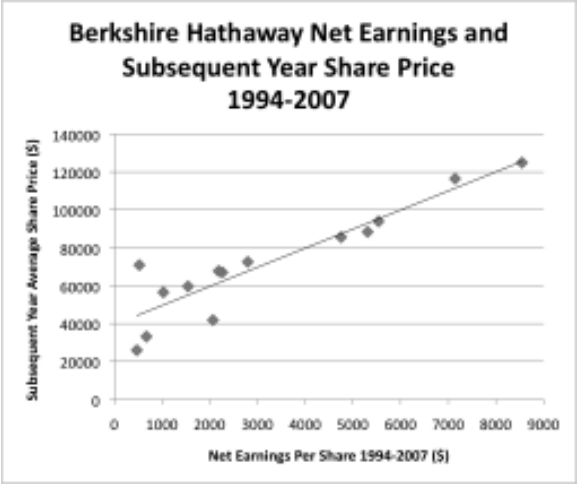
Lynch's contention seems to make sense. If a company makes money and keeps at least some of it, the company should be worth more and more as time passes. A demonstrated close relationship between earnings and share price would simplify the process of buying a stock. It would help to identify companies that have excellent prospects for share-price growth. And it would assist an investor to take advantage of advances or declines in share value by forecasting the price of a stock in the near future based on earnings reports as they were issued.

To test the strength of the correlation between earnings and share price I examined Warren Buffett's Berkshire Hathaway (mainly a property and casualty insurance company) over a period of 14 years, from 1994 to 2007. The per-share net earnings of BRK.A were plotted against the average share price for the year following the release of the earnings numbers. I also predicted the 2009 stock value based on this data and the 2008 earnings report.

As far as the relationship between the two factors went, the graph looked good (see Figure 1).

Most of the points on the scatter plot were fairly close to a line that was the best fit for them (the linear regression or trend line), indicating a very close correlation between net earnings and share price. According to statistical software analysis, the correlation coefficient "r" was a very high 0.91 (out of a possible 1.0) with a standard error estimate of about $12,000 for the share price, indicating that two-thirds of the time the estimate of share price would fall within that margin.

FIGURE 1



The results show that as far as Berkshire Hathaway is concerned, its share price moves nicely in keeping with its net earnings. Score a big point for Peter Lynch. However, it reveals that as a predictor of future share price in the short term, net earnings is not very accurate. In our case, the actual average 2008 BRK.A share price of $93,000 was greater than the predicted $72,000 by $9,000 more than the standard error estimate of $12,000. Lynch himself recognized that this discrepancy could occur, conceding that, if not immediately, then in the longer term a stock price "eventually" would match earnings.

What did I learn from this exercise? One of the more valuable benefits for me was that I gained confidence about Berkshire's price movements over time. The statistical software I used printed out a list of the amounts by which the predicted share price for each year differed from the actual stock price. For 2001, earnings were miniscule due to insurance payouts for the damage caused by the terrorist attack in New York. But the share price remained much higher than it "should" have been according to regression analysis, given the close relation historically between net earnings and stock value. That told me that BRK's shareholders were not easily spooked into selling and driving down the stock price when bad times arrived.

With regard to making profitable buying decisions for the shares, having over 10 years' worth of history of their price movement linked to earnings (earnings is an important factor not taken into account by simple technical analysis of price and volume movements) allowed me to judge better when they represented good value. The fact that the shares were selling close to their expected value of $72,000 in early 2009 when the stock price had not dropped to that low a level during difficult times in the past signaled an opportunity for purchase that carried only a low risk of loss of capital. And indeed, the share price did not stay that low for long.

Would this analysis work well for other companies? Unfortunately, it seems not to be as useful. When I ran a linear regression for several companies over a 10-year period, the results were nowhere near as tidy. For example, Torstar (an "r" of 0.81) and Loblaw (0.82) displayed only a moderate correlation, and 3M (0.64) was approaching the weak range. If the proportion of the variation from the "average" (as indicated by the best-fitting line) that was due to the net earnings was calculated by squaring these correlation figures (the "r-squared", also known as the coefficient of determination), then only about two-thirds of the variance from the trend line was attributable to earnings in the case of the first two firms and a meagre (41%) for 3M. The rest of the variation was due to factors other than earnings. By contrast, for BRK.A (r of 0.91), a high 83% of the variance was due to changes in net earnings.

What's the problem? While Berkshire is a model company in many respects, many other firms are not. They wrote down sharply the value of assets, committed costly strategic errors or misspent the earnings that they had retained

Fun with Linear Regression

Before the wildly popular book, *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything* (Harper, 2005), by Steven Levitt and Stephen Dubner and its sequel were published, few of us had any particular interest in or even knowledge of linear regression.

These men made statistics fun. Whether it was speculating that the legalizing of abortion in the USA halted the violence overwhelming that country at the time or explaining why drug dealers lived with their mothers, their research was grounded on the study of historical data. In particular, they depended on the results provided by relating one or more factors to another using correlation analysis. In one chapter, the authors devote several pages to a straightforward description of what linear regression is and how it works.

The chart in Figure 1 is based on the study of the historical data, taken from Internet sources, that pertains to Berkshire Hathaway's A shares. Its plotting produced a measure of the correlation between net earnings and share price, as well as a linear regression equation that could be used to predict future share prices based on current earnings.

Relating earnings to stock price to determine a correlation coefficient "r" is not difficult with common software, or it can be done with a pencil and calculator if you have the time. Using a spreadsheet such as Excel (or the free Open Office equivalent) or Numbers, set up two columns of historical data side by side with the earnings of a given year in one column and the average share price for the following year next to it. Select the columns and use the "Correlation" function of the programme to return the "r" figure (it can run from +1 to -1). If you want a graphical representation, the charting ability of the spreadsheet can produce a scatter chart and add the best-fitting line of regression (or trend line) to it (as in Figure 1 above).

For BRK.A, the linear regression equation, which is how one would express the line on the chart in mathematical language, software yielded a formula that the share price would be expected to be $39,500 plus 10 times the net earnings amount. (The linear regression equation is y + mx, or, in this case, Subsequent Year Share Price = $39,500 + 10 times the Net Earnings per Share.) This figure is something like what an "average amount" would be for a list of temperatures, ages, salaries or number of children in a family. It may never correspond to any actual number (as with 1.9 children per family) but it's a close estimate.

To find the approximate linear regression equation from the chart alone, start with the amount on the vertical y-axis of the chart where the line crosses this axis, or $39,500. Then add to that whatever amount the y-axis increases for a given change in the x-axis, multiplied by the net earnings for a given year. In Figure 1, the y-axis amount increases by $10,000 from $70,000 to $80,000 for the $1,000 change between $3,000 and $4,000 on the horizontal x-axis of the chart in Figure 1, for a ratio of 10 to 1. Hence the regression formula of $39,000 plus 10 times earnings. Spreadsheet software can return the equation with a lot of fiddling or dedicated statistics software can automate the entire process.

In our example, the actual 2008 net earnings amount of BRK.A, $3,250 per share, is multiplied by 10 to give $32,500. The sum of the figures two (y + mx, $39,5000 plus $32,500) yields the expected 2009 share price of $72,000. As it turned out, this number was much lower than the actual average price for 2009 (about $93,000) but very close to the lowest closing price of $72,500 set in March.

Even without knowing the regression equation, you can easily find the next predicted share price by entering the latest earnings figure in the spreadsheet and employing the "Forecast" function to provide an expected share price.

Of course, the connection between net earnings and share price is only one among numerous possible relations that could be explored. It will be interesting to see what useful (and profitable) findings other correlation analyses can yield.

on capital expenditures such as grand buildings that did not contribute to profits. These missteps made their net earnings less consistent because of these occasional large charges against their operating profits. Adjusting for this in correlation analysis by using only operating earnings and not net earnings was of little help.

Adjustments to earnings make the buying decision of investors, be they individuals or institutions, much more difficult. They must ask: Is this a temporary setback? Are there better buys elsewhere? Does the dividend income override the earnings factor? Each investor will make his or her own individual judgment and buy or sell accordingly. That's not a reliable guide to share price movements (despite the implication in investment theory that rational investors will come up with the same result). Old-fashioned, dull, value analysis that evaluates and, if necessary, adjusts each item on the financial statements would be a more reliable guide for valuing such companies and estimating their future share price.

If correlation analysis is not all that helpful in many instances and not very reliable in estimating predicted share prices in the short term, does it have benefit at all? First, as I noted above, the very exercise of examining the details of the earnings and price histories of a company in itself has great benefit. It's not much trouble to gather this data. Historical stock prices are available on Internet sites such as Yahoo Finance and can be cut and pasted into a spreadsheet for ready manipulation. Long-term earnings data is sometimes found in convenient tabular form on the web, but it can be extracted with a little work from the past annual reports posted on a firm's website. By studying the figures for ten years or so, one can get an idea of what kind of a money-maker a company is, as well as get a feel for when its shares represents good value, or are "on sale". Quick analysis with a spreadsheet programme can render the data more accessible by presenting it in numerical and graphical form (see "Fun with Linear Regression").

Second, even a limited experience with correlation analysis of this kind is enough to cast doubt on many of the predictions made so frequently by security analysts. If predictions based on years of actual earnings data are not particularly reliable in estimating share price in the short term, think how much more unreliable will be forecasts of future share prices based only on predicted earnings data. Academic studies presented in David Dreman's excellent investing book, *Contrarian Investment Strategies* (Simon and Schuster, 1998, pp. 84-116), found that analysts' predictions of stock prices were incorrect about half of the time, if not more. A very low correlation indeed!

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