Accrual Accounting and Equity Valuation Models

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Roadmap

- Key differences between the accounting-based valuation models
- Choosing among these models
- Implementation issues
- Remaining problems

Picking the Right Valuation Model

- A necessary step between analyzing financial statements and valuing stocks
- Several models to choose from
- An accounting perspective

A Starting Point – the Dividend Discount Model (DD)

$$P_0 = \sum_{t=1}^{\infty} R^{-t} E[\tilde{d}_t] = \frac{E[\tilde{d}_1]}{R} + \frac{E[\tilde{d}_2]}{R^2} + \ldots$$

Earnings Growth Model (EG)

- $d_t = k_t \bullet e_t$

$$P_0 = \sum_{t=1}^{\infty} R^{-t} E[\tilde{k}_t \tilde{e}_t] = \frac{E[\tilde{k}_1 \tilde{e}_1]}{R} + \frac{E[\tilde{k}_2 \tilde{e}_2]}{R^2} + \ldots$$

Earnings Growth Model

- Ohlson and Juettner-Nauroth (2005)
- $y_t = e_{t+1}/(R-1)$
- $y_t = R \cdot y_{t-1} - d_t + z_t$

$$P_0 = y_0 + \sum_{t=1}^{\infty} \frac{E[\tilde{z}_t]}{R^t} = \frac{e_1}{R-1} + \frac{E[\tilde{z}_1]}{R} + \frac{E[\tilde{z}_2]}{R^2} + \ldots$$

Residual Income Model (RI)

- Edwards-Bell (1961), Peasnell (1982), Ohlson (1995)
- $b_t = b_{t-1} + e_t - d_t$
- $x_t = e_t - (R-1)b_{t-1}$

$$P_0 = b_0 + \sum_{t=1}^{\infty} \frac{E[\tilde{x}_t]}{R^t} = b_0 + \frac{E[\tilde{x}_1]}{R} + \frac{E[\tilde{x}_2]}{R^2} + \ldots$$

Why Do We Care?

- Penman (1997), Ohlson and Zhang (1999)
- Theoretically, they are all the same
- The issue of forecast horizon
- Finite horizon versions

$$P_0 = \sum_{t=1}^{\infty} R^{-t} E[\tilde{d}_t] = \frac{E[\tilde{d}_1]}{R} + \frac{E[\tilde{d}_2]}{R^2} + \ldots$$

Finite Horizon – DD and EG Models

- $P_t = \alpha_t \cdot d_t$
- $P_t = \beta_t \cdot e_t$
- $P_t = [k/(R-G)] \cdot e_{t+1}$

Finite Horizon – EG Models

- Ohlson and Juettner-Nauroth (2005)
- $z_{t+1}=\gamma z_t$
- $z_t=[e_{t+1}+(R-1)d_t-Re_t]/(R-1)$

$$P_0 = \frac{e_1}{R-1} + \frac{z_1}{R-\gamma}$$

Finite Horizon – RI Model

- Ohlson (1995)
- $x_{t+1}=\omega x_t$

$$P_0 = b_0 + \sum_{t=1}^{\infty} \frac{E[\tilde{x}_t]}{R^t} = b_0 + \frac{E[\tilde{x}_1]}{R-\omega}$$

Choosing the Right Model

- Models involve progressively more data
- Models rely on progressively more specific assumptions
- The choice depends on
  - Confidence in your data
  - Confidence in the model specific assumptions
  - Use of model output

Comparing Alternative Models

- Understand the underlying assumptions of each model
- Understand the strengths and limitations
- Possible ways to expand these models to fit your need

Comparing the Earnings Growth Models

$$P_0 = \frac{k}{R - G} e_1$$

$$P_0 = \frac{e_1}{R - 1} + \frac{z_1}{R - \gamma}$$

Constant Growth Model

- $P_t = [k/(R-G)] \cdot e_{t+1}$
- Dividends affect earnings:

Earnings	$10	10	10	…
Dividends	10	10	10	
Earnings	$10	11	12.1	…
Dividends	0	0	0	

Constant Growth Model

- If discount rate = 10% (and earnings is unbiased), then G-1=(1-k)(R-1). In fact,
  - regardless of G, P_0=100 (i.e., \$10/0.1)
  - G captures the growth due to dividend reinvestment
- If discount rate ≠ 10%, then why constant k?
- The role of conservative accounting

Expected Earnings Growth Model

$$P_0 = \frac{e_1}{R-1} + \frac{z_1}{R-\gamma}$$

- Utilize a key accrual accounting feature: accounting tends to “smooth” earnings
- With “perfect smoothing”, z_1=0, growth rate (G, which differs from one due to dividend payout) does not matter

Expected Earnings Growth Model

$$P_0 = \frac{e_1}{R-1} + \frac{z_1}{R-\gamma}$$

- $z_t=[e_{t+1}+(R-1)d_t-Re_t]/(R-1)$ specifies the relation between dividend and earnings
- Gives rise to the role of forecasting the growth in book value

Expected Earnings Growth Model

$$P_0 = \frac{e_1}{R-1} + \frac{z_1}{R-\gamma}$$

- Allows the short-term growth rate to differ from the long-term growth rate, to capture different aspects of growth
- Long-term growth rate (γ) tends to reflect earnings growth due to conservative accounting

Expected Earnings Growth Model

- Key assumptions:
  - e_{t+1} *fully* reflects the earnings power of all assets
  - z_t (i.e., changes from e_{t+1} to e_{t+2}) *fully* reflects the impact of accounting conservatism
- Limited “smoothing” in accounting due to reliability constraint

Expected Earnings Growth Model

- We can generalize the model to accommodate for “non-smooth” earnings patterns

- For instance, assume

$$z_{t+1} = \omega z_t + v_{t+1}$$

$$v_{t+1} = \gamma\, v_t$$

with $\omega<1$ and $\gamma>1$

Note – Discounted Earnings Models

$$P_0 = \beta e_1$$

$$P_0 = \frac{k}{R-G} e_1$$

$$P_0 = \frac{e_1}{R-1} + \frac{z_1}{R-\gamma}$$

$$P_0 = \sum_{t=1}^{\infty} R^{-t} E[\tilde{d}_t] = \frac{E[\tilde{d}_1]}{R} + \frac{E[\tilde{d}_2]}{R^2} + \ldots$$

Note – Balancing Between the Cost and Benefit of Additional Degrees of Freedom

- As the model becomes more complicated,
  - It requires more data
  - It relies on more specific assumptions
- Picking the right model involves a trade-off

Note – Discounted Earnings Models

- The concept of “permanent earnings”
- The rule of conservative accounting
- The impact of “limited” smoothing

Balance-sheet Approach of Accounting and RI model

- Fair value accounting

- Historical cost accounting

$$P_0 = b_0 + \sum_{t=1}^{\infty} \frac{E[\tilde{x}_t]}{R^t} = b_0 + \frac{E[\tilde{x}_1]}{R - \omega}$$

Conservative Accounting and RI Model

- Feltham and Ohlson (1995), Zhang (2000), Pope and Wang (2005)
- With conservative accounting,
  - Book rate of return > discount rate
  - RI positive and expanding
- Need to separate “economic value added” and RI due to conservative accounting

Ways to Expand the RI Model

- Add current book value and lagged book value in valuation
- Set $r^{*}>r$, and separate RI into two components: $b\cdot(ROE-r^{*})$ and $b\cdot(r^{*}-r)$
- $RI_{t+1} = \omega RI_t + v_{t+1}$

  $v_{t+1} = \gamma\, v_t$

Further Extensions of RI Model

- Gode and Ohlson (2004)
- O'Hanlon and Peasnell (2004)
- Ohlson (1999), Pope and Wang (2005)

Comparing EG and RI Models

- Balance-sheet approach versus income-statement approach to accounting
- How to measure “abnormal earnings growth”

Comparing EG and RI Models

- Assume constant growth and conservative accounting
- The issue of earnings persistence

$$RI: P_0 = \frac{e_1}{R-G} - \frac{G-1}{R-G} b_0$$

$$EG: P_0 = \frac{e_1}{R-G} - \frac{(R+G-1)e_1 - (R-1)d - e_2}{(R-G)(R-1)}$$

Picking Among Models

- Cash flow model: stable firm, or when accounting is really lousy
- RI model: with significant assets on the books
- EG model: with less assets, but earnings capture significant portion of operating results

Implementation – Two Approaches

- Infer unknown model elements from current price – reverse engineering
- Calculate intrinsic value based on your own estimates

Implementation – RI and EG Model

- Penman (2004), Ohlson (2005)
- Separating financial and operating assets
- Share purchase transaction

Large Sample Evidence – RI

- Stober (1996), Dechow, Hutton and Sloan (1999), Myers(1999), Ahmed, Morton and Schaefer (2000)
- Liu and Ohlson (2000), Begley and Feltham (2002), Galan and Segal (2005), Choi, O'Hanlon and Pope (2006)
- Abarbanell and Bushee (1997), Frankel and Lee (1998)
- Penman and Sougiannis (1998), Francis, Olsson and Oswald (2000)

Book Value and Future Earnings

- Fairfield and Yohn (2003)
- Nissim and Harris (2005)
- Penman and Zhang (2005)

Estimating Cost of Capital

- Residual income model:
  - Claus and Thomas (2000)
  - Gebhardt, Lee and Swaminathan (2001)
  - Easton, Taylor, Shroff and Sougiannis (2002)
- Earnings Growth model:
  - Gode and Mohanram (2003)
  - Easton (2004)

Remaining Problems

- Ohlson (2005), Ohlson (2006)

$$0 = y_0 + (y_1 - Ry_0) + (y_2 - Ry_1) + \ldots$$

- Pope and Wang (2005)

$$p_t = \beta_1 x_{1t} + \beta_2 x_{2t} + \beta_3 b_t + \beta_4 d_t$$

Summary

- Research in this area has generated an array of accounting-based valuation models to serve investors
- Empirical research provides preliminary support for their usefulness
- Picking the right model is important.
  - Model misspecification
  - Running against the crowd