Equity Securities

TOPIC 10:   RESIDUAL INCOME VALUATION

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Student learning outcomes

10.1 Calculate and interpret residual income and describe and calculate alternative measures of residual earnings (i.e., economic value added, market value added);

10.2 Discuss the uses of residual income models;

10.3 Calculate future values of residual income, given current book value, consensus earnings growth estimates, and an assumed dividend payout ratio and calculate the intrinsic value of a share of common stock using the residual income model;

10.2

Student learning outcomes

10.4 Contrast the recognition of value in the residual income model to value recognition in other present value models, discuss the strengths and weaknesses of the residual income model, and justify the choice of the residual income model for equity valuation, given characteristics of the company being valued;

10.5 Discuss the fundamental determinants or drivers of residual income;

10.6 Explain the relationship between residual income valuation and the justified price-to-book ratio based on forecasted fundamentals;

10.7 Explain the relationship of the residual income model to the dividend discount model and the FCFE model;

10.3

Student learning outcomes

10.8 Discuss the major accounting issues in applying residual income models;

10.9 Calculate and interpret the intrinsic value of a share of common stock using a single-stage residual income model;

10.10 Calculate and interpret the intrinsic value of a share of common stock using a multi-stage residual income model, given the required rate of return, forecasted earnings per share over a finite horizon, and forecasted continuing residual earnings. Justify an estimate of continuing residual income at the earnings forecast horizon, given company and industry prospects;

10.4

References

• **Pinto J.E., E. Henry, T.R. Robinson and D.D. Stowe. (2010).** Equity Asset Valuation. (2nd edition) John Wiley & Sons: New Jersey. Chapter 5.

10.5

Outcome 10.1
Residual income

• Traditional accounting concepts, which deduct the cost of debt in calculating net income but not the cost of equity, let shareholders decide whether net income covers their opportunity cost

• A company can have positive net income yet still may not be adding value for shareholders if it does not earn more than the cost of its equity capital

• The residual income concept, however, explicitly deducts the estimated cost of equity capital

10.6

Outcome 10.1

Economic value added (EVA)

- Traditional accounting concepts, which deduct the cost of debt in calculating net income but not the cost of equity, let shareholders decide whether net income covers their opportunity cost
- A company can have positive net income yet still may not be adding value for shareholders if it does not earn more than the cost of its equity capital
- The residual income concept, however, explicitly deducts the estimated cost of equity capital

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Outcome 10.1

Economic value added (EVA)

- One version of the residual income concept is economic value added (EVA)

$$EVA = NOPAT - (C\% \times TC)$$

where
- $NOPAT$ = net operating profit after tax
- C = cost of capital
- TC = total capital

- A number of accounting adjustments are made in operationalising EVA and determining a value for $NOPAT$ and TC

Outcome 10.1

Market value added (MVA)

- Over time a company must generate EVA in order for its market value to increase
- A company that generates positive EVA should have a market value in excess of accounting book value of its capital

$$MVA = \text{Market value of company} - \text{Total capital}$$

- Research on the ability of value-added concepts to explain equity value and stock returns has resulted in mixed conclusions

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Outcome 10.1

Residual income model (RIM)

- In the long run companies that earn more than the cost of capital should sell for more than book value and companies that earn less than the cost of capital should sell for less than book value
- The residual income model of valuation incorporates:
  - The current book value of equity
  - The present value of expected future residual income

$$V_0 = B_0 + \sum_{t=1}^{\infty} \frac{RI_t}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{E_t - r \times B_{t-1}}{(1+r)^t} = B_0 + \sum_{t=1}^{\infty} \frac{(ROE_t - r) \times B_{t-1}}{(1+r)^t}$$

where RI_t is the expected residual income per share for period t, equal to the EPS for period t, E_t, less the per-share equity charge for the period, which is required rate of return on equity, r, times the book value per share at the beginning of the period, B_{t-1}

Outcome 10.1

Residual income

- David Smith is evaluating the expected residual income for ScottishPower (SPW) and has decided upon a return of 8%
- He obtains the following data from Thomson Financial as at 4 March 2002
  - Current market price　　　　　　　　　GBP4.00
  - Book value per share　　　　　　　　　GBP3.41
  - Consensus annual earnings estimates FY2002　GBP0.33
  - Consensus annual earnings estimates FY2003　GBP0.39
  - Annualised dividend per share　　　　　GBP0.26

- **What is the forecast residual income for fiscal years ended March 2002 and March 2003?**

Outcome 10.1

Residual income model (RIM)

- Bugg Properties' expected EPS is $2.00, $2.50 and $4.00 for the next three years, respectively
- Analysts expect Bugg will pay dividends of $1.00, $1.25 and $12.25 for the next three years
- The last dividend is anticipated to be a liquidating dividend as analysts expect Bugg to cease trading after Year 3
- Bugg's current book value is $6.00 per share and its required rate of return on equity is 10%

- **Calculate per-share book value and residual income for the next three years**
- **Estimate the stock's value using the residual income model**

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Outcome 10.2

Uses of the residual income model

- RIM appropriate to use when
  - A company does not pay dividends or its dividends are not predictable
  - A company's expected free cash flows are negative within the analyst's comfortable forecast horizon
  - There is great uncertainty in forecasting terminal values using an alternative present value approach
- RIM less appropriate to use when
  - There are significant departures from clean surplus accounting
  - Significant determinants of residual income, such as book value and ROE, are not predictable

10.13

Outcome 10.4

Timing of the recognition of value

- In dividend and free cash flow discount models we often model the value of a stock as the sum of the present value of individually forecasted dividends or free cash flow up to some terminal point, and add the present value of the terminal value of the stock at that point in time
- Often the terminal value comprises a large fraction of the value of the stock, though substantial uncertainty surrounds the terminal value
- Residual income models are relatively less sensitive to terminal value estimates, hence provide earlier recognition of value

10.14

Outcome 10.4

Strengths and weaknesses of RI

- Strengths
  - Terminal value does not comprise a large portion of the valuation compared to other models
  - RI models use readily available accounting data
  - RI models can be applied to valuing companies that do not pay dividends or do not have positive near-term cash flow
  - The models can be used when cash flows are unpredictable
  - The models have an appealing focus on economic profitability
- Weaknesses
  - Accounting data can be manipulated by management and hence it may required significant adjustment by the analyst
  - The models require that the clean surplus relation holds

10.15

Outcome 10.1

Residual income model (RIM)

- A company will earn $1.00 per share forever
- The company pays out all its earnings as dividends
- Book value per share is $6.00
- The required rate of return on equity is 10%

- **Calculate the value of the stock using a DDM**
- **Calculate the value of the stock using a RIM**
- **Compare the recognition of value each year in the two models**

9.16

Outcomes 10.5 and 10.6

Fundamental determinants of RI

- The RIM makes no assumptions about earnings and dividend growth
- If we assume constant earnings and dividend growth at g we can derive a version of the RIM that is useful for illustrating the fundamental drivers of residual income
- The justified P/B based on forecasted fundamentals was:

$$\frac{P_0}{B_0} = \frac{ROE - g}{r - g} \Rightarrow \frac{P_0}{B_0} = 1 + \frac{ROE - r}{r - g}$$

$$\Rightarrow V_0 = B_0 + \frac{ROE - r}{r - g} \times B_0 \qquad \text{assuming } P_0 = V_0$$

9.17

Outcome 10.7

RIM, DDM and FCFE models

- DDM and FCFE models both forecast future cash flows and find the value of the stock by discounting them back to the present using the required rate of return on equity as the discount factor
- RIM starts with the book value of the firm and adds the present value of expected future residual income
- Although the recognition of value is different, if the assumptions and forecasts are mutually consistent the different models should yield the same value for the firm

10.18

Outcome 10.8

Accounting considerations

- In order to operationalise the RIM model the analyst needs to:
  - Adjust the book value of common equity for off-balance sheet items and
  - Adjust reported net income to obtain comprehensive income
- A company has $1 million of book value and $200,000 of earnings before taxes, after expensing an expenditure of $50,000
  - Ignoring taxes the company has a ROE of 20%
  - If the company capitalises the $50,000 expenditure it would increase ROE to 23.8% ($250,000/$1,050,000)
  - An overstated ROE will lead to an overstated RIM valuation

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Outcome 10.8

Accounting considerations

- Violations of the clean surplus relationship
  - i.e. $B_t = B_{t-1} + E_t - D_t$
  - Hence, $D_t = E_t - (B_t - B_{t-1}) = E_t + B_{t-1} - B_t$
  - Violations may occur when accounting standards permit changes directly to stockholders' equity, bypassing the income statement, e.g. foreign currency translation adjustments, certain pension adjustments and fair value changes of some financial instruments
  - Items bypassing the income statement are excluded from historical ROE data
  - However book value is stated correctly
- Balance sheet adjustments for fair value
  - Off-balance sheet items should be incorporated into the balance sheet
  - Assets and liabilities should be stated at fair value

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Outcome 10.8

Accounting considerations

- Intangible assets
  - If the intangible asset is specifically identifiable and can be separated from the firm it should be included in the calculation of book value
  - Goodwill is generally not recognised as an asset unless it results from an acquisition, however, any amortisation of goodwill should be removed from the income statement
- Nonrecurring items
  - Unusual and extraordinary items, restructuring charges, discontinued operations and accounting charges should be removed from net income in determining earnings per share or ROE
- Aggressive accounting practices
  - Any accelerated revenue or deferred charges should be adjusted for in determining net income, earnings per share and ROE

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Outcomes 10.9

Single stage RIM

- The single-stage (constant growth) residual income model assumes that a company has a constant return on equity and constant earnings growth rate over time

$$V_0 = B_0 + \frac{(ROE - r) \times B_0}{r - g}$$

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Outcome 10.9

Residual income model (RIM)　❓

- Bugg Properties' expected EPS is $2.00, $2.50 and $4.00 for the next three years, respectively
- Analysts expect Bugg will pay dividends of $1.00, $1.25 and $12.25 for the next three years
- The last dividend is anticipated to be a liquidating dividend as analysts expect Bugg to cease trading after Year 3
- Bugg's current book value is $6.00 per share and its required rate of return on equity is 10%

- **Calculate per-share book value and residual income for the next three years**
- **Estimate the stock's value using the residual income model**

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Outcome 10.9

Single stage RIM　❓

- Joseph Yoh is evaluating a purchase of Canon Inc (CAJ)
- Current book value per share is $12.90, and the current price per share is $32.41 as at 8 February 2002
- Yoh expects long-term ROE to be 10% p.a. and long-term growth to be 8% p.a.

- **Calculate the intrinsic value of Canon stock using a RIM, assuming a cost of equity of 9% p.a.**

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Outcome 10.10

Multi-stage RIM

- A drawback of the single-stage RIM is that it assumes that the premium of *ROE* over *r* will persist indefinitely, when evidence suggests that *ROE* is mean reverting over time
- If a company or industry has abnormally high *ROE* it will attract other companies to the market, increasing competition, reducing margins and reducing *ROE*
- This issue can be dealt with a multi-stage model, where residual income is forecast for a certain time horizon prior to a terminal value based on **continuing residual income** estimated as at the end of the time horizon of the original stage

10.25

Outcome 10.10

Multi-stage RIM

- Analysts make one of the following assumptions in calculating a multi-stage RIM
  - Residual income continues indefinitely at a positive level
  - Residual income is zero from the terminal year forward
  - Residual income declines to zero as ROE reverts to the cost of equity over time
  - Residual income reflects the reversion of ROE to some mean level

10.26

Outcome 10.10

Multi-stage RIM

- One finite horizon model of residual income assumes that at the end of time horizon *T* there is a premium over book value (P_T-B_T) for the company

$$V_0 = B_0 + \sum_{t=1}^{T} \frac{(ROE - r) \times B_{t-1}}{(1+r)} + \frac{P_T - B_T}{(1+r)^T}$$

- The last component represents the premium over book value at the end of the forecast horizon
- The longer the forecast period, *T*, the greater the chance that company's residual income will converge to zero
- For long forecast periods this last component may be assumed to be zero

9.27

Outcome 10.9

Single stage RIM

- Semiconductor Manufacturing Ltd (TSM):
  - Has a current price of TWD81
  - Has a cost of equity of 14.33%
  - Does not pay dividends
  - Its ROE has ranged from 18.3% to 26.2% over the last five years
  - Its forecast growth in book value is 22% p.a.
  - Its current book value per share is TWD16.47
  - In 2001, ROE declined to 5.5%, but a rebound is expected in 2002 and 2003
  - After 2003, ROE is expected to stabilise at 25% until 2011 and then to decline to 20% until 2021, after which time residual value will be zero

- **Determine whether TSM is overvalued or undervalued in the market**

9.28

Outcome 10.10

Multi-stage RIM

- Another model of residual income assumes that ROE fades over time

$$V_0 = B_0 + \sum_{t=1}^{T} \frac{(ROE - r) \times B_{t-1}}{(1+r)} + \frac{(ROE - r) \times B_{t-1}}{(1+r-\omega)(1+r)^{T-1}}$$

where

- is a persistence factor, which takes a value between 0 and 1
- A persistence factor of 1.0 assumes that residual income will continue indefinitely, whereas a persistence factor of zero implies that residual income will not continue after the initial forecast horizon
- The higher the value of the persistence factor, the higher is the valuation
- From 1976 to 1995 the persistence factor equalled 0.62

9.29