

Residual Income Valuation	
Basic Concept (Gordon's Model & P/B Ratio)	$P_0 = \frac{(1-b)E_1}{r-g} = \frac{(1-b)(B_0 ROE_1)}{r-g} = \frac{B_0(ROE_1 - bROE_1)}{r-g} = \frac{B_0(ROE_1 - g)}{r-g}$ $\frac{P_0}{B_0} = \frac{(ROE_1 - g)}{r-g} = \frac{(r-g) + (ROE_1 - r)}{r-g} = 1 + \frac{\alpha}{r-g} = 1 + \frac{\left(\frac{\alpha B_0}{r-g}\right)}{B_0} = 1 + \frac{V_{RI_0}}{B_0}$ $P_0 = B_0 + V_{RI_0}$
Equity Value	Current Equity Value = Book Value per share + PV of all future Residual Incomes
Residual Income	$RI_t = \alpha B_{t-1} = (ROE_t - r)B_{t-1} = ROE_t \cdot B_{t-1} - r \cdot B_{t-1} = EPS_t - r \cdot B_{t-1}$ <p>Residual Income Per Share = Earning Per Share minus Equity Charge (Expense) Residual Income_t = Net Income_t minus (Cost of Equity x Book Equity Value_{t-1})</p>

Basic Formulation		$V_{E_0} = B_{E_0} + V_{RI_0}$
	If g is constant	$V_{RI_0} = \frac{(ROE_1 - r)B_0}{r - g} = \frac{EPS_1 - rB_0}{r - g}$
	Non-constant Growth	$V_{RI_0} = \left[\sum_{t=1}^T \frac{(ROE_t - r)B_{t-1}}{(1 + r)^t} \right] + \left[\frac{P_T - B_T}{(1 + r)^T} \right],$ <p>P_T = Terminal Sale Price of Equity</p>
Book Value (per share) Calculation over time	$ \begin{aligned} B_t &= B_{t-1} + EPS_t - DPS_t \\ &= B_{t-1} + (b \cdot EPS_t) \\ &= B_{t-1} + b(ROE_t \cdot B_{t-1}) \\ &= (1 + g)B_{t-1} \end{aligned} $	
Example	<p>Paul Riley, CFA, is preparing to analyze a pharmaceutical company, (IBDF, \$21.00). The company makes drugs that help people with breathing problems. He has decided to use residual income valuation methods to determine a target price for Aspiration. He has gathered the following information:</p>	

Financial Statements for Years Ended 12/31/X6 and 12/31/X7 (\$ million, except per share data)	Balance Sheet		
	Cash and equivalents	20x6	20x7
		14	17
	Other current assets	45	58
	Net property, plant and equipment	165	170
	Current liabilities	40	51
	Long-term debt	74	74
	Stockholders' equity	110	120
	Income Statement		
	Revenue	220	240
	Operating costs	180	190
	Interest expense	6	6
	Depreciation	18	20
	Taxes	5	7
	Net Income	11	17
Other Information	1	a total of 9 million common shares outstanding, which are trading at \$21.00.	
	2	a stable dividend payout ratio of 20%,	
	3	a beta of 0.8.	
	4	debt was issued, and is still trading, at par and has an 8 percent coupon	
	5	capital spending was \$20 million in 20X6 and \$25 million in 20X7.	
	6	Paul has estimated IBDF's cost of equity to be 12% and its weighted-average cost of capital (WACC) to be 10%.	

What the residual
Income for 20X7?

$$RI_{20x4} = (ROE_{20x7} - r) \times B_{20x6} = [(17/110) - 12\%] \times 110 = 3.8 \text{ million}$$

Assume the long-term ROE will be 15% and the constant long-term earnings growth rate will be 6%. Use a single-stage residual income valuation model to find the 20X7 value per share.

$$RI_{20x8} = (ROE_{20x8} - r) \times B_{20x7} = (15\% - 12\%) \times 120 = 3.6$$

$$V_{20x7} = 120 + [3.6/(12\% - 6\%)] = 180$$

$$P_{20x7} = 180/9 = 20 \text{ per share}$$

Assume IBDF will achieve a 15% ROE for the next two years and that the company will maintain a 20% dividend payout ratio. Further, IBDF's shares will sell at 1.8 times book value at the end of the two-year period. What is the current share value?

	20x7	20x8	20x9
$ROE_t = NT_t/B_{t-1}$		15%	15%
Payout		20%	20%
Retain Earning		$(0.8)(15\%)(120) = 14.4$	$(0.8)(15\%)(134.4) = 16.13$
Book Value	120	$120 + 14.4 = 134.4$	$134.4 + 16.13 = 150.23$
Residual Income		$(0.15 - 0.12) \times (120) = 3.6$	$(0.15 - 0.12) \times (134.4) = 4.03$
Terminal Value (P_T)			$1.8(150.23) = 270.41$
Discount Factor (12%)		0.893	0.797
PV of RI		3.214	3.212
PV of ($P_T - B_T$)			$(270.41 - 150.23) \times 0.797 = 95.783$
$V_0 = B_0 + PVRI + PV(P_T - B_T)$	$120 + 3.214 + 3.212 + 95.783 = 222.22$		
$P_0 = V_0 / \text{\#shares}$	$222.22 / 9 = 24.69$		

<p>Growth Rate Estimation</p>	<table border="1" data-bbox="451 191 1974 597"> <tr> <td data-bbox="451 191 1209 423"> $P_0 = B_0 + \frac{[ROE_0(1 + g) - r]B_0}{r - g}$ $r - g = \frac{EPS_0(1 + g) - rB_0}{P_0 - B_0}$ </td><td data-bbox="1209 191 1974 423"> $g = \frac{r - \frac{EPS_0 - rB_0}{P_0 - B_0}}{1 + \frac{EPS_0}{P_0 - B_0}}$ </td></tr> <tr> <td data-bbox="451 423 1209 597"> <p>Eastern Mobil reported earnings per share of \$4.5 and its book value per share is \$26. The company's cost of equity is 15% and the company's trailing P/E ratio is 10. What is the growth rate?</p> </td><td data-bbox="1209 423 1974 597"> $P_0 = (P/E) EPS_0 = 10 \times 4.5 = 45$ $g = \frac{0.15 - \frac{4.5 - 3.9}{19}}{1 + \frac{4.5}{19}} = \frac{0.118}{1.23} = 9.6\%$ </td></tr> </table> <ul style="list-style-type: none"> • $P_0 - B_0$ represents "Value Adding" • What if $P_0 - B_0 > 0$ but $EPS_0 < 0$? 	$P_0 = B_0 + \frac{[ROE_0(1 + g) - r]B_0}{r - g}$ $r - g = \frac{EPS_0(1 + g) - rB_0}{P_0 - B_0}$	$g = \frac{r - \frac{EPS_0 - rB_0}{P_0 - B_0}}{1 + \frac{EPS_0}{P_0 - B_0}}$	<p>Eastern Mobil reported earnings per share of \$4.5 and its book value per share is \$26. The company's cost of equity is 15% and the company's trailing P/E ratio is 10. What is the growth rate?</p>	$P_0 = (P/E) EPS_0 = 10 \times 4.5 = 45$ $g = \frac{0.15 - \frac{4.5 - 3.9}{19}}{1 + \frac{4.5}{19}} = \frac{0.118}{1.23} = 9.6\%$
$P_0 = B_0 + \frac{[ROE_0(1 + g) - r]B_0}{r - g}$ $r - g = \frac{EPS_0(1 + g) - rB_0}{P_0 - B_0}$	$g = \frac{r - \frac{EPS_0 - rB_0}{P_0 - B_0}}{1 + \frac{EPS_0}{P_0 - B_0}}$				
<p>Eastern Mobil reported earnings per share of \$4.5 and its book value per share is \$26. The company's cost of equity is 15% and the company's trailing P/E ratio is 10. What is the growth rate?</p>	$P_0 = (P/E) EPS_0 = 10 \times 4.5 = 45$ $g = \frac{0.15 - \frac{4.5 - 3.9}{19}}{1 + \frac{4.5}{19}} = \frac{0.118}{1.23} = 9.6\%$				
<p>Compare residual income models to dividend discount and free cash flow models.</p>	<ul style="list-style-type: none"> • DDM and FCFE models estimate equity value by discounting a stream of expected cash flows. • Residual income model estimate equity value using the sum of book value and the present value of the expected stream residual income. • Theoretically, the intrinsic value derived using expected dividends, expected free cash flow to equity, or book value plus expected residual income should be identical if the underlying assumptions used to make the necessary forecasts are the same. 				

<p>Strengths and weaknesses of residual income models, and justify the selection of a residual income model to value a company's common stock.</p>	<table> <tr> <th data-bbox="428 253 1209 293">Strength</th><th data-bbox="1209 253 1995 293">Weakness</th></tr> <tr> <td data-bbox="428 293 1209 808"> <ol style="list-style-type: none"> 1. Terminal value does not dominate the intrinsic value estimate 2. Residual income models use accounting data, which is usually easy to get 3. The models can be used to value firms that do not pay dividends or that do not have positive expected free cash flows in the short run 4. The models are applicable even when cash flows are volatile 5. The models focus on economic profitability rather than just on accounting profitability. </td><td data-bbox="1209 293 1995 808"> <ol style="list-style-type: none"> 1. The models rely on accounting data that can be manipulated by management 2. The models rely on accounting data that requires significant adjustments 3. The models assume that the clean surplus relation holds or that its failure to hold has been properly taken into account. </td></tr> </table>	Strength	Weakness	<ol style="list-style-type: none"> 1. Terminal value does not dominate the intrinsic value estimate 2. Residual income models use accounting data, which is usually easy to get 3. The models can be used to value firms that do not pay dividends or that do not have positive expected free cash flows in the short run 4. The models are applicable even when cash flows are volatile 5. The models focus on economic profitability rather than just on accounting profitability. 	<ol style="list-style-type: none"> 1. The models rely on accounting data that can be manipulated by management 2. The models rely on accounting data that requires significant adjustments 3. The models assume that the clean surplus relation holds or that its failure to hold has been properly taken into account.
Strength	Weakness				
<ol style="list-style-type: none"> 1. Terminal value does not dominate the intrinsic value estimate 2. Residual income models use accounting data, which is usually easy to get 3. The models can be used to value firms that do not pay dividends or that do not have positive expected free cash flows in the short run 4. The models are applicable even when cash flows are volatile 5. The models focus on economic profitability rather than just on accounting profitability. 	<ol style="list-style-type: none"> 1. The models rely on accounting data that can be manipulated by management 2. The models rely on accounting data that requires significant adjustments 3. The models assume that the clean surplus relation holds or that its failure to hold has been properly taken into account. 				
<p>Three general issues to consider for using the RI model</p>	<ol style="list-style-type: none"> 1. Reliability of earnings forecasts 2. Whether clean surplus relation holds 3. Quality of accounting reports 				

<p>Common accounting issues in applying residual income models</p>	<table border="1"> <tr> <td data-bbox="457 250 512 532">1</td><td data-bbox="512 250 2003 532"> <p>The clean surplus relationship may fail when items are charged directly to shareholders' equity and do not go through the income statement, such as:</p> <ul style="list-style-type: none"> ❖ Foreign currency translation gains and losses that flow directly to retained earnings under the all-current method. ❖ The minimum liability adjustment in pension accounting ❖ Changes in the market value of debt and equity securities classified as available-for-sale. </td></tr> <tr> <td data-bbox="457 532 512 938">2</td><td data-bbox="512 532 2003 938"> <p>Deviations from Fair Value – the accrual method of accounting may cause the book value of balance sheet items to differ significantly from the market value. Common adjustments to the balance sheet:</p> <p>Operating lease should be capitalized;</p> <ul style="list-style-type: none"> ❖ Special purpose entities (SPEs) should be consolidated; ❖ Reserves and allowances should be adjusted. ❖ Inventory for companies that use LIFO should be adjusted to FIFO; ❖ The pension asset or liability should be adjusted to reflect the funded status of the plan ❖ Deferred tax liabilities should be eliminated and reported as equity if the liability is not expected to reverse </td></tr> <tr> <td data-bbox="457 938 512 1198">3</td><td data-bbox="512 938 2003 1198"> <p>Intangible asset effects on Book Value. Two intangible assets that require adjustments:</p> <ul style="list-style-type: none"> ❖ Goodwill – goodwill that results from an acquisition should be included on the balance sheet for purposes of calculating book value of equity; amortization of goodwill should be excluded from the estimate of ROE. ❖ R&D expenditures – productive R&D expenditures increase ROE and residual income; while unproductive expenditures reduce ROE and residual income. </td></tr> </table>	1	<p>The clean surplus relationship may fail when items are charged directly to shareholders' equity and do not go through the income statement, such as:</p> <ul style="list-style-type: none"> ❖ Foreign currency translation gains and losses that flow directly to retained earnings under the all-current method. ❖ The minimum liability adjustment in pension accounting ❖ Changes in the market value of debt and equity securities classified as available-for-sale. 	2	<p>Deviations from Fair Value – the accrual method of accounting may cause the book value of balance sheet items to differ significantly from the market value. Common adjustments to the balance sheet:</p> <p>Operating lease should be capitalized;</p> <ul style="list-style-type: none"> ❖ Special purpose entities (SPEs) should be consolidated; ❖ Reserves and allowances should be adjusted. ❖ Inventory for companies that use LIFO should be adjusted to FIFO; ❖ The pension asset or liability should be adjusted to reflect the funded status of the plan ❖ Deferred tax liabilities should be eliminated and reported as equity if the liability is not expected to reverse 	3	<p>Intangible asset effects on Book Value. Two intangible assets that require adjustments:</p> <ul style="list-style-type: none"> ❖ Goodwill – goodwill that results from an acquisition should be included on the balance sheet for purposes of calculating book value of equity; amortization of goodwill should be excluded from the estimate of ROE. ❖ R&D expenditures – productive R&D expenditures increase ROE and residual income; while unproductive expenditures reduce ROE and residual income.
1	<p>The clean surplus relationship may fail when items are charged directly to shareholders' equity and do not go through the income statement, such as:</p> <ul style="list-style-type: none"> ❖ Foreign currency translation gains and losses that flow directly to retained earnings under the all-current method. ❖ The minimum liability adjustment in pension accounting ❖ Changes in the market value of debt and equity securities classified as available-for-sale. 						
2	<p>Deviations from Fair Value – the accrual method of accounting may cause the book value of balance sheet items to differ significantly from the market value. Common adjustments to the balance sheet:</p> <p>Operating lease should be capitalized;</p> <ul style="list-style-type: none"> ❖ Special purpose entities (SPEs) should be consolidated; ❖ Reserves and allowances should be adjusted. ❖ Inventory for companies that use LIFO should be adjusted to FIFO; ❖ The pension asset or liability should be adjusted to reflect the funded status of the plan ❖ Deferred tax liabilities should be eliminated and reported as equity if the liability is not expected to reverse 						
3	<p>Intangible asset effects on Book Value. Two intangible assets that require adjustments:</p> <ul style="list-style-type: none"> ❖ Goodwill – goodwill that results from an acquisition should be included on the balance sheet for purposes of calculating book value of equity; amortization of goodwill should be excluded from the estimate of ROE. ❖ R&D expenditures – productive R&D expenditures increase ROE and residual income; while unproductive expenditures reduce ROE and residual income. 						