The impact of share buy-backs on earnings per share

While companies often undertake share buy-backs with a view to raising earnings per share, share buy-backs affect both the numerator and denominator in calculating EPS. To determine the conditions under which share buy-backs will increase a firm’s EPS, the impact on earnings from which the firm’s resources are diverted must be considered, as well as the reduction in the number of shares.

Mathematically the relationship between share buy-backs and EPS can be represented as follows:  

Let $EPS_0$ represent current earnings per share for a firm that does not repurchase its shares and is measured as follows:

$$EPS_0 = \frac{E_0}{S_0}$$  \hspace{1cm} (1)

where $E_0$ and $S_0$ represent current net profit and outstanding ordinary shares, respectively. The denominator, $S_0$, is measured as the weighted average number of ordinary shares issued during the period and weightings are determined by the number of days that the shares were issued during the financial year after adjusting for shares issued and bought back during the year. Net profit in turn can be represented as a function of the book value of equity and return on equity capital, as follows:

$$E_0 = BV_{-1} \times ROE$$  \hspace{1cm} (2)

where $BV_{-1}$ represents the book value of equity at the end of the previous period (or the beginning of the current period), and $ROE$ is the return on equity capital invested in the firm. Identifying the relationship between a company’s earnings and its book value enables us to restate the formula for EPS as:

$$EPS_0 = \frac{BV_{-1} \times ROE}{S_0}$$  \hspace{1cm} (3)

Earnings per share is therefore a function of the book value of equity ($BV_{-1}$), the return on equity (ROE) and the number of shares outstanding, $S_0$. Let $EPS_0'$ represent...
EPS if the firm enters into a share buy-back transaction, measured as follows:

$$EPS'_0 = \frac{(BV_{-1} - w\Delta sP_B) \times ROE}{S_0 - w\Delta s}$$  (4)

where $\Delta s$ represents the amount of shares bought back and $P_B$ represents the price paid by the company for its shares. The symbol $w$ represents the buy-back timing weight used to calculate the weighted average shares outstanding for the period and has a value ranging from 1, for repurchases that occur at the start of the period, to 0 for those occurring at the end of the period. It can be seen from Equation (4) that share buy-backs have an impact on both the numerator and the denominator in calculating EPS, since both a company’s earnings and number of shares on issue are affected. It is important to note here that funds used to finance the share buy-back program, measured as $(w\Delta s, P_B)$, have an opportunity cost equal to the firm’s return on equity capital, ROE.

In terms of improving EPS, a share buy-back will only be successful if EPS is increased, that is, the condition $EPS'_0 > EPS_0$ must be met. In terms of Equations (3) and (4) the following condition must hold:

$$\frac{(BV_{-1} - w\Delta sP_B) \times ROE}{S_0 - w\Delta s} > \frac{BV_{-1} \times ROE}{S_0}$$  (5)

Equation (5) can be simplified to:

$$P_BS_0 < BV_{-1}$$  (6)

Equation (6) allows us to make a direct comparison between the book value of equity at the beginning of the period and the multiple of the price paid per share and the number of shares outstanding. Alternatively, providing that the market capitalisation, expressed in terms of the buy-back price, is less than the firm book value then EPS will increase. The higher the price paid for its shares, the less likely that the condition of Equation (6) will be met. This relationship becomes more apparent if we divide both sides of Equation (6) by the number of shares outstanding, $S_0$, and invoke the condition that the number of shares on issue remains constant, to produce the condition:

$$\frac{P_BS_0}{S_0} < BV_{-1}$$  (7)

where $B_{-1}$ represents the book value per share and is measured as the book value of equity divided by the number of shares on issue. Equation (7) highlights that the EPS is dependent upon the relationship between buy-back price paid and book value per share. More simply, EPS can only increase providing that shares are repurchased at a discount to book value, that is:

$$\frac{P_B}{B_{-1}} < 1$$  (8)

Given the condition of Equation (8), we would only expect EPS to increase if a company is able to repurchase the shares at a discount to book value. For most companies listed on the ASX this is unlikely to be the case.

The opportunity cost of share buy-backs

The problem with the preceding analysis is that the true opportunity cost of cash used to repurchase the shares is not considered in the EPS numerator. Instead, it is assumed in Equation (4) that the opportunity cost of financing a buy-back program is a function of the company’s return on equity, ROE. It is possible that funds are diverted from investment projects yielding a high return or a low return, such as is the case when firms hold surplus cash to their needs. Therefore the effect on the EPS numerator will be influenced by the after-tax earnings or savings from funds used to finance the share buy-back program. We should expect the impact on EPS to be less favourable for firms that divert resources from profitable investments compared to firms that apply surplus cash since the reduction in after-tax earnings will be greater.

We have shown that if the rate of return on after-tax earnings is equal to ROE then EPS can only increase providing the condition of Equation (8) is held. Let’s re-examine the condition that leads to an improved EPS when considering the opportunity costs of share buy-backs.

EPS following the buy-back can be restated in terms of the forgone earnings as follows:

$$EPS'_0 = \frac{E_0 - C_0}{S_0 - w\Delta s}$$  (9)

were $C_0$ represents the cost of the share buy-back in terms of earnings forgone, measured as:

$$C_0 = w\Delta sP_B \times r$$  (10)

where $r$ represents the rate of after-tax earnings forgone in order to finance the buy-back of shares. Substituting Equation (10) for $C_0$ we can restate Equation (9) as follows:

$$EPS'_0 = \frac{E_0 - w\Delta sP_B \times r}{S_0 - w\Delta s}$$  (11)

The condition under which a share buy-back will increase EPS then becomes:

$$\frac{E_0 - w\Delta sP_B \times r}{S_0 - w\Delta s} > \frac{E_0}{S_0}$$  (12)

Substituting $BV_{-1} \times ROE$ for $E_0$, Equation (12) can then be simplified to:

$$P_B \times r < B_{-1} \times ROE$$  (13)
From Equation (13) we can now see how EPS can be affected by the after-tax earnings foregone. EPS will increase providing that the multiple of the opportunity cost and buy-back price, \( P_B/r \), is less than the multiple of book value per share and return on equity, \( B_{-1} \times ROE \). This relationship can be re-stated in the following forms:

\[
\frac{P_B}{B_{-1}} < \frac{ROE}{r} \tag{14}
\]

This can be rearranged to the following form:

\[
\left( \frac{\frac{ROE}{r}}{\frac{P_B}{B_{-1}}} \right) > 1 \tag{15}
\]

On comparing Equations (14) and (15) with Equations (7) and (8) we can now see that the impact on EPS is now also dependent upon the relationship between the return on equity and the after-tax earnings forgone, \( \frac{ROE}{r} \), in addition to the relationship between price paid and book value, \( \frac{P_B}{B_{-1}} \).

The condition under which EPS can be increased, \( \frac{P_B}{B_{-1}} < 1 \), can now be extended to include the condition \( \frac{P_B}{B_{-1}} \geq 1 \), providing that \( \frac{P_B}{B_{-1}} < \frac{ROE}{r} \).

This means that companies repurchasing shares at a premium to book value may still benefit from an increase in EPS providing that \( r \) is relatively low compared to \( ROE \), such as in the case when companies have surplus cash. If we assume that \( r = ROE \) then Equations (14) and (15) simplify to Equations (7) and (8) respectively.

**Illustrative example**

Bluescope Steel Ltd (BSL) has an ongoing share buy-back program which can be used to illustrate the foregoing discussion. Table 1 presents data on the number of shares repurchased, as a percentage of ordinary shares outstanding at the beginning of each period, the weighted average price at which shares were repurchased and total dollar value expended for each period 2004–06 for BSL.

Overall, BSL has repurchased over 100 million shares at a total cost in excess of half a billion dollars representing in excess of 14% of its outstanding shares. The program was particularly active in 2004 and 2005. The last row presents the value of EPS ‘as if’ no shares were repurchased, \( EPS_0 \) and has been estimated assuming that BSL applied the funds necessary to buy back shares to reduce the amount of outstanding interest-bearing debt and therefore reduce after-tax interest expenses.\(^3\)

Tables 2 and 3 illustrate the impact on EPS of different values for the key variables used in the determination of EPS. The after-tax return on funds used in the buy-back is assumed to be equal to the firm’s ROE in Table 2 and after-tax rate of interest expense savings in Table 3.

Table 2 presents data on the book value per share, \( B_{-1} \), based on total shareholders equity reported at the end of the previous period, the ratio of price paid and book value per share \( \frac{P_B}{B_{-1}} \) and EPS under the buy-back program, \( EPS_0' \). The final row looks at the net change in \( EPS_0 \) as a result of the buy-back program by comparison with \( EPS_0' \) from Table 1.\(^5\)

**TABLE 1: BSL share buy-back program 2004–2006**

<table>
<thead>
<tr>
<th></th>
<th>Year Jun-06</th>
<th>Year Jun-05</th>
<th>Year Jun-04</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of shares purchased</td>
<td>13.5m</td>
<td>41.7m</td>
<td>52.4m</td>
</tr>
<tr>
<td>As a % of shares outstanding at beginning of period</td>
<td>1.80%</td>
<td>5.60%</td>
<td>6.60%</td>
</tr>
<tr>
<td>Price paid per share, ( P_B )</td>
<td>$7.01</td>
<td>$7.78</td>
<td>$4.93</td>
</tr>
<tr>
<td>Total value</td>
<td>$94.64m</td>
<td>$324.43m</td>
<td>$258.33m</td>
</tr>
<tr>
<td>( EPS_0 ) (cents)</td>
<td>48</td>
<td>131.3</td>
<td>76.4</td>
</tr>
</tbody>
</table>
It can be seen that the value of the ratio of price paid to book value per share exceeds 1.0 in each year thus indicating the condition set out in Equation (8), \( \frac{P_B}{B_{-1}} < 1 \), has not been met and therefore resulting in a reduction in EPS (last row) for each year over the entire period. Under this scenario, \( r = ROE \), if increasing EPS was a primary objective of the firm then a buy-back program would have been unwise. The greatest impact can be seen in 2005, where EPS has decreased by 2.5%, since both the ratio of price paid to book value per share and total dollar value expended is highest, 1.86 and $324.43 million (Table 1), respectively.

Table 3 presents data on ROE, rate of after-tax earnings forgone, \( r \), based on after-tax savings in interest expense, the ratios \( \frac{ROE}{r} \) and \( \frac{ ROE / r }{ P_B / B_{-1} } \) from which the conditions set out in Equations (14) and (15), can be compared, and \( EPS_0' \) observed.\(^7\) The condition under which EPS can increase, \( \left( \frac{ROE}{r} \frac{ P_B }{ B_{-1} } \right) > 1 \), can now be attained even if the condition from Equation (8), \( \frac{P_B}{B_{-1}} < 1 \), is not met.

<table>
<thead>
<tr>
<th>TABLE 2: EPS excluding opportunity cost of buy-back</th>
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<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>Book Value per share, ( B_{-1} )</td>
</tr>
<tr>
<td>Ratio ( \frac{P_B}{B_{-1}} )</td>
</tr>
<tr>
<td>( EPS_0' ) (cents)</td>
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<tr>
<td>Percentage change in EPS</td>
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<th>TABLE 3: EPS including opportunity cost of buy-back</th>
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<tbody>
<tr>
<td><strong>Year</strong></td>
</tr>
<tr>
<td>( ROE )</td>
</tr>
<tr>
<td>Rate of after-tax earnings forgone, ( r' )</td>
</tr>
<tr>
<td>Ratio ( \frac{ROE}{r} )</td>
</tr>
<tr>
<td>Ratio ( \frac{ ROE / r }{ P_B / B_{-1} } )</td>
</tr>
<tr>
<td>( EPS_0' ) (cents)</td>
</tr>
<tr>
<td>Percentage change in EPS</td>
</tr>
</tbody>
</table>
Notes

1 Literature on share buy-backs is dominated by research conducted in the United State, where share buy-backs are referred to as stock repurchases. For a discussion on the Australian evidence see Harris and Ramsay (1995) and Lamba and Ramsay (2002).

2 Adapted from Hribar et al., 2006.

3 Equation (5) can be simplified by the following steps. First dividing both sides by ROE:

\[
\frac{(BV_{eq} - w\Delta P_{0})}{S_{0} - w\Delta} > \frac{BV_{eq}}{S_{0}}
\]

then cross-multiplying by the denominators:

\[
\frac{(BV_{eq} - w\Delta P_{0})S_{0}}{(S_{0} - w\Delta)S_{0}} > \frac{BV_{eq}(S_{0} - w\Delta)}{S_{0}(S_{0} - w\Delta)}
\]

which simplifies to:

\[
(BV_{eq} - w\Delta P_{0})S_{0} > BV_{eq}S_{0} - BV_{eq}w\Delta
\]

and expands to:

\[
BV_{eq}S_{0} - w\Delta P_{0}S_{0} > BV_{eq}S_{0} - BV_{eq}w\Delta
\]

subtracting \(BV_{eq}S_{0}\) from both sides and dividing both sides by \(w\Delta\)

simplifies the equation to \(P_{0}S_{0} < BV_{eq}\).

4 Equation (12) can be simplified by the following steps. First by cross-multiplying and expanding:

\[
BV_{eq}xROE_{eq}S_{0} - w\Delta P_{0}rS_{0} > BV_{eq}xROE_{eq}S_{0} - BV_{eq}xROE_{eq}w\Delta
\]

then subtracting the first term from both sides and dividing both sides by \(w\Delta\)

\[
P_{0}rS_{0} < BV_{eq}xROE
\]

then dividing both sides by \(S_{0}\) to produce the per share equivalent:

\[
P_{0}r < B_{eq}xROE
\]

5 Reported profits include the effects of share buy-backs making it necessary to estimate \(\text{EPS}_{0}\) as an adjustment to actual reported earnings as follows:

\[
\text{EPS}_{0} = \frac{E_{0} + w\Delta P_{0}r}{S_{0} + w\Delta}
\]

where \(E_{0}\) = Reported consolidated profit for the annual year

\(w\) = is assumed to equal 0.5 representing the mid-point of possible value

\(S_{0}\) = is the reported weighted average number of ordinary shares used in calculating basic EPS and is the equivalent of \(S_{0} - w\Delta\)

\(r\) = is measured as forgone savings in interest expense after-tax and is estimated as:

\[
1 - \frac{\text{Interest Expense}_{eq}}{\text{Interest Bearing Debt}_{eq}} (1 - \frac{\text{Tax Expense}_{eq}}{\text{Profit Before Tax}_{eq}})
\]

6 \(\text{EPS}_{0}\) is estimated using Equation (4) and \(r\) is assumed to be equal to ROE which is measured as \(E_{0}/BV_{eq}\).

7 \(\text{EPS}_{0}\) is equal to that actually reported in the financial statements. Values for the ratio \(P/B_{eq}\) are taken from Table 2.

References


