# Analysts' earnings forecasts and equity valuations

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*Equity valuations are important for monetary policy makers as the factors that drive equity valuations may contain information about the future course of the economy. Moreover, a possible correction in equity prices may be a source of shocks to which monetary policy may have to react. Such an equity market correction may also have negative implications for financial stability. We use a three-stage dividend discount model to see whether analysts' forecasts can explain the level of equity prices over the past ten years. This model is also used to decompose equity returns into changes to earnings, the yield curve and equity risk premia.*

## Introduction

Recent developments in equity prices have revived interest in equity valuation, on which there is already a large literature. Many models are based on the idea that equity prices represent the present value of the future income to be derived from equities. Thus they analyse equity valuation in terms of the current level and expected growth of dividends together with the rate at which future dividends are discounted, including any allowance for the risks attached to owning equities (the equity risk premium). For many in the private sector, equity valuation is an aid to investment decisions and the focus is on whether equities are in some sense 'fairly' valued. For monetary policy the focus is somewhat different. Monetary policy makers are interested in the factors underlying equity valuations for the light they may shed on the future course of the economy. Expected dividend growth may reflect the market's view of company profitability or the growth of the economy more generally. The equity risk premium is an element in the cost of capital and hence in principle an influence on real investment. Moreover, expected equity returns may affect future consumption through the equity wealth channel. Of course equity markets may be a source of shocks to which monetary policy may have to react. So for monetary policy makers too measures of over or undervaluation may be of interest, as a guide to the risks of possible 'corrections' in equity price levels. For example, the minutes of the May 2000 MPC meeting contain the following statement: 'Whereas the possibility of a large and disorderly equity price fall remained one of the key risks to the world economy, the equity market had risen so far over the past few years that an orderly correction need not give rise to concerns about the macroeconomic outlook; some correction was welcome, and indeed could usefully contribute to restraining US domestic demand growth.'(1)

Equity valuations are also important for financial stability as equity overvaluation increases the risk of a sharp correction, with potential negative implications for the financial system. For example, the June 1999 *Financial Stability Review* comments that: 'Another possibility is that some other development triggers a fall in the equity market, which would be a shock to domestic demand through the effect on household wealth and the cost of capital. Whether these or other possible scenarios have any implications for financial stability turns largely on the extent and duration of any price adjustments, and on the balance sheet strength of market participants.'(2)

Analysis using the 'dividend discount model' often makes the simplifying assumption that future dividend growth is constant. Earlier Bank work has typically used models of this kind to investigate the combinations of dividend growth, discount rate and equity risk premium needed to account for the level of equity prices actually observed (see, for example, the box on equity market valuations in

(1) Minutes of the Monetary Policy Committee meeting held on 3–4 May 2000.
(2) *Bank of England Financial Stability Review*, 'The financial stability conjuncture and outlook', June 1999, page 18.

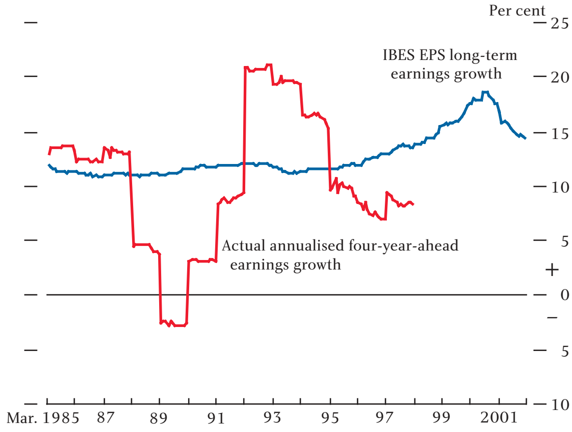
the June 2001 *Financial Stability Review*)[1]. The main innovation here is that we do not assume that dividends grow at a constant rate into the future (a one-stage model). Rather we use a three-stage model in which dividend growth is projected over the next few years on the basis of analysts' earnings forecasts, then adjusts in a second period towards the long-run growth which is obtained in the third period (extending into the indefinite future) and which is tied down by equating the rate of return that investors require (cost of equity) with the projected equity return.

The objective of this work is to investigate whether analysts' forecasts are useful in explaining the level of equity prices over the past ten years. We can then derive estimates of equity risk premia by equating the observed values of prices to those derived from the three-stage model. This helps us to decompose equity price movements into changes in earnings, changes in the risk-free rate and changes in the equity risk premium. This can be a useful tool for policy-makers. Although we find that Institutional Brokers Estimate System (IBES) forecasts do help to explain the level of equity prices, any judgment that this level is a fair one depends on how one views the plausibility of the earnings forecasts used within the model.

## IBES earnings forecasts

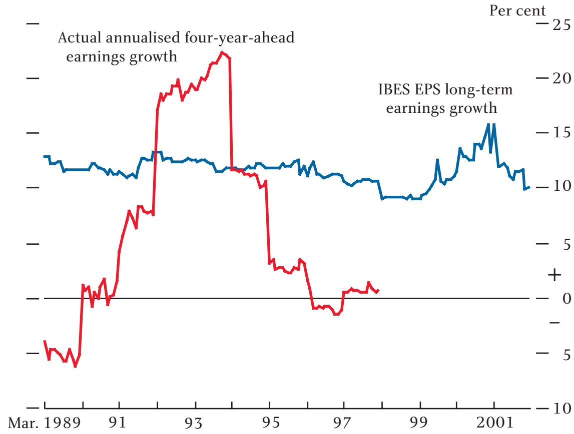
The forecasts used in this work are those published by IBES. They are forecasts of corporate earnings (not dividends) and are consensus forecasts by sell-side analysts of the earnings per share (EPS) growth of an index, sector or company over a specific period of time.[2] Here we use the 'long-term' EPS projections over the course of a business cycle, which IBES specifies to be between three to five years. We use them as four-year average EPS growth projections. Analysts' long-term forecasts for the FTSE 100 and S&P 500 indices are shown in Charts 1 and 2 along with their outturns.[3] They are usually revised by small amounts and are less cyclical than actual earnings growth. This means that they overpredict actual earnings in downturns and underpredict in upturns of the economic cycle, ie the forecast error is cyclical.

**Chart 1**
**US IBES earnings forecasts versus outturns**




Source: IBES.

**Chart 2**
**UK IBES earnings forecasts versus outturns**




Source: IBES.

IBES earnings forecasts are criticised for being biased.[4] This is true for the IBES long-term projections for the S&P 500 and FTSE 100 indices for the periods March 1985 to February 1998 and January 1989 to February 1998 respectively. In particular, both the mean absolute and the mean squared errors were significantly different from zero (the mean absolute error being 5.5% for the S&P 500 and 8.9% for the FTSE 100).[5]

(1) *Bank of England Financial Stability Review*, June 2001, pages 36–37.
(2) The analysts make their forecasts on a continuing operating basis. IBES receives an analyst's forecast after discontinued operations, extraordinary charges and other non-operating items (one-off or special charges that do not reflect the ongoing business) have been taken out.
(3) Euro-area forecasts are not reported due to the small sample size available.
(4) Work done in the Bank in the past found that IBES aggregate forecasts of earnings per share growth in both the United Kingdom and the United States for the first, second and third year (fixed-event forecasts) are biased (non-zero average error) and inefficient (errors correlated with past information). In particular, they are excessively optimistic during economic downturns and too pessimistic in recoveries. Harris (1999) found also that analysts' long-run earnings forecasts for US companies are biased and inefficient. However, the largest part of analysts' forecasts error is made at the individual firm level and there is increasing accuracy with the level of aggregation.
(5) We also test for weak efficiency, which requires that the forecast error is uncorrelated with the forecast itself. We cannot reject the hypothesis that the forecasts are weakly efficient in both the S&P 500 and FTSE 100 cases (at the 5% significance level). However, the fact that the forecast errors shown in Charts 1 and 2 are cyclical means that they are forecastable, and the hypothesis of strong efficiency (which requires that the forecast error is uncorrelated with the entire information set at the time of the forecast) is likely to be rejected.

However, this could be the result of the small sample, which contains no more than one economic cycle (it contains two downturns and one upturn of the economic cycle). For this reason we use the IBES projections without any adjustment for the bias observed in the available sample.

## Equity valuation

As noted above, the fundamental value of an asset can be thought of as the present value of expected cash flows returned to the asset holder. In the basic dividend discount model (DDM) these cash flows are assumed to be the dividend payments. An equity valuation model is therefore given by the following equation:

$$P_t = \frac{D_{t+1}}{1+R_{t+1}} + \frac{D_{t+2}}{1+R_{t+2}} + \cdots \qquad (1)$$

where $P_t$ is the current equity price, $D_{t+k}$ is the expected dividend payments to shareholders at time $t+k$, and $R_{t+k}$ is the discount rate or the opportunity cost of holding equity in the period to $t+k$. The cost of equity is equal to the risk-free rate at the given maturity plus a risk premium that compensates investors for the uncertainty about future cash flows (dividends). In the simple case in which dividends are expected to grow at a constant rate $g$ over the lifetime of the asset, equation (1) becomes:

$$P_t = \frac{D_t \cdot (1+g)}{(ERP+r)-g} \qquad (2)$$

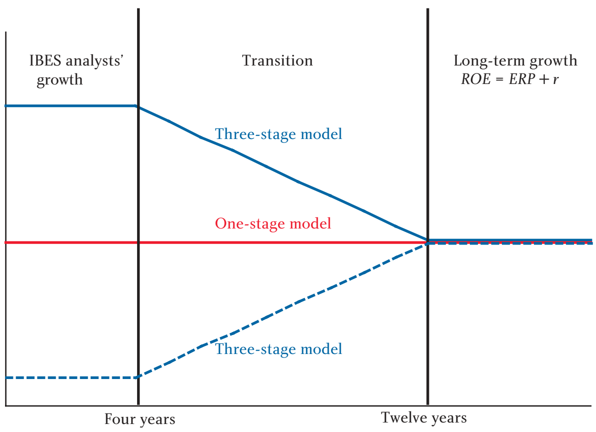
where $ERP$ is the equity risk premium and $r$ is an expected, constant risk-free rate over the life of the asset. Of the above variables only the current equity price, the risk-free rate and current dividends are observable. The $ERP$ and the dividend growth rate $g$ are not observable, but we can investigate combinations of $g$ and $ERP$ that are consistent with the other, observable, variables. In this exercise, however, we generally assume that the $ERP$ is constant and equal to 4%, which is close to the average annual excess return over US and UK Treasury bills for the S&P 500 and FTSE 100 indices since the early 1960s.

IBES 'long-term' earnings projections provide some information about the growth of earnings over the next four years. Assuming that the ratio of dividends to earnings (the payout ratio) is constant, the growth of dividends will be equal to the growth of earnings over the first four years. These four years correspond to the first stage of the three-stage model.

After the first four years we assume a transition period of eight years in which dividend growth will move towards a long-run rate determined by the long-run equilibrium restriction that the return on equity is equal to the cost of equity, ie $ROE = ERP + r$. After year twelve (in the maturity stage), growth is assumed constant at the long-run rate. It is easy to show (see the appendix on page 65) that a company earning a return on its equity that is equal to the cost of equity for all periods should have a value equal to the replacement cost of its net assets (book value of equity capital)—this is equivalent to the one-stage model. In the three-stage model that we examine, we allow a company to earn a return on its equity above or below its cost of equity (abnormal or below-normal earnings) for the first twelve years, ie the value of its equity can differ from the book value. The long-run equilibrium restriction in the third stage (from year twelve onwards) means that a company cannot earn abnormal earnings in this stage (maturity stage).

The three stages are shown in Diagram 1. The two blue lines correspond to the three-stage model: the solid line represents a case where the company earns abnormal returns in the first twelve years and therefore is valued above its book value, while the dotted line represents the case where the company earns less than normal returns in the first twelve years and therefore its value is below its book value. The red line corresponds to the case where a company earns normal returns in every period, that is, its equity value is equal to the book value. A company cannot earn abnormal earnings indefinitely, so we should observe equity valuations that fluctuate around the benchmark one-stage model in the long run.

### Diagram 1




The choice of the length of the transition period is subjective. A transition period of eight years has been used in the academic literature[1] and by practitioners.[2] However, the results are not very sensitive to changes in the length of the transition period length between six and ten years.

With the assumption of a constant payout ratio *b*, dividend growth in the maturity stage will be equal to:

$$g = ROE \cdot (1 - b) \qquad \textbf{(3)}$$

The payout ratio *b* is observable. It is equal to the ratio of current dividends $D_t$ to current earnings $E_t$,[3] ie $b = \frac{D_t}{E_t} \cdot ROE$ is given by the long-run restriction $ROE = ERP + r$.

The intuition of equation **(3)** is that the higher the current payout ratio *b*, the lower the fraction of earnings used for investment and the lower the future growth of the company.

In the case of the three-stage model described above, the valuation equation **(1)** is modified as follows:

$$P_t = \frac{D_t}{(ERP + r) - g}[(1 + g) + 8 \cdot (g_{IBES} - g)] \qquad \textbf{(4)}$$

where $ERP = 4\%$, $r$ = long-term real rate,[4] $g = ROE \cdot (1 - b) = (ERP + r) \cdot (1 - \frac{D_t}{E_t})$ is the long-run real growth rate, and $g_{IBES}$ is the real growth rate from IBES forecasts. Equation **(4)** is a simplified formula for the three-stage model given by Fuller and Hsia (1984).

The value of the S&P 500 and FTSE 100 indices using equation **(4)** are shown in Charts 3 and 4.

The charts show that the values of the two indices implied by the three-stage model track the observed index values. We can also see the incremental effect of IBES projections on equity valuations above that derived from a one-stage model (growth in every period equal to the long-term growth of the three-stage model), which is a measure of the book value of equity. The contribution of the IBES earnings projections is significant in explaining the level of equity valuations.

**Chart 3**
**S&P 500**

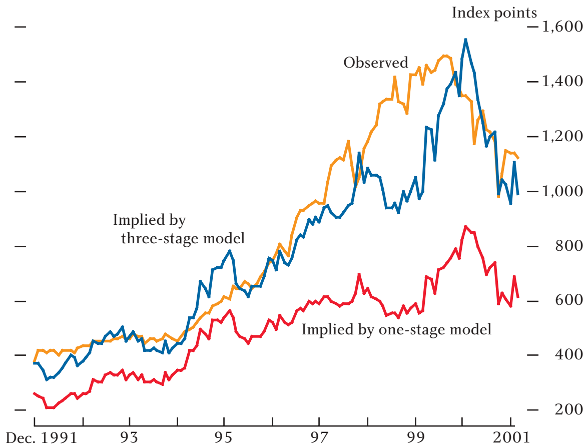
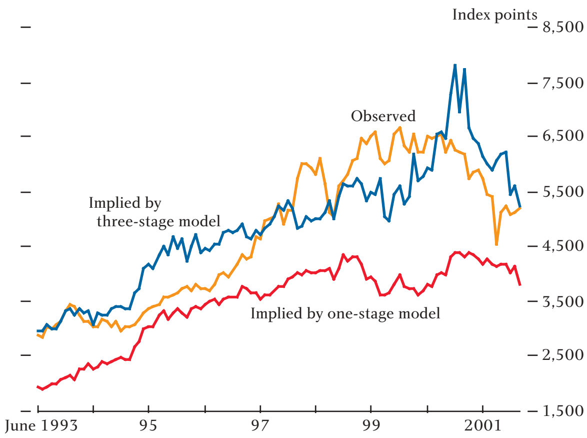



**Chart 4**
**FTSE 100**




Charts 5 and 6 show the relation between the third-stage growth rate used in the model (equation **(3)**) and real GDP growth. In the long run we would expect company earnings and dividends at an aggregate level to grow at the same rate as whole-economy income. The two growth rates follow similar patterns consistent with the above view. As the charts show, long-term growth has been close to real GDP in recent years in both the United Kingdom and the United States. It is also less variable than current real GDP growth, since it reflects growth expected in the long run, which is likely to be more stable than current or short-term growth. Indeed

(1) See, for example, Lee, Myers and Swaminathan (1999).
(2) See, for example, Reimer, Zanker and Nawroth (2001) or the dividend discount model used by Bloomberg.
(3) Earnings and dividends for both the FTSE 100 and S&P 500 indices are calculated from the price/earnings ratios and dividend yields of Datastream.
(4) In the case of the FTSE 100 the ten-year index-linked zero-coupon yield is used. In the case of the S&P 500 the ten-year nominal benchmark yield is used, reduced by the Philadelphia Fed quarterly long-term (ten-year) inflation expectations. An alternative for the S&P 500 index would be to use index-linked yields from US Treasury inflation-indexed securities (TIPS). However, TIPS have only been traded since 1997 and are relatively illiquid.

**Chart 5**
**Third-stage implied earnings growth rates versus real GDP growth for the United States**

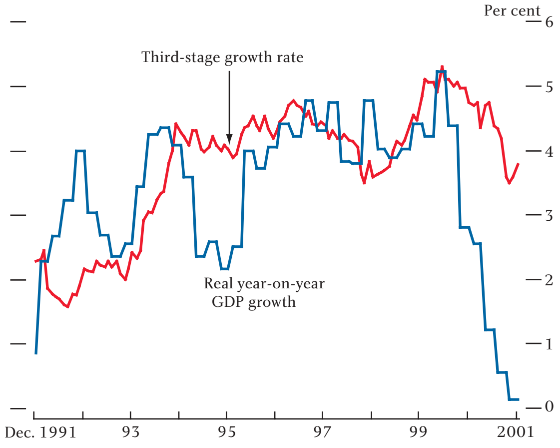
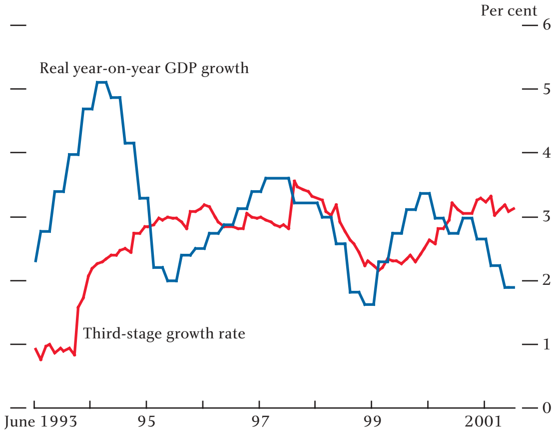



**Chart 6**
**Third-stage implied earnings growth rates versus real GDP growth for the United Kingdom**




during the current downturn GDP fell faster than the implied long-term growth rate.(1)

The factors that drive the valuation of the two indices using the three-stage model described above are:

- **Current earnings:** current dividends have a minimal effect on valuation because the positive effect of higher current dividends is offset by lower long-term growth. This is because a company that pays high dividends today invests less and is expected to grow less in the future. The reduced sensitivity of the valuation to current dividends is a desirable feature of the model as dividends are often distorted by factors such as share buy-backs and cash-financed mergers/acquisitions/leveraged buyouts etc.(2) An increase in current earnings increases the equity value, since earnings are expected to grow from a higher starting level.

- **IBES real earnings projections:** a rise in IBES earnings projections has a positive effect on equity valuations by raising growth in the first stage of the model.

- **Yield curve:** the long-term real yield is used in equation **(4)**. A rise in the long real yield has a negative effect on the value of the index implied by the model because of the higher discount rate. It also has a positive effect by raising long-term real growth (a rise in the long real rate implies higher economic growth in the future, which has a positive impact on long-term earnings growth). The first effect dominates the second, so a rise in long real rates decreases valuations.

- **Equity risk premium:** this has so far been assumed constant and equal to 4%. But any increase in the equity risk premium would have a negative effect on equity valuations by raising the discount rate.

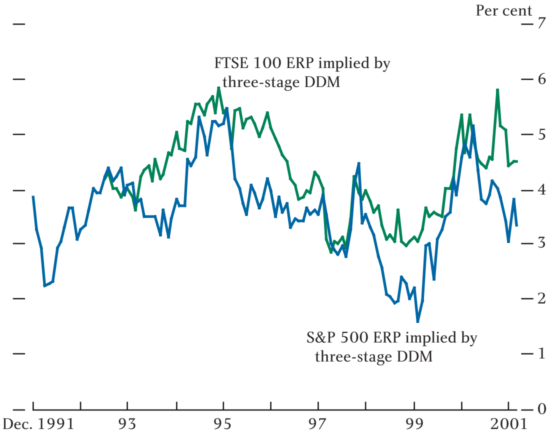
Charts 3 and 4 use an assumed equity risk premium to give the level of the index consistent with the model. But we can easily use equation **(4)** in the opposite direction, to find the level of the risk premium that equates the observed level of the index with that produced by the three-stage model (ie the estimated equity risk premium is the residual). This is shown in Chart 7.

It is interesting to note the rises in the equity risk premium in the LTCM crisis and in the period after the March 2000 peak. Also the equity risk premia for the S&P 500 and FTSE 100 indices are highly correlated.

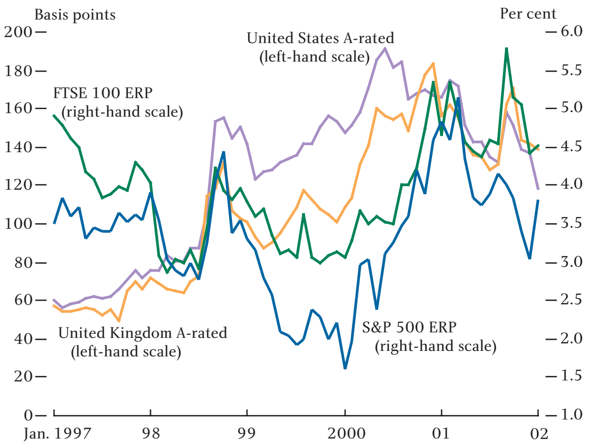
The high correlation between the risk premia in Chart 7 is consistent with the high correlation observed between other measures of corporate risk such as US and UK corporate spreads (see Chart 8).

(1) When calculating the growth rate that is used in the final stage of the model, and is shown in Charts 5 and 6, we use equation **(3)**. This assumes that the current payout ratio prevailing in the market holds through time. However each month the payout ratio is recalculated and we re-estimate equation **(3)** using the new dividend yield, price/earnings ratio and real rate. This calculation gives us a new third-stage growth rate. It is the variation over time in this growth rate, caused by the monthly recalculation, which is shown in Charts 5 and 6. The cyclicality of the third-stage growth rate results from its dependence on current earnings under the assumption of a constant payout ratio.
(2) See Wadhwani (1999).

## Chart 7
## Implied equity risk premia




## Chart 8
## Equity risk premia and corporate spreads(a)

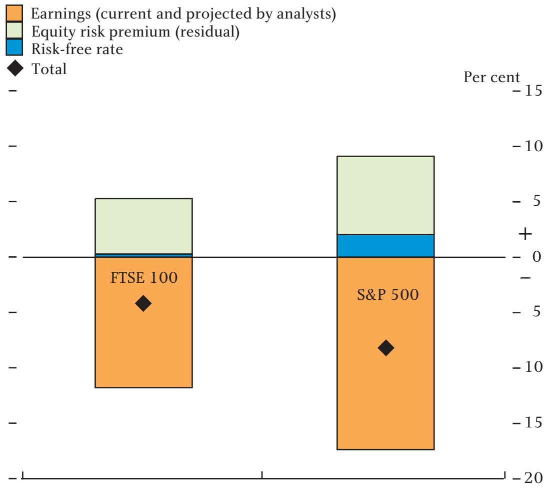



Source: Merrill Lynch.

(a) Option-adjusted spread over government yields.

We can also use the three-stage model to decompose equity price movements into changes to the real rate, changes to earnings (current and projected by analysts) and changes to the risk premium (the residual). Chart 9 shows this decomposition for the S&P 500 and

## Chart 9
## Equity decomposition July 2001 to February 2002




FTSE 100 price changes from July 2001. The equity risk premium made a positive contribution to the value of the two indices as it fell over the corresponding period. We can also see that the risk-free rate made a positive contribution as it also fell. The current level of earnings combined with analysts earnings projections fell over the period, contributing negatively to the valuation of the two indices. Changes in earnings and the real rate were not enough to explain changes in the values of the two indices since last July. Significant changes in the risk premia were needed to explain the observed movements in the indices.

## Conclusions

This article suggests that sell-side earnings forecasts help to explain the level of equity prices (though when they are included the explanation is still far from complete). Even though we can explain the level of prices, that does not mean that they are 'fair value'—judgment is still required on the plausibility of the forecasts that go into the explanation.

## Appendix

The value derived from the one-stage dividend discount model (DDM) can be used to measure the book value of the equity. This is because it assumes that return on equity is equal to the cost of equity for all periods, and abnormal returns on equity are not allowed. We can easily see this by using the framework of clean surplus accounting and the DDM.

The clean surplus equation states that:

$$y_t = y_{t-1} + x_t - \delta_t \qquad \text{(A1)}$$

where $y_t$ is the book value of the equity, $x_t$ is earnings and $\delta_t$ is dividends paid out of earnings. Earnings are determined by return on equity capital, ie $x_t = ROE \cdot y_{t-1}$.

This leads to:

$$y_t = y_{t-1} + ROE \cdot y_{t-1} - \delta_t \Rightarrow \delta_t = (1 + ROE) \cdot y_{t-1} - y_t \qquad \text{(A2)}$$

If $R_t$ is the cost of equity at period $t$, ie the risk-free rate plus the equity risk premium, the value of the equity according to DDM is:

$$S_t = \sum_{i=1}^{\infty} (1+R)^{-i} E_t\left[\delta_{t+i}\right] \qquad \text{(A3)}$$

By combining equations **(A2)** and **(A3)** we get:

$$S_t = \sum_{i=1}^{\infty} (1+R)^{-i} E_t\left[(1+ROE) \cdot y_{t+i-1} - y_{t+i}\right] \qquad \text{(A4)}$$

We define abnormal earnings as $x_t^a = (ROE - R) \cdot y_{t-1}$, ie returns earned above the cost of equity. Then we can rewrite equation **(A4)** as:

$$S_t = y_t + \sum_{i=1}^{\infty} (1+R)^{-i} E_t\left[x_{t+i}^a\right] \qquad \text{(A5)}$$

Equation **(A5)** says that the value of the equity is equal to the equity capital (book value of equity) plus the expected discounted value of future abnormal earnings. When return on equity is equal to the cost of equity in every period, the equity value is simply equal to the book value of the equity.

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