

SHARE PRICE BEHAVIOUR ON EX-DIVIDEND DATES*

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Introduction

It has been assumed by investors for a long time that the price of a share drops on the ex-dividend date by approximately the amount of the dividend. This means, that an investor eligible for a dividend rebate could either buy just before or just after the ex-dividend date but, in fact, would buy just before it in order to show a higher dividend yield on investment. On the other hand, an investor, not eligible for a dividend rebate would normally sell before and buy after the ex-dividend date because of income tax considerations. Share price behaviour near the ex-dividend date is examined here and based on the results, modified courses of action are suggested. Implications for the valuation of exchange traded options are also discussed.

Ex-Dividend date price drop-off

Campbell and Beranek [1] have argued that share prices could not drop by the full amount of the dividend on the ex-dividend date, since tax-conscious investors, behaving in a rational manner, would sell only cum-dividend or buy ex-dividend if contemplating a transaction about the ex-dividend date, thereby reducing the amount of the drop-off. In their study, they concluded that the average drop-off on the ex-dividend date "tends to be about 90 per cent of the amount of the dividend when the stock market is otherwise stable". Thus, the expected value of the drop-off only differs slightly from the widely accepted value. Some of their other findings are equally important, although not nearly so appealing: this average value of the drop-off is obtained from a widely varying range of values and "out of 200 cases studied, 14 stocks actually rose in price when they sold ex-dividend, and 14 declined by 200 per cent of the

dividend or more" [1]. Thus, advantage can only be expected in the long run, and not every single time, if a rational policy is employed.

Durand and May [2] investigated the ex-dividend behaviour of American Telephone and Telegraph (AT & T) by examining 43 ex-dividend drop-offs and found them to be about 96% of the dividend on the average, but ranging from 56% to 150% of the dividend. Interestingly, they also report that the average price two to three weeks before the ex-dividend date rose by about one half of the dividend and did not recover from the drop-off during the two weeks immediately following.

Summary of Results

The ex-dividend behaviour of B.H.P., Bougainville Copper, C.S.R. and W.M.C. shares was investigated from 1969 on. (1) These shares were selected because they are widely held, have an active and orderly market and have exchange traded options. The results are summarised in Table 1. (2) They tend to reinforce the commonly held belief that the average drop-off on the ex-dividend date is approximately the amount of the dividend. Implicit acceptance of this is found in the U.S. in certain stock-exchange rules which require all open orders to be reduced on the ex-dividend date by the amount of the dividend (rounded off to the nearest eighth of a point) [2]. It is somewhat surprising that the C.S.R. ex-dividend drop-off is so significantly below the dividend paid, since it is fairly large, being between 6.25 and 7.75 cents per payment per share. The deviation from the expected value of the drop-off can be very large, as is shown by the rather large standard deviations. Thus, very small or very

large drop-offs (well in excess of the amount of the dividend) have occurred and are possible. These results mean that *in the long run*, the drop-offs are as indicated.

It is evident that the market trend on the day the shares go ex-dividend must affect the amount of the drop-off. Thus, if the market is strong, or in fact if there is bullish news associated with the company whose shares are going ex-dividend, it is possible for the share price to remain unaltered or even to rise on the ex-dividend date. The effect of the market on the price behaviour of the shares can be isolated by using a time series. This was done for each year separately and after taking into account the effect on the index of the price changes of the particular shares considered. The unsystematic price changes, i.e. the ones which are not correlated with the market, give a better measure of the share price behaviour due to the shares going ex-dividend.

The share prices adjusted in the above manner are given for B.H.P. for the last five years in Figure 1. The days shown correspond to trading days. (3) The solid line shows the average price for the period considered. B.H.P. is a particularly good medium for studying the ex-dividend behaviour, as its dividends (14.5 and 16 cents) are large compared to the one cent minimum price differential. Also it is actively and widely traded and is of general interest to institutional and private investors.

The scatter of prices shown in Figure 1 is fairly large and the price behaviour of B.H.P. appears less regular than that of AT & T [2]. However, it is quite comparable to the price behaviour of various (unnamed) shares reported by Campbell and Beranek [1]. All the small dividend drop-offs occurred when B.H.P. was strong during the period considered. It is interesting to note that the average follows a pattern quite similar to that described by Durand and May [2].

The share price rises steadily from about 40% of the dividend to the full dividend during the last ten days, when the ex-dividend price is taken as the reference. Then,

it drops by the full amount of the dividend on the ex-dividend date. The price scatter following the ex-dividend date is less than before it and no tendency to recover from the drop-off is evident. In fact, prices tend to drift slightly. Thus, considering the effect of the price drop-off, one is tempted to conclude that an investor not eligible to a dividend rebate should sell his shares two to three days before the ex-dividend date (if he wants to sell), and should buy after, or two to three weeks before the ex-dividend date depending on his tax position. An investor, eligible to the dividend rebate, however, should always buy two to three weeks prior to the ex-dividend date. This strategy, of course, has the added advantage of making the investment 'look good' from the point of view of dividend yield. (4)

Implications for the valuation of options

Valuation of the options listed on the Australian Option Market was recently discussed in a general context [3]. It was pointed out that when the underlying share pays a dividend during the life of the option an extension to the model presented there is necessary. This extension is given here.

Merton showed that if the underlying share pays discrete dividends, it may be worthwhile to exercise an American option just prior to the share going ex-dividend, but never between dividend payments [4]. The value of an option of a dividend paying share is worth less than the same option with the same maturity of the same share paying no dividend. This is the case, since, when the share pays a dividend, its price falls, on the average, by an amount as given in Table 1 when it goes ex-dividend, thereby reducing the probability that the share will be above its exercise price at maturity.

If there is a finite probability of a premature exercise, then for every maturity, there is a share price such that for all share prices higher than this critical value the option is worth exercising [4]. This critical share price can be calculated using dynamic programming and the decision to exercise or not to exercise can be based on this value by comparing it with the actual share price [5]. A simpler approach, however, is possible, and is discussed next.

The option can be valued by assuming that the investor will act rationally and will exercise his option only before the last ex-dividend date and only if it is worth more exercised than kept. As the option price is the market measure of what it is worth to the option holder acting rationally, it will be the higher of the two values obtained: one assuming exercise before the ex-dividend date and one assuming exercise on maturity.

If the option is exercised before the ex-dividend date then the ex-dividend date should be used as the maturity date in the option valuation formula (see [3]). If the option is not exercised, then the option value has to be adjusted for the ex-dividend date drop-off in the share price, by subtracting the present value of the dividend from the share price before substituting in the valuation formula. (5) The higher of the two calculated values is the value of the option. If there are two dividend payments during the life of the option, then the present value of the first dividend has to be subtracted from the share price, as an additional adjustment in both cases. In the above calculations perfect knowledge of the ex-dividend dates, as well as the amount of the dividend is assumed. Moreover, it is assumed that the decrease in price on the ex-dividend date is equal to the dividend (c.f. Table 1).

The closer the last ex-dividend date is to the maturity date, the more likely it is that the option is worth exercising before the ex-dividend date. Thus, in general, the March and September Bougainville, the December BHP, the June and December CSR and the September WMC in-the-money options are those most likely to be worth exercising.

As an example, consider Bougainville options. Taking the share price at \$1.06 (7 August 1977), the calculated value of Sep 1.00 is 8.8 cents if exercised and 6.3 cents if not exercised. Thus, the value of the option is 8.8 cents now and the option will be worth exercising (at a share price of \$1.06) just prior to the ex-dividend date. On the ex-dividend date, the option will be worth 3.1 cents. However, the option 'dead' (i.e. exercised) the day before would have been worth 6 cents, which is clearly the better alternative. This discussion is based on the assumption that the ex-dividend

price drop-off is equal to the dividend. However, it has been pointed out that while this is likely to happen, it is not certain to happen. The price could, for instance, drop by only 2 cents on the ex-dividend date. If we *knew* this now, then we would price the option kept at 8.1 cents now and at 5.1 cents on the last cum-dividend date, only slightly below the 'dead' value of 6 cents. Clearly, only a probabilistic approach is fully satisfactory. (6) A further refinement to this model can be made by allowing for the net tax paid (if any) on the dividend. (7)

The calculated price of the Bougainville Dec 1.00, held to maturity is 10.6 cents, considerably more than the 8.8 cents it is worth exercised before the September dividend. Thus, it should not be exercised, as expected. The Mar 1.00 option kept to maturity is worth 11.5 cents but 14.4 cents if exercised. Therefore, it should be priced at 14.4 cents and exercised or sold, before the March dividend date.

The BHP Dec 5.50 option, as mentioned above, also deserves a closer examination. If the option is to be exercised before the ex-dividend date then it should be priced at 52.7 cents (taking the closing price of \$5.82 on 7 August 1977) which is lower than the value of the option held to maturity viz. 56.7 cents if the interim dividend is maintained at 14.5 cents. Even for a higher dividend of 16 cents, the option 'live' is worth 55.7 cents and therefore, BHP Dec 5.50 option *should not be* exercised before the ex-dividend date (at current prices) even though the large dividend payment is tempting.

Conclusions

In this paper the price behaviour of BHP, CSR, Bougainville Copper and CSR shares on the ex-dividend date was examined and it was shown that while the price drop-off on the ex-dividend date is nearly equal to the dividend, large deviations from this amount are possible. It was concluded, that purchasing shares two to three days prior to the ex-dividend date, on the average, is not a good policy. It is also shown that the pricing of options where the underlying share pays a dividend during the life of the option is affected by the ex-dividend price behaviour of the underlying share.

FOOTNOTES

- (1) Since listing for Bougainville Copper.
- (2) The BHP maverick 1971 interim dividend, when BHP share price dropped by \$2.15 in five weeks, was omitted.
- (3) Thus, the fifteenth day before ex-dividend corresponds to about three weeks before the ex-dividend date.
- (4) The increase in price during the last few days prior to the ex-dividend date could, in fact, be due to institutional buying.
- (5) The discount rate should be the interest rate used in the valuation formula: see [3].
- (6) However, this is beyond the scope of this article.
- (7) In that case, the boundary condition to the differential equation is $P = \text{Max} [O, S - X + D(1 - t - f)]$ where P is the option price, S is the share price, X is the exercise price, D is the amount of the dividend, t is the effective tax rate and f is the price drop-off as a fraction of the dividend on the ex-dividend date.

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Table 1
AVERAGE PRICE DROP-OFF ON EX-DIVIDEND DATE

	Average drop-off (% of dividend)	Standard Deviation (%)
BHP	95	12
Bougainville Copper	115	12
CSR	68	11
WMC	103	15

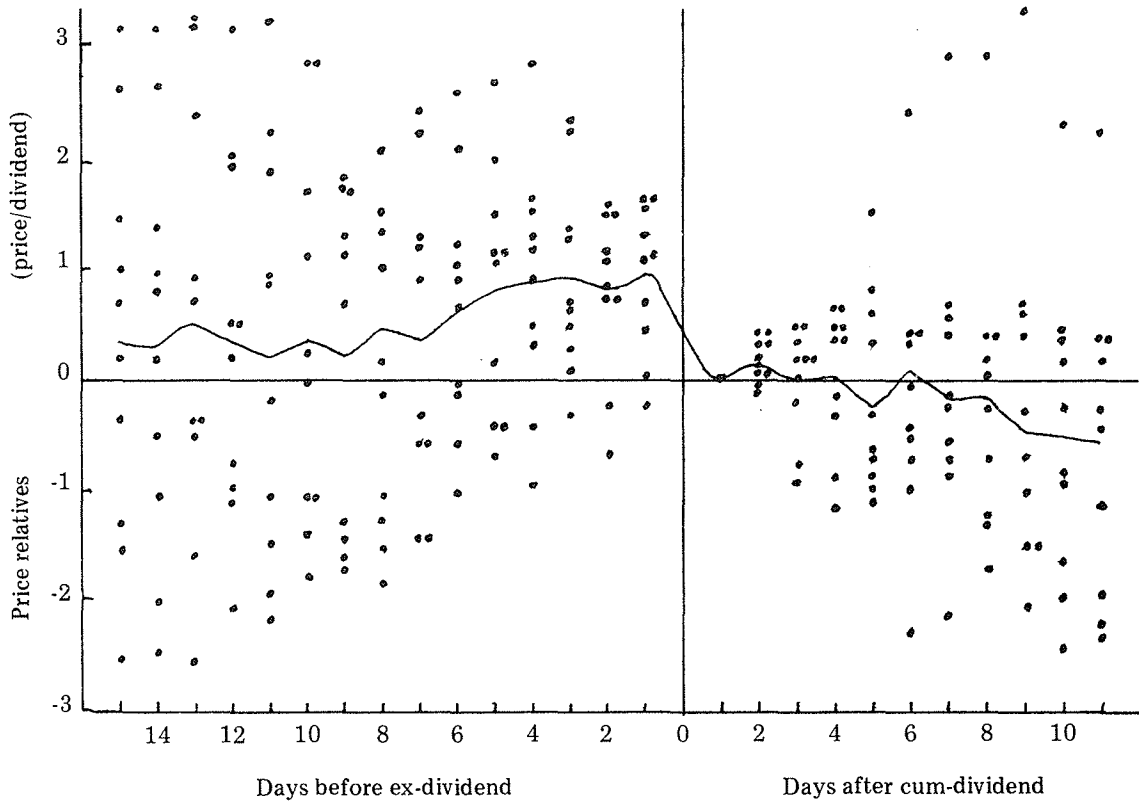


Figure 1. Price behaviour of BHP shares before and after the ex-dividend date relative to the ex-dividend closing price expressed as a fraction of the dividend.