Does the future matter?

Forget the crystal ball. It might be lying

The world of investment echoes with warnings against using past performance to predict future returns. JAMES DICK turns the scenario around and finds that you should not rely too much on future performance to explain a company's NPV.

JAMES DICK ASIA is research officer for Barbacan Benefits Pty Ltd and is the coordinator of the Professional Members Division of the Economic Society of Australia (Qld). He is studying a Masters of Professional Economics at the University of Queensland and is active in the UQ Mathematical Finance Interest Group. He thanks Philip Dolan, Jon Stanford and Rodney Beard for their assistance.

Investment based on genuine long-term expectation is so difficult today as to be scarcely practicable. Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature . . . Most probably our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits — of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities.
— John Maynard Keynes

We all want to see into the future. It is an aim as alluring as alchemy. Investors talk about predicting what future earnings will be, valuing companies based on what their expectations will be, and making buy/sell decisions based on that. Naive investors may do this implicitly; professional securities analysts may do it quantitatively. If for a minute we could assume that we could actually see into the future (and were the only ones who could do so), then we would expect to make abnormal profits. The alchemist's dream!

This paper will take the reader back in time to 1990, and unlike your 1990 peers, you are able to see 10 years into the future. To make things interesting, however, rather than simply knowing which share prices have performed best, you will be blinkered so you can see only the future earnings and dividends of each company studied.

Formally, the process involves undertaking a discounted cashflow valuation of the known future earnings (with a 31/12/1999 share price for a terminal value). This valuation is then compared with other securities and the relationship between "true valuation"[1] and the actual future

return is studied. In addition to providing portfolio construction ideas, this also allows for a study of the pricing efficiency of the Australian stockmarket in 1990.

The results may surprise some: the market valuations in 1990 were generally poor and inconsistent predictors of the "true value" of most companies.

Before analysing the data, it is important to assess whether 10 years of future earnings knowledge is enough. Of the companies studied, the average dependency of the first 10 years' earnings on the net present value (NPV) was about 50%. For some companies, the NPV is 90% dependent on earnings over the first 10 years.

Without great difficulty, then, we can to go back to 1 January 1990 and review company performances over the subsequent 10 years. To make judgments about the market's pricing efficiency, it might be important to set out some *a priori* expectations. If the efficient market hypothesis (EMH) is valid, we would expect 1990 share prices to be a good estimate of each company's NPV and share price performance. It would be unreasonable to expect the 1990 share price to be a perfect indicator for future performance. However, if the EMH was valid we would expect that the distribution of errors to be random, ie, they would have a mean of zero, a modest standard deviation, and fit a normal distribution.

THE DATA

For a company to be included in the analysis, its earnings and dividends per share for 10 years, its average 1989/90 share price and 30 December 1999 share price, as well a historical ß were all needed. Betas for 1996 were used as these have been calculated using historical data from the proceeding five years. This ensured that the risk premium for each company was well suited to the data being assessed.

From approximately 250 influential companies listed on the ASX, the necessary data could be determined for 40 companies. The earnings per share and 1990 share prices were adjusted for all dilutions and share splits. An example of one company is shown in Table 1.

Table 1 **Typical company data**

Co.	1990 Price	1990 EPS	1991 EPS	1992 EPS	1993 EPS	1994 EPS	1995 EPS	1996 EPS	1997 EPS	1998 EPS	1999 EPS	β	1999 Price
AMC	4.30	33.3	35.8	42.9	47.9	56.9	66.3	56.7	27.9	39.4	46.5	0.70	7.13

Table 2 **% Error between NPV and 1990 price assuming 3.5% risk premium above 12.9% risk-free rate**

1	-20	47	66	-77	-33	52	-1091
-235	-31	46	70	38	-135	76	5.7
-31	48	-13	-10	2	-129	-39	31
-538	15	4	25	8	13	10	8
7	15	24	10	14	6	9	5

Table 3 **Distribution of errors as % from 1990 share price**

Statistic	1.5% Risk premium	3.5% Risk premium
Mean	-41.94	-29.97
Median	8.18	9.60
Standard deviation	199.00	182.14
Skew	-4.37	-4.53
Kurtosis	21.08	22.68

THE PROCESS

The discount rate on each company's earnings was determined by using the capital asset pricing model (CAPM). Although arguments may exist against the CAPM, it should provide a consistent approach for estimating discount rates in order to assess market pricing efficiency for a 10-year buy/hold strategy.

The risk-free rate and market rate were important inputs. As the 10-year government bond was yielding 12.9% at the end of December 1989, this has been used as a proxy for a risk-free rate. It could, however, reasonably be assumed that the expected risk premium for equities would be 3.5% above this. Incidentally, the market returned 14.4% over the 10 years from 1990, implying an actual *ex ante* risk premium of only 1.5%. Analysis was conducted under both risk premiums.

The process involved discounting, at a stock-specific discount rate, the 10 years' worth of earnings per share (EPS) and a terminal value. The 30 December 1999 share price was used as proxy terminal value. It is interesting to note that the "portfolio" of 40 shares had an overall ß of 0.97, which is similar to that of the market (that is, 1).

Table 4 **Distribution of errors as % from actual NPV**

Statistic	3.5% Risk premium
Mean	113.52
Median	108.49
Standard deviation	131.91
Skew	18.59
Kurtosis	-1.06

THE ANALYSIS

The difference (in percentage terms) between each share's adjusted average 1989/90 price and the NPV of its future earnings was recorded. There are two methods of quantifying the errors. One is in relation to

FIGURE 1 **Distribution of errors – 3.5% risk premium**

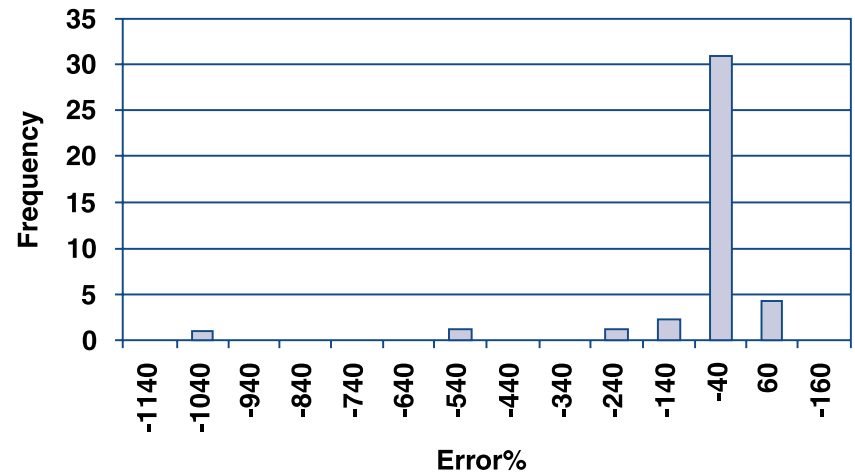
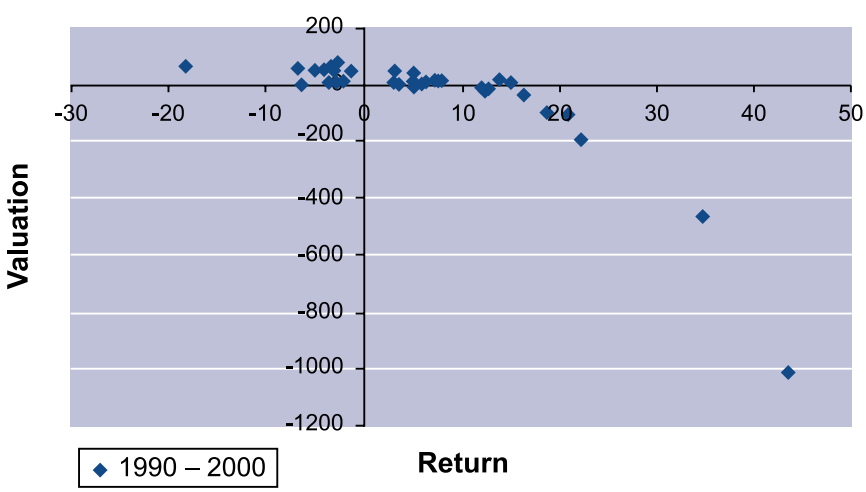


FIGURE 2 **Relationship between valuation and return**



the 1990 share price, the other in relation to the 1990 NPV.

To use our example of AMC in Table 1, the adjusted 1990 share price was $4.30, yet the NPV of its future earnings and terminal value at a discount rate of 15.42% was $3.88. The overvaluation of 42c is 9.7% above the 1990 share price but 10.8% above the net present value. The difference between the two methods is negligible if there is only a small mispricing, as is the case for AMC. However, when there is a significant mispricing, say for HVN which had an adjusted 1990 share price of $0.0792 and a NPV of $0.88, then the two methods vary considerably. The error ($0.8) is more than 10 times the 1990 share price. It is therefore not inaccurate to say it was 1,090% undervalued.

However in terms of the NPV, the most undervalued a share can be is 100%. HVN was nearly 91% undervalued when calculated in this manner. The method of calculating the errors does not materially affect the research, although the different methods are useful to express different aspects of the results.

Table 2 shows each error with respect to the adjusted 1990 share price, where a positive number indicates that the future earnings were not high enough to justify the price.

The undervalued errors have been highlighted in Table 2. Note that 27 out of the 40 were positive errors. It can be seen that the most spectacular mispricings were undervaluations. Statistics relating to the distribution of errors are set out in Table 3.

Table 3 shows the increased risk premium (from actual to expected) has little impact on any of the statistics except the mean.

Our initial reaction to this distribution is that contrary to our *a priori* expectations, it does not seem to be a normal distribution with a zero mean and a modest standard deviation.

A graphical illustration of the errors is shown in Figure 1.

Given that our share price is first approached from the point of view of what is the current market price, the error term expressed as a percentage of the current market price is useful. However, in some respects the more informative statistic is the error relative to the net present value as this is the true indication of the share's intrinsic value. Table 4 details the relevant statistics of the distribution of errors shown instead as a percentage of NPV.

In some respects, when the distributions are presented this way they are more "normal", given that the kurtosis is lower and the mean and median are closer together. However, while the standard deviation has fallen, it is still high. Further, the skew and mean have both risen dramatically.

VALIDATING THE STATISTICS

Table 2 shows that there are a few significant residuals on the undervalued side. Given the reasonably small sample size of only 40, it is possible that the errors are normally distributed but we have insufficient data to show it.

To determine what we would expect from a normal distribution with a small sample, a Monte Carlo routine with 1,000 trials was conducted, each with a sample size of 40. In absolute terms, the largest trial mean was -

109. However, all trials appeared more or less normal with the highest skewness at -1.32 and kurtosis at 2.93. Both of these are significantly less than for our sample of errors from the adjusted 1990 share price.

From this analysis we can be confident that the sample has highlighted the distribution of errors to be very different from what was expected. Despite the small sample size, we can be confident that the high standard deviation and leptokurtic nature of the distributions (as shown in Figure 1) is a fair representation of the remainder of the population as a whole. Further, as there were only two samples in the 1,000 trials that had a mean greater than 100, we can be extremely confident that the very high average error (as a percentage from the NPV) is significant and is probably an accurate indication of the market overall. Additionally a Kolmogorov-Smirnov test indicates that the errors are not normally distributed.

The high standard deviation and asymmetric distribution implies that the current market price of a share is not a good indicator of its future cashflows.

BEST ESTIMATE

The high standard deviation and asymmetric distribution implies that the current market price of a share is not a good indicator of its future cashflows. If the errors are predictable, then obviously there is one or more missing explanatory variable. But given that we were able to see perfectly into the future from 1990, and we have taken into account future profits, future share price and even a risk-adjusted discount rate, what other explanatory variable exists?

Using standard multiple-regression techniques, an analysis of the relevant factors influencing share returns was undertaken. The variables tested were: VALUATION — the magnitude of the mispricing using the DCF method with a 3.5% risk premium; PE — the average PE ratio in 1989/90; and GROWTH — the earnings per share growth over the 10 years.

These were all regressed against RETURN of each share price over the 10 years. The only variable that was significant was VALUATION with an R^2 of 0.779. This crudely suggests that factors other than valuation account for more than 20% of shares' future return.[2]

Unfortunately, no such significant relationship could be discovered with VALUATION as the dependent variable (and ignoring RETURN as an explanatory variable as it is the true unknown). Alas, we are not yet able to see into the future. Even if we could, it seems that we would still only have 80% of the picture.

The relationship between RETURN and VALUATION is shown in Figure 2.

OVERVALUED?

The extremely high average error as a percentage of NPV indicates that a better estimate of the "intrinsic value" of a share is to divide the current market price by two. Theoretically, this is nonsensical. However, was the market in 1990 overvalued by traditional measures?

From the investor's point of view, the most important issue was whether buying shares in 1990 was rewarded. As noted, the All-Ordinaries outperformed bonds by 1.5% over the 10 years. This was perhaps a little under expectations but certainly would not be described as being due to extreme valuations in 1990. Incidentally, the "portfolio" of 40 shares analysed slightly underperformed the All-Ordinaries over the period. Perhaps the portfolio beta of 0.97 explains this.

Using another traditional measure of value, the sharemarket was trading at an average PE of 10.6. Using the Rule of 20 and with the 1990 inflation rate at just under 7% (and forecast at 7.5%) we can see that the market would not be considered overvalued. However, the earnings yield of the 1990 stockmarket compared to the bond yield (9.4% and 12.9% respectively) indicates that the market did not represent extraordinary value.

It is possible then that the market was expecting abnormally high growth rates to justify the share prices. Using the 1989/90 PE as a base, a market discount rate of 16.4% (3.5% risk premium) implies 6.96% earnings growth. GDP growth over the period was however closer to 5.75% annualised. This could explain in part some overvaluation in shares — but not by 100%.

IMPLICATIONS FOR PORTFOLIO CONSTRUCTION

It could be argued that perfect foresight into a company's future earnings is only of benefit if earnings growth is significantly above average, as was the case for HVN.

It is the few hugely undervalued shares that provide the potential for supernormal profits. This analysis, however, concerns itself only with long-term buy-and-hold strategies. It does at least create a framework for a systematic approach to assessing preferred deviations from the benchmark. In particular, more light is shed on the kind of companies that outperform —the HVNs of the future.

The skills of share analysts should be directed not only at assessing future earnings (and discount rates), but how these fit into a broader framework of what the market will value highly in 10 years.

The skills of share analysts should be directed not only at assessing future earnings (and discount rates), but how these fit into a broader framework of what the market will value highly in 10 years. It is the fundamental knowledge of the industry, the companies and the overall experience of markets that means the analyst can go beyond mere statistics and add value.

NOTES

1 "True value" in this paper is defined as the net present value of a company's future earnings discounted at a stock-specific rate.

2 While it is beyond the scope of this paper to address fully what factors actually make up the remaining 20%, this is an area that provides profitable research opportunities. J