

Chapter 5: Accrual Accounting and Valuation Pricing Book Values

Residual Earnings and Valuation

$$\text{Residual Earnings}_t = \text{Earnings}_t - \text{Investment}_{t-1} \times \text{Required Return}$$

To value a firm anchoring on its book value, we see the book value of common equity as investment, i.e.,

$$\begin{aligned}\text{Residual Earnings}_t &= \text{Earnings}_t - \text{Book Value of Common Equity}_{t-1} \times \text{Required Return} \\ &= (\text{ROCE}_t - \text{Required Return}) \times \text{Book Value of Common Equity}_{t-1}\end{aligned}$$

where

$$\text{ROCE}_t = \frac{\text{Comprehensive Earnings to Common}_t}{\text{Book Value of Common Equity}_{t-1}}$$

is called return on common shareholders' equity.

Example

The following are earnings and dividend forecasts made at the end of 2012 for a firm with \$20.00 book value per common share at that time. The firm has a required equity return of 10% per year.

(\$)	2012	2013	2014	2015
EPS		3.00	3.60	4.10
DPS		0.25	0.25	0.30
BPS	20.00			

Given the information above, we can calculate BPS by the formula $\text{BPS}_t = \text{BPS}_{t-1} + \text{EPS}_t - \text{DPS}_t$, which results in

(\$)	2012	2013	2014	2015
EPS		3.00	3.60	4.10
DPS		0.25	0.25	0.30
BPS	20.00	22.75	26.10	29.90

Then the ROCE can be calculated by the formula $\text{ROCE}_t = \frac{\text{EPS}_t}{\text{BPS}_{t-1}}$.

	2012	2013	2014	2015
ROCE		15.00%	15.82%	15.71%

The residual earnings per share can be calculated by the formula $(\text{ROCE}_t - \text{Required Return}) \times \text{BPS}_{t-1}$.

(\$)	2012	2013	2014	2015
RE		1.00	1.32	1.49

Since the retain earnings are all positive, the firm has a positive extra value. Thus, the intrinsic value of equity per share (assume retain earnings are zero after 2015) is

$$\$20.00 + \frac{\$1.00}{1 + 10\%} + \frac{\$1.32}{(1 + 10\%)^2} + \frac{\$1.49}{(1 + 10\%)^3} = \$23.12$$

Advantages of Residual Earnings Valuation

- Focus on value drivers - profitability of investment and growth in investment.
- Using accrual accounting:
 - Use the properties of accrual accounting that recognize value added ahead of cash flows;
 - Match value added to value given up;
 - Treat investment as an asset rather than a loss of value.
- Aligned with what people forecast - earnings.

Chapter 6: Accrual Accounting and valuation: Pricing Earnings

Normal P/E

Remember that the forward P/E is

$$\text{Forward P/E} = \frac{\text{Price}_0}{\text{Earnings Forecast}_1}$$

and the trailing P/E (dividend-adjusted) is

$$\text{Trailing P/E} = \frac{\text{Price}_0 + \text{Dividend}_0}{\text{Earnings}_0}$$

Then the normal forward P/E is

$$\text{Normal Forward P/E} = \frac{1}{\text{Required Return}}$$

and the normal trailing P/E is

$$\text{Normal Trailing P/E} = \frac{1 + \text{Required Return}}{\text{Required Return}} = \text{Normal Forward P/E} + 1$$

Abnormal Earnings Growth (AEG)

Abnormal earnings growth (AEG) is the **growth in earnings over the required growth rate**:

$$\text{AEG}_t = \text{Earnings}_t - \text{Earnings}_{t-1} - \text{Change in Book Value of Equity}_{t-1} \times \text{Required Return}$$

Remember that

$$\text{Residual Earnings}_t = \text{Earnings}_t - \text{Book Value of Equity}_{t-1} \times \text{Required Return}$$

so

$$\begin{aligned} \text{AEG}_t &= \text{Earnings}_t - \text{Earnings}_{t-1} - \text{Change in Book Value of Equity}_t \times \text{Required Return} \\ &= (\text{Earnings}_t - \text{Book Value of Equity}_{t-1} \times \text{Required Return}) \\ &\quad - (\text{Earnings}_{t-1} - \text{Book Value of Equity}_{t-2} \times \text{Required Return}) \\ &= \text{Residual Earnings}_t - \text{Residual Earnings}_{t-1} \end{aligned}$$

is also the **change in residual earnings**.

P/E Valuation Using AEG

The book value of equity at time 0 can be forecast as follow:

$$\text{Book Value of Equity}_0 = \frac{1}{\text{Required Return}} \left(\text{Earnings}_1 + \frac{\text{AEG}_2}{1 + \text{Required Return}} + \frac{\text{AEG}_3}{(1 + \text{Required Return})^2} + \dots \right)$$

Example: Valuation of IBM

Analysts' forecast of IBM is shown below:

\$	2010	2011	2012	Next Three Years
EPS		13.22	14.61	Growth at 11%
DPS		3.00	3.30	Growth at 11%
BPS	18.77			

Assume the required return for equity is 10%.

We first calculate the BPS using $BPS_t = BPS_{t-1} + EPS_t - DPS_t$,

\$	2010	2011	2012	2013	2014	2015
EPS		13.22	14.61	16.22	18	19.98
DPS		3.00	3.30	3.66	4.07	4.51
BPS	18.77	28.99	40.30	52.86	66.79	82.26

Then, the residual earnings is calculated by $RE_t = EPS_t - BPS_{t-1} \times \text{Required Return}$,

\$	2010	2011	2012	2013	2014	2015
EPS		13.22	14.61	16.22	18	19.98
DPS		3.00	3.30	3.66	4.07	4.51
BPS	18.77	28.99	40.30	52.86	66.79	82.26
RE		11.34	11.71	12.19	12.71	13.30

The AEG is just the change in RE,

\$	2010	2011	2012	2013	2014	2015
EPS		13.22	14.61	16.22	18	19.98
DPS		3.00	3.30	3.66	4.07	4.51
BPS	18.77	28.99	40.30	52.86	66.79	82.26
RE		11.34	11.71	12.19	12.71	13.30
AEG			0.37	0.48	0.52	0.59

which means the current value of IBM's common equity should be

$$\frac{1}{10\%} \left(\$13.22 + \frac{\$0.37}{1 + 10\%} + \frac{\$0.48}{(1 + 10\%)^2} + \frac{\$0.52}{(1 + 10\%)^3} + \frac{\$0.59}{(1 + 10\%)^4} \right) \approx \$147.47$$

Note that at the beginning of 2011, the price of IBM is \$147.14, which is close to our valuation.

Cum-Dividend Earnings and Normal Earnings

Cum-Dividend Earnings

Cum-dividend earnings is earnings with the prior year's dividend reinvested.

There are 2 methods of calculation:

- Compound interest of several years' dividend

$$\text{Cum-Dividend Earnings}_t = \text{Earnings}_t + \text{Dividend}_{t-1} \times \text{Required Return} + \text{Dividend}_{t-2} \times (1 + \text{Required Return}) \times \text{Required Return} + \dots$$

- Simple interest of last year's dividend

$$\text{Cum-Dividend Earnings}_t = \text{Earnings}_t + \text{Dividend}_{t-1} \times \text{Required Return}$$

We can derive some conclusions using the compounding method, however, using the second method would be more convenient for calculation.

Example: The Prototype Savings Account

Consider a company pays all its earnings as dividend (assume the required return is 5%):

(\$)	0	1	2	3
EPS		5	5	5
DPS		5	5	5
BPS	100	100	100	100
Cum-Dividend Earnings		5	$5 + 5 \times 5\% = 5.25$	$5 + 5 \times 5\% + 5 \times (1 + 5\%) \times 5\% \approx 5.51$

[!NOTE]

Here we use the compounding method.

Also consider a company pays zero as dividend (with the same earnings and required return):

(\$)	0	1	2	3
EPS		5	$105 \times 5\% = 5.25$	$110.25 \times 5\% \approx 5.51$
DPS		0	0	0
BPS	100	105	110.25	115.76
Cum-Dividend Earnings		5	5.25	5.51

Note that 2 companies with totally different payout plan have the same cum-dividend earnings, which means **dividend do not affect cum-dividend earnings, and thus do not affect value.**

Normal Earnings

Normal earnings is earnings growing at the required return:

$$\text{Normal Earnings}_t = \text{Cum-Dividend Earnings}_{t-1} \times (1 + \text{Required Return})$$

Consider the example above, the normal earnings and cum-dividend earnings are equal.

If the cum-dividend earnings is calculated using only the simple interest of last year's dividend instead of compound interest of several years, the normal earnings can be simply calculated by

$$\text{Normal Earnings}_t = \text{Earnings}_{t-1} \times (1 + \text{Required Return})$$

We use the method of simple interest by default.

Actually, there is a relation between AEG and these 2 types of earnings:

$$\begin{aligned} \text{AEG}_t &= \text{Cum-Dividend Earnings}_t - \text{Normal Earnings}_t \\ &= \text{Earnings}_{t-1} \times (1 + \text{Cum-Dividend Growth Rate}) - \text{Earnings}_{t-1} \times (1 + \text{Required Return}) \\ &= \text{Earnings}_{t-1} \times (\text{Cum-Dividend Growth Rate} - \text{Required Return}) \end{aligned}$$

where

$$\text{Cum-Dividend Growth Rate}_t = \frac{\text{Cum-Dividend Earnings}_t}{\text{Earnings}_{t-1}} - 1$$

Thus, the example above shows zero AEG, which means the company should have a normal P/E.

Example (Continued): Valuation of IBM

Recall the [example of valuating IBM](#), the information is shown below:

\$	2010	2011	2012	2013	2014	2015
EPS		13.22	14.61	16.22	18	19.98
DPS		3.00	3.30	3.66	4.07	4.51
BPS	18.77	28.99	40.30	52.86	66.79	82.26
RE		11.34	11.71	12.19	12.71	13.30
AEG			0.37	0.48	0.52	0.59

Now we try to calculate the cum-dividend earnings and the normal earnings to check the relation with AEG. We use the simple interest of last year's dividend to calculate: $\text{Cum-Dividend Earnings}_t = \text{Earnings}_t + \text{Dividend}_{t-1} \times \text{Required Return}$ and $\text{Normal Earnings}_t = \text{Earnings}_{t-1} \times (1 + \text{Required Return})$.

\$	2010	2011	2012	2013	2014	2015
EPS		13.22	14.61	16.22	18	19.98
DPS		3.00	3.30	3.66	4.07	4.51
BPS	18.77	28.99	40.30	52.86	66.79	82.26
Cum-Dividend Earnings			14.91	16.55	18.37	20.39
Normal Earnings			14.54	16.07	17.84	19.80
Earnings Difference			0.37	0.48	0.53	0.59

We can see that the earnings difference between cum-dividend earnings and normal earnings is just the AEG.

Price Earnings to Growth (PEG) Ratio

$$\text{PEG} = \frac{\text{Forward P/E}}{\text{Forward Earnings Growth Rate} \times 100}$$

where forward earnings growth rate is 1-year ahead earnings growth rate.

If earnings of a company grows at the required return, then the normal PEG is

$$\text{Normal PEG} = \frac{\frac{1}{\text{Required Return}}}{\text{Required Return} \times 100} = \frac{1}{\text{Required Return}^2 \times 100}$$

Thus, only when the required return is 10%, we have normal PEG 1.

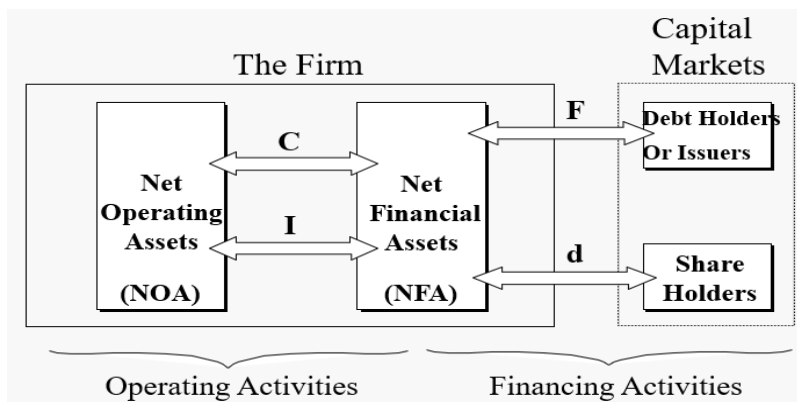
Disadvantages

- The 1-year ahead growth rate does not capture the long-term growth. Use an average 5-year growth rate may be better.
- The earnings growth rate does not consider the reinvestment of dividend and thus should be cum-dividend earnings growth rate.

Chapter 8: Viewing the Business through the Financial Statements

Operating and Financing Assets

Articulation



where

C = Cash Flow from Operations

I = Cash Investment in Operations

F = Net Cash Flow to Debtholders and Issuers

d = Net Cash Flow (Net Payout) to Shareholders

Note that we have

$$C - I = F + d$$

where $C - I$ is actually the FCF, and

F = Net Principal Payments + Net Interest Paid (i)

d = Common Dividends + Share Repurchases – Share Issues

[!TIP]

For FCF, go back to [Chapter 4](#) for a review; for net payout to shareholders, go back to [Chapter 2](#) for a review.

The Treasurer's Rule

- If $C - I - i > d$, which means more money can be used, then we can lend money out or buy down own debt.
- If $C - I - i < d$, which means less money can be used, then we can borrow money or reduce lending.

Example: Actions of Microsoft's CFO

<i>In millions</i>	2nd Quarter 2004	2nd Quarter 2005
Cash flow from operations	\$4,236	\$3,377
-Cash investment in operations	172	177
=Free cash flow (C-I)	\$4,064	\$3,200
-Interest paid (after tax) (i)	338	242
=Cash available for shareholders	4,402	3,442
-Net dividend (d) :		
Cash dividend	\$1,729	\$33,498
Share repurchases	730	969
Share issues	(189)	(795)
=Purchase (sale) of financial assets	\$2,132	(\$30,230)
	Invest in short-term bonds	Sell trading securities

In 2004, the FCF of Microsoft is \$4,064 million and the after-tax interest paid is \$338 million, while net dividend is just \$2,270 million. Using the treasurer's rule, the CFO can invest \$2,132 million in short-term bonds.

In 2005, the FCF of Microsoft is \$3,200 million and the after-tax interest paid is \$242 million, while net dividend is \$33,672 million. Using the treasurer's rule, the CFO may sell \$30,230 million of trading securities.

Reformulated Statements

Statement of Cash Flows

Statement of Cash Flows	
Cash flow from operations:	<u>XX</u>
Cash inflow from operations	
Cash outflow from operations	
Cash flow from investment:	<u>(XX)</u>
Cash inflow from investment	
Cash outflow from investment	
Cash flow from financing:	<u>XX</u>
Cash inflow from financing	
Cash outflow from financing	
Net change of cash	<u>XX</u>
Beginning balance of cash	<u>XX</u>
Ending balance of cash	<u>XX</u>

Typical Statement of Cash Flows



Reformulated Statement of Cash Flows	
Cash flow from operations	<u>C</u>
Cash investment	<u>(I)</u>
Free cash flow	<u>C-I</u>
Equity financing flows:	
Dividends and share repurchases	XX
Share issues	<u>(XX)</u> d
Debt financing flows:	
Net purchases of financial assets	XX
Interest on financial assets	(XX)
Net issue of debt	(XX)
Interest on debt	<u>XX</u> F
Total financing flows	<u>d+F</u>

Reformulated Statement of Cash Flows

Statement of Balance Sheet

Balance Sheet	
<u>Assets</u>	
Operating assets	OA
Financial assets	<u>FA</u>
Total Assets	<u>OA + FA</u>
<u>Liabilities and Equity</u>	
Operating liabilities	OL
Financial obligations	FO
Common stockholders' equity	<u>CSE</u>
Total Claims	<u>OL + FO + CSE</u>

Typical Statement of Balance Sheet



Reformulated Balance Sheet	
<u>Operating Assets</u>	
Operating assets	OA
Operating liabilities	<u>(OL)</u>
Net operating assets	<u>NOA</u>
<u>Financial Obligations & Owners' Equity</u>	
Financial liabilities	FO
Financial assets	<u>(FA)</u>
Net financial obligations	NFO
Common equity	<u>CSE</u>
Total NFO & Equity	<u>NFO + CSE</u>

Reformulated Statement of Balance Sheet

From above we have

$$NOA = NFO + CSE$$

where

$$NOA = \text{Net Operating Assets} = \text{Operating Assets} - \text{Operating Liabilities}$$

$$NFO = \text{Net Financial Obligations} = \text{Financial Liabilities} - \text{Financial Assets}$$

$$CSE = \text{Common Shareholders' Equity}$$

Income Statement

We split revenue and expense to be **operating revenue (OR)**, **financial income (revenue) (FI)**, **operating expense (OE)** and **financial expense (FE)**. Typically, we have

$$(OR + FI) - (OE + FE) = CI$$

where **CI** is comprehensive income.

Income Statement	
Operating revenue	OR
Financial revenue	FI
Total Revenue	(OR+FI)
Operating expense	(OE)
Financial expense	(FE)
Total expense	(OE+FE)
Comprehensive income	CI

Typical Income Statement



Reformulated Income Statement	
Operating revenue	OR
Operating expense	(OE)
Operating income	OI
Financial expense	FE
Financial revenue	(FI)
Net financial expense	(NFE)
Comprehensive income	CI

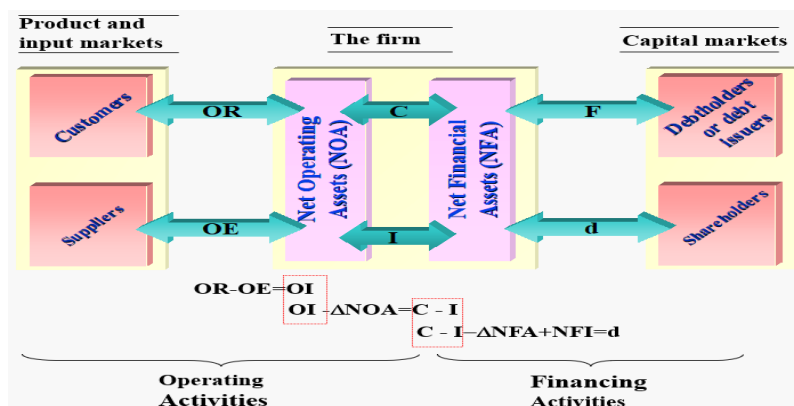
Reformulated Income Statement

From above we can see that the reformulation just change the categorization from **revenue and expense** to **operating and financing**, i.e.

$$\begin{aligned}
 (OR + FI) - (OE + FE) &= CI \\
 (OR - OE) - (FE - FI) &= CI \\
 OI - NFE &= CI
 \end{aligned}$$

where **OI** is operating income and **NFE** is net financial expenses.

Total Articulation



where **NFI** = $-NFE$ is net financial income.

[TIP]

You may be curious about why $OI - \Delta NOA = C - I$. We write it in another way:

$$\text{NOA}_t = \text{NOA}_{t-1} + \text{OI}_t - \text{FCF}_t$$

i.e., we receive operating income and split it into 2 parts - free cash flow (to use) and net operating assets (to hold).

Since $\text{CSE} = \text{NOA} - \text{NFO}$ in reformulated statement of balance sheet, we have

$$\begin{aligned}\text{CSE}_t &= \text{CSE}_{t-1} + \text{CI}_t - d_t \\ \text{NOA}_t - \text{NFO}_t &= \text{NOA}_{t-1} - \text{NFO}_{t-1} + \text{CI}_t - d_t \\ \text{OI}_t - \text{FCF}_t - \text{NFO}_t &= -\text{NFO}_{t-1} + \text{CI}_t - d_t\end{aligned}$$

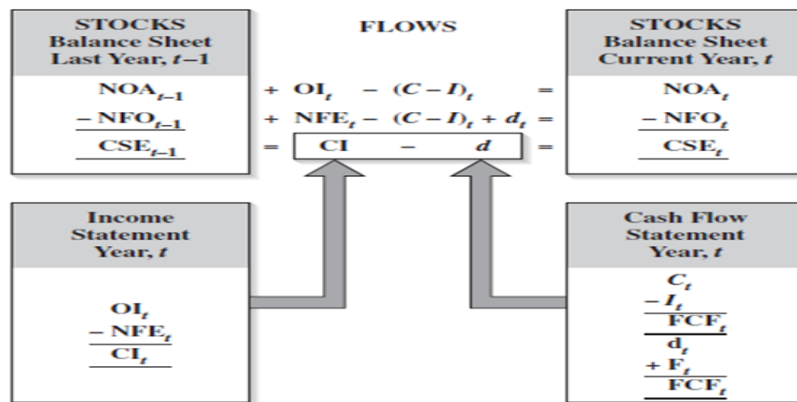
Note that $\text{OI}_t - \text{NFE}_t = \text{CI}_t$ in reformulated income statement, we have

$$\begin{aligned}\text{NFO}_t &= \text{NFO}_{t-1} + \text{NFE}_t - \text{FCF}_t + d_t \\ \text{NFA}_t &= \text{NFA}_{t-1} + \text{NFI}_t + (\text{C}_t - \text{I}_t) - d_t\end{aligned}$$

which means free cash flow is used to pay net financial expenses and dividends, as well as to reduce net financial obligations.

Thus, $\text{C} - \text{I} - \Delta\text{NFA} + \text{NFI} = d$.

Finally, we have



Chapter 9: The Analysis of the Statement of Shareholders' Equity

Reformulated Statement of Common Stockholders' Equity

Opening book value of equity (common, preferred, and noncontrolling equity)
+ Net share transactions with common stockholders
+ Capital contributions (paid in capital from share issues)
- Share repurchases (into treasury stock or against paid-in capital)
+ Net share transactions with preferred shareholders
+ Capital contributions (share issues)
- Share redemptions
+ Change in retained earnings
+ Net income – including noncontrolling interest income
- Common dividends
- Preferred dividends
- Some share repurchases
± Accumulated other comprehensive income
± Earnings restatements due to change in accounting
± Increase in equity from issuing stock options
Closing book value of equity (common, preferred, and noncontrolling equity)

GAAP Statement of Shareholders' Equity



Opening book value of common equity (CSE_{t-1})

- + Net transactions with common shareholders
 - + *Capital contributions (share issues)*
 - *Share repurchases*
 - *Common dividends*
- + Comprehensive income to common shareholders
 - + *Net income – Noncontrolling interest income*
 - + *Other comprehensive income*
 - *Preferred dividends*

Closing book value of common equity (CSE_t)

Reformulated Statement of Common Stockholders' Equity

where CSE is given by

$$CSE = \text{Total Equity} - \text{Preferred Stock} - \text{Noncontrolling Interest} + \text{Dividends Payable}$$

and common dividends is actually **cash dividends** given by

$$\text{Cash Dividends} = \text{Dividends Declared} - \text{Change in Dividends Payable}$$

Other comprehensive income includes

- currency **translation** gains and losses (caused by the change of exchange rate from the day it is realized to the day it is recognized);
- **unrealized** gains and losses on securities (debt and equity);
- **hedging** gains and losses (gains and losses on derivative instruments).

These 3 items are also called **dirty surplus**.

[!TIP]

Other comprehensive income is income that out of control, i.e., it is not about company's management.

Example: Reformulate Statement of Common Stockholder's Equity for Nike

The GAAP statement of shareholders' equity is shown below:

NIKE, INC. GAAP Statement of Shareholders' Equity (in millions, except per share data)								
	Class A		Class B		Capital in Excess of Stated Value	Accumulated Other Comprehensive Income	Retained Earnings	Total
	Shares	Amount	Shares	Amount				
Balance at May 31, 2009	95.3	\$0.1	390.2	\$2.7	\$2,871.4	\$367.5	\$5,451.4	\$8,693.1
Stock options exercised			8.6		379.6			379.6
Conversion to Class B Common Stock	(5.3)		5.3					—
Repurchase of Class B Common Stock			(11.3)		(6.8)		(747.5)	(754.3)
Dividends on Common Stock (\$1.06 per share)							(514.8)	(514.8)
Issuance of shares to employees			1.3		40.0			40.0
Stock-based compensation (Note 11):					159.0			159.0
Forfeiture of shares from employees			(0.1)		(2.6)		(0.3)	(2.9)
Comprehensive income (Note 14):							1,906.7	1,906.7
Net income								
Other comprehensive income:								
Foreign currency translation and other (net of tax benefit of \$71.8)						(159.2)		(159.2)
Net gain on cash flow hedges (net of tax expense of \$27.8)						87.1		87.1
Net gain on net investment hedges (net of tax expense of \$21.2)						44.8		44.8
Reclassification to net income of previously deferred net gains related to hedge derivatives (net of tax expense of \$31.7)						(121.6)		(121.6)
Reclassification of ineffective hedge gains to net income (net of tax expense of \$1.4)						(3.8)		(3.8)
Total Comprehensive income						(152.7)	1,906.7	1,754.0
Balance at May 31, 2010	90.0	\$0.1	394.0	\$2.7	\$3,440.6	\$214.8	\$6,095.5	\$9,753.7

The dividends payable at the beginning is \$121.4 and at the end is \$130.7.

First, CSE at the beginning is $\$8,693.1 + \$121.4 = \$8814.5$ and at the end is $\$9,753.7 + \$130.7 = \$9884.4$.

Then, we should identify share issues. Note that **stock options exercised is seen as a type of share issues** and **shares forfeited from employees would be treasury stock**. Thus, we have

$$\begin{aligned}\text{Share Issues} &= \text{Stock Options Exercised} + \text{Issuance of Shares to Employees} \\ &\quad - \text{Forfeiture of Shares from Employees} \\ &= \$416.7\end{aligned}$$

And cash dividends is given by

$$\begin{aligned}\text{Cash Dividends} &= \text{Dividends Declared} - \text{Change in Dividends Payable} \\ &= \$514.8 - (\$130.7 - \$121.4) \\ &= \$505.5\end{aligned}$$

Also, we can calculate that net hedging gains or losses is $\$87.1 + \$44.8 - \$121.6 - \$3.8 = \$6.5$.

Note that the item **Stock-based compensation is also a part of comprehensive income.**

Finally, we have

Reformulated Statement of Common Equity		
Balance at May 31, 2009		\$8,814.5
Transactions with shareholders		
Stock issued for stock options	379.6	
Stock issued to employees (net)	37.1	
Stock repurchased	(754.3)	
Cash dividends	(505.5)	(843.1)
Comprehensive Income		
Net income reported	1,906.7	
Net translation gain (loss)	(159.2)	
Net hedging gains (loss)	6.5	1,754.0
Stock-based compensation		159.0
Balance at May 31, 2010		<u>\$9,884.4</u>

Hidden Losses in Options

Shareholders lose when shares are issued at a price less than the market price, e.g., when options are exercised. This loss is not recorded as expense under GAAP and IFRS.

There are 2 cases for this loss:

- If the loss comes from the exercise of options that are a part of a **compensation package**, then the loss is an **employee compensation expense**;
- if the loss comes from conversion of a bond, preferred stock or warrants, then the loss is a **financing expense**.

Example: Options for Employee

A company grants 100 shares options to 10 members of its executive management team on Jan 1, 2015. Each executive manager has the right to buy 10 shares of the company's stock at \$13 if he serves the company for 3 years. Each option has a fair value \$15 at the date of grant.

Assume the company records its financial statements every half a year. On June 30, 2015, i.e., after half a year, the company expects that all 100 shares options will vest in the future. Therefore it records

$$\frac{100 \times \$15}{6} = \$250$$

as its option expense at **debit side** and as its paid in capital at **credit side** since the 3-year period is divided to 6 half-a-year periods.

[!TIP]

For assets, debit side is + and credit side is -; for liabilities and equity, debit side is - and credit side is +. If there is a change in debit side, then there must be a change in credit side.

One member of the executive management team leaves during the second half of 2016, therefore forfeiting 10 options. Thus, on Dec 31, 2016, it should change the number to record. Suppose there was only 9 members at the beginning, then the company should record

$$\frac{90 \times \$15}{6} = \$225$$

every reporting period. However, the company has recorded $\$250 \times 3 = \750 . Thus, the number recorded on Dec 31, 2016 should be

$$\$225 \times 4 - \$750 = \$150$$

and it will record \$225 in the following periods.

The remaining 9 members exercise the options on Dec 31, 2017, when the company's stock price is \$18. The company first records \$225 at both debit and credit side. Then, it will record $90 \times \$13 = \1170 as cash received and $90 \times \$225 = \1350 as paid in capital at debit side, and record 90 common stock with par value \$1 and the remaining $\$1170 + \$1350 - \$90 = \2430 as paid in capital in excess of par value at credit side.

However, this recording method omits the actual loss $(\$18 - \$13) \times 90 = \$450$. We can use 2 different methods to do the adjustment.

According to IRS, this loss (from **non-qualified options**) can be used for tax deduction. Suppose the tax rate is 36.3%, then this tax benefit implies $\frac{\$450}{36.3\%} = \1239.67 of expense, which means the after-tax expense is $\$1239.67 - \$450 = \$789.67$.

The other method is used when tax benefit is not reported or when the loss is from **incentive options** (IRS does not allow tax deduction). We first calculate the average stock price $\frac{\$15 + \$18}{2} = \$16.5$. Then, the after-tax expense is given by $(\$16.5 - \$13) \times 90 \times (1 - 36.3\%) = 200.66$.

[TIP]

Stock-based compensation includes non-qualified options and incentive (qualified) options. Incentive options have favorable tax treatment for employees, and thus have many restrictions for a company to grant (e.g., only available to employees, maximal issuance, etc.). The cost of non-qualified options can be deducted as an operating expense while that of incentive options cannot.

Example: Reformulate Statement of Common Stockholder's Equity for Nike (Continued)

Using the first method, the tax benefit and its implication are shown below.

Stock option expense $\$58.5/0.363$	\$161.10
Tax benefit at 36.3%	(58.5)
Stock option expense, after tax	<u>\$102.60</u>

Using the second method, we have

Estimate market value of shares issued: 8.6 mill x \$64	\$550.40
Exercise (issue) price , from equity statement	<u>321.1*</u>
Stock option expense, before tax	229.3
Tax benefit at 36.3%	83.2
Stock option expense, after tax	\$146.10

This after-tax expense is also called **option overhang** or **contingent liability**, which **should be deducted in comprehensive income and added in shares issues:**

Balance at May 31, 2009			\$8,814.5
Transactions with shareholders			
Stock issues for stock options	(321.1 + 161.1)	482.2	=379.6+102.6
Stock issued to employees (net)		37.1	
Stock repurchased		(754.3)	
Cash dividends		(505.5)	(740.50)
Comprehensive income			
Net income reported		1,906.7	
Net translation gains and losses		(159.2)	
Net hedging gains and losses		6.5	
Loss on the exercise of stock options (after-tax)	-102.6		
less stock compensation recorded	159.0	56.4	1,810.4
Balance at May 31, 2010			\$9,884.4

where stock issues for stock options can be calculated by **sum of capital in excess of stated value and after-tax expense** (the right side) or by **sum of proceeds from exercise and before-tax expense** (the left side).

Ratio Analysis from Reformulated Common Equity Statement

Payout and Retention Ratios

$$\text{Dividend Payout Ratio} = \frac{\text{Dividends}}{\text{Comprehensive Income}}$$

$$\text{Total Payout Ratio} = \frac{\text{Dividends} + \text{Stock Repurchases}}{\text{Comprehensive Income}}$$

$$\text{Retention Ratio} = \frac{\text{Comprehensive Income} - \text{Dividends}}{\text{Comprehensive Income}} = 1 - \text{Dividend Payout Ratio}$$

$$\text{Dividends-to-Book Value} = \frac{\text{Dividends}}{\text{Book Value of CSE} + \text{Dividends} + \text{Stock Repurchases}}$$

$$\text{Total Payout-to-Book Value} = \frac{\text{Dividends} + \text{Stock Repurchases}}{\text{Book Value of CSE} + \text{Dividends} + \text{Stock Repurchases}}$$

Shareholder Profitability Ratio

$$\text{ROCE}_t = \frac{\text{Comprehensive Earnings}_t}{1/2(\text{CSE}_t + \text{CSE}_{t-1})}$$

Growth Ratios

$$\text{Net Investment Rate} = \frac{\text{Transactions with Shareholders}}{\text{Beginning CSE}}$$

$$\text{Growth Rate of CSE} = \frac{\text{Change in CSE}}{\text{Beginning CSE}} = \frac{\text{Net Transactions with Shareholders} + \text{Comprehensive Income}}{\text{Beginning CSE}}$$

Chapter 10: The Analysis of the Balance Sheet and Income Statement

Reformulating the Balance Sheet

Financial and Operating Items in the Balance Sheet

Financial assets are usually **interest bearing** assets, including

- cash equivalents
- short-term investments
- short-term notes receivable
- long-term non-marketable debt investments

- long-term marketable debt securities

Similarly, **financial liabilities** are usually interest bearing liabilities, including

- short-term borrowing
- short-term notes payable
- current maturities of long-term debt
- long-term borrowing (bank loans, bonds payable, notes payable)
- lease obligation
- preferred stock

Other items are operating assets or liabilities.

[!NOTE]

Cash is hard to classify since there is **working cash** that is **operating** asset and the remaining is **excess cash** that is **financial** asset.

Short-term notes receivable can have operating purpose. However, we usually classify it into financial assets. Similarly for short-term notes payable in financial liabilities.

Lease assets are **operating** assets that are included in PPE while lease liabilities are **financial** obligation.

Example: Reformulated Balance Sheet for Nike

NIKE, INC. Consolidated Balance Sheets (in millions)			
	2010	May 31 2009 (in millions)	2008
Assets			
Current assets:			
Cash and equivalents	\$ 3,079.1	\$ 2,291.1	\$ 2,133.9
Short-term investments (Note 6)	2,066.8	1,164.0	642.2
Accounts receivable, net (Note 1)	2,649.8	2,883.9	2,795.3
Inventories (Notes 1 and 2)	2,040.8	2,357.0	2,438.4
Deferred income taxes (Note 9)	248.8	272.4	227.2
Prepaid expenses and other current assets	873.9	765.6	602.3
Total current assets	10,859.2	9,734.0	8,839.3
Property, plant, and equipment, net (Note 3)	1,931.9	1,957.7	1,891.1
Identifiable intangible assets, net (Note 4)	467.0	467.4	743.1
Goodwill (Note 4)	187.6	193.5	448.8
Deferred income taxes and other assets (Notes 9 and 18)	873.6	897.0	520.8
Total assets	\$14,419.3	\$13,249.6	\$12,442.7
Liabilities and Shareholders' Equity			
Current liabilities:			
Current portion of long-term debt (Note 8)	\$ 7.4	\$ 32.0	\$ 6.3
Notes payable (Note 7)	138.6	342.9	177.7
Accounts payable (Note 7)	1,254.5	1,031.9	1,287.6
Accrued liabilities (Notes 5 and 18)	1,904.4	1,783.9	1,761.9
Income taxes payable (Note 9)	59.3	86.3	88.0
Total current liabilities	3,364.2	3,277.0	3,321.5
Long-term debt (Note 8)	445.8	437.2	441.1
Deferred income taxes and other liabilities (Notes 9 and 18)	855.3	842.0	854.5
Commitments and contingencies (Note 15)	0.3	0.3	0.3
Shareholders' equity:			
Common stock at stated value (Note 11):			
Class A convertible—90.0 and 95.3 shares outstanding	0.1	0.1	0.1
Class B—394.0 and 390.2 shares outstanding	2.7	2.7	2.7
Capital in excess of stated value	3,440.6	2,871.4	2,497.8
Accumulated other comprehensive income (Note 14)	2,144.8	367.5	251.4
Retained earnings	6,095.5	5,451.4	5,073.3
Total shareholders' equity	9,753.7	8,693.1	7,825.3
Total liabilities and shareholders' equity	\$14,419.3	\$13,249.6	\$12,442.7

GAAP Balance Sheet

Reformulated Balance Sheets (in millions)			
	2010	2009	2008
Net operating assets			
Operating assets			
Working cash ¹	\$ 95.1	\$ 95.9	\$ 93.1 (4)
Accounts receivable, less allowance for doubtful accounts	2,649.8	2,883.9	2,795.3
Inventories	2,040.8	2,357.0	2,438.4
Prepaid expenses and other current assets	873.9	765.6	602.3
Property, plant, and equipment, net	1,931.9	1,957.7	1,891.1
Goodwill	187.6	193.5	448.8
Identifiable intangible assets	467.0	467.4	743.1
Deferred income taxes and other assets	1,122.4	1,169.4	747.6
Total operating assets	9,368.5	9,890.4	9,759.7
Operating liabilities			
Accounts payable—non-interest bearing ²	\$ 1,166.3	\$ 953.4	\$ 1,221.7 (7)
Accrued liabilities ³	1,773.7	1,662.5	1,790.0 (6)
Income taxes payable	59.3	86.3	88.0
Deferred income taxes and other liabilities	855.3	842.0	854.5
Total operating liabilities	3,854.6	3,544.2	3,954.2
Net operating assets	\$ 5,513.9	\$ 6,346.2	\$ 5,805.5 (2)
Net financial assets			
Financial assets			
Cash equivalents ¹	2,984.0	2,195.2	2,040.8 (4)
Short-term investments	2,066.8	1,164.0	642.2
Total financial assets	5,050.8	3,359.2	2,683.0
Financial liabilities			
Current portion of long-term debt	7.4	32.0	6.3
Notes payable ⁴	138.6	342.9	177.7
Accounts payable—interest bearing ²	88.2	78.5	65.9 (7)
Long-term debt	445.8	437.2	441.1
Redeemable preferred stock	0.3	0.3	0.3 (5)
Total financial liabilities	680.3	890.9	691.3 (3)
Common shareholders' equity³	\$ 9,884.4	\$ 8,814.5	\$ 7,797.3 (1) (6)

¹Cash and cash equivalents are split between operating cash and cash investments. Operating cash is estimated at 1/2 percent of sales.

²Interest-bearing accounts payable are classified as financing obligations.

³Accrued liabilities include dividends payable that have been included in shareholders' equity.

⁴Notes payable are interest bearing.

Reformulated Balance Sheet

where working cash is split from cash and cash equivalents and is estimated at 0.5% of sales.

[!NOTE]

Remember that in [Chapter 9](#), we add back dividends payable to CSE. So we need to exclude it in accrual liabilities (check the difference between GAAP and reformulated balance sheet).

Balance Sheet Leverage Ratios

Financial Leverage Ratios

$$\text{Capitalization Ratio} = \frac{\text{NOA}}{\text{CSE}}$$

$$\text{Financial Leverage Ratio (FLEV)} = \frac{\text{NFO}}{\text{CSE}}$$

Since $\text{NOA} - \text{NFO} = \text{CSE}$, we have

$$\text{Capitalization Ratio} - \text{FLEV} = 1$$

Operating Liability Leverage Ratio

$$\text{Operating Liability Leverage Ratio (OLLEV)} = \frac{\text{OL}}{\text{NOA}}$$

Reformulating the Income Statement

Remember in [Chapter 8](#) we have separated the income statement into OL and NFE. But there is an item that needs further consideration - **income taxes**.

```

Net sales (sales minus sales allowances)
+ Other revenue (royalties, rentals, license fees)
- Cost of sales
= Gross margin
- Marketing and advertising expenses
- General expenses
- Administrative expenses
- ± Special items and nonrecurring items
  o Restructuring charges
  o Merger expenses
  o Gains and losses on asset sales
  o Asset impairments
  o Litigation settlements
  o Environmental remediation
- Research and development expense

+ Interest revenue
- Interest (expense)
± Realized gains and losses on financial assets
± Unrealized gains and losses on trading securities
+ Share of income of subsidiary
- Income taxes
= Income before extraordinary items and discontinued operations
± Discontinued operations
± Extraordinary items
  • Abnormal gains and losses

= Net income or loss
+ Noncontrolling interest
= Net income to shareholders

```

Typical Income Statement

```

Reformulated Comprehensive Income Statement
Net sales
- Expenses to generate sales
Operating income from sales (before tax)
- Tax on operating income from sales
+ Tax as reported
+ Tax benefit from net financial expenses
- Tax allocated to other operating income
Operating income from sales (after tax)
± Other operating income (expense) requiring tax allocation
  Restructuring charges and asset impairments
  Merger expenses
  Gains and losses on asset sales
  Gains and losses on security transactions
- Tax on other operating income
± After-tax operating items
  Equity share in subsidiary income
  Operating items in extraordinary income
  Dirty-surplus operating items in Table 8.1
  Hidden-dirty surplus operating items
Operating income (after tax)
- Net financial expenses after tax
+ Interest expense
- Interest revenue
± Realized gains and losses on financial assets
= Net taxable financial expense before tax
+ Tax benefit from net financial expenses
= Net taxable financial expense after tax
± Gains and losses on debt retirement
± Dirty surplus financial items in Table 8.1
± Hidden dirty surplus financial items
+ Preferred dividends
± Gains and losses on redemption of preferred stock
+ Tax benefit from preferred dividends (if any)
- Noncontrolling Interest
= Comprehensive Income to Common

```

Reformulated Income Statement

Since net interest expense can be used for tax deduction and we would have more income taxes if we do not have net interest expense, we should move the tax benefit to income taxes.

Example: Tax Allocation

A company has the following income statement with tax rate 35%.

GAAP Income Statement	
Revenue	\$4,000
Operating expenses	(3400)
Interest expense	(100)
Income before tax	500
Income tax expense	(150)
Net income	<u>\$350</u>

The operating income should be calculated as follow:

Top-down Tax Allocation	
Revenue	\$4,000
Operating expenses	<u>(3400)</u>
Operating income before tax	600
Tax expense:	
Tax reported	\$150
Tax benefit for interest (\$100 x 0.35)	<u>35</u> (185)
Operating income after tax	<u>\$415</u>

The NFE would also exclude the tax benefit from interest expense.

Residual Operating Income (ReOI)

$$\text{ReOI}_t = \text{OI}_t - \text{NOA}_{t-1} \times \text{Required Return}$$

show how operations add value to the book value of operations (similar idea to RE).

Income Statement Ratios

Profit Margin Ratios

$$\text{Operating Profit Margin} = \frac{\text{OI (after tax)}}{\text{Sales}}$$

$$\text{Sales Profit Margin} = \frac{\text{OI (after tax) from Sales}}{\text{Sales}}$$

$$\text{Other Items Profit Margin} = \frac{\text{OI (after tax) from Other Items}}{\text{Sales}}$$

$$\text{Net Profit Margin} = \frac{\text{CI}}{\text{Sales}}$$

Expense Ratios

$$\text{Expense Ratio} = \frac{\text{Expense for an Activity}}{\text{Sales}}$$

$$1 - \text{Sales Profit Margin} = \text{Sum of Expense Ratios}$$

Operating Profitability: Return on NOA (RNOA)

$$RNOA_t = \frac{OI_t}{1/2(NOAt_{-1} + NOA_t)}$$

Financing Profitability: Net Borrowing Cost (NBC) or Return on NFA (RNFA)

$$NBC_t = \frac{NFE_t}{1/2(NFO_{t-1} + NFO_t)}$$

or

$$RNFA_t = \frac{NFI_t}{1/2(NFA_{t-1} + NFA_t)}$$

Common-Size Analysis

Common-size analysis is simply a **standardization** of line items to **eliminate the effect of size**. Line items are expressed per dollar of an attribute that reflects the scale of operations. We can compare

- each item
- total revenues

in the income statement and

- operating items
- financing items
- total

in the balance sheet using the ratios above.

Common-size analysis can be cross-sectional or time-series.

Trend Analysis

Trend analysis is a kind of time-series analysis. We set a base for a specific year and see how the following years go, e.g.,

Income Statement						
	2010	2009	2008	2007	2006	Base in 2005 (\$ in millions)
Sales	138.4	139.6	135.6	118.8	108.8	13,740
Cost of sales	134.0	138.7	134.3	120.2	109.8	7,625
Gross margin	143.9	140.7	137.2	117.1	107.7	6,115
Operating expenses	147.7	142.6	138.8	118.3	105.5	4,250
Operating income from sales (before tax)	135.3	136.4	126.8	114.4	112.9	1,865
Operating income from sales (after tax)	157.3	153.1	147.8	119.3	112.9	1,215
Operating income	139.0	131.4	147.3	118.8	104.7	1,264
Comprehensive income to common	139.0	132.2	151.5	122.4	106.7	1,261
Balance Sheet						
Operating assets	132.9	140.3	138.5	112.4	108.5	7,049
Operating liabilities	171.0	156.9	168.2	131.6	120.2	2,267
Net operating assets	114.8	132.4	124.4	103.3	102.9	4,782
Net financial assets	467.8	264.2	212.1	232.1	154.3	939
Common shareholders' equity	172.8	154.1	138.8	124.4	111.3	5,721

where we set the base in 2005 to be 100 for each item.

Chapter 11: The Analysis of the Cash Flow Statement

The Calculation of Free Cash Flow

In [Chapter 8](#) we have introduced 2 methods to calculate FCF:

$$FCF = C - I = F + d$$

where

C = Cash Flow from Operations

I = Cash Investment in Operations

F = Net Cash Flow to Debtholders and Issuers

d = Net Cash Flow (Net Payout) to Shareholders

By reformulating the balance sheet, we have

$$C - I = \Delta \text{NOA}$$

and

$$F + d = \text{NFE} - \Delta \text{NFO} + d = \Delta \text{NFA} - \text{NFI} + d$$

In this Chapter, we would introduce a new method to calculate FCF by reformulating the cash flow statement.

Reformulating the Cash Flow Statement

In the standard cash flow statement, there are 2 methods to derive OCF:

- Indirect method
- Direct method

Indirect Method

Remember in [Chapter 4](#) we have shown that

$$\text{NI} = \text{OCF} + \text{Accruals}$$

Indirect method is to put $-\text{Accruals}$ on the statement and thus we have

$$\text{OCF} = \text{NI} + (-\text{Accruals})$$

NIKE, INC. GAAP Statements of Cash Flows (in millions)			
	Year Ended May 31		
	2010	2009	2008
Cash provided by operations:			
Net income	\$ 1,906.7	\$ 1,486.7	\$ 1,883.4
Income charges (credits) not affecting cash:			
Depreciation	323.7	335.0	303.6
Deferred income taxes	8.3	(294.1)	(300.6)
Stock-based compensation (Note 11)	159.0	170.6	141.0
Impairment of goodwill, intangibles and other assets (Note 4)	—	401.3	—
Gain on divestitures (Note 17)	—	—	(60.6)
Amortization and other	71.8	48.3	17.9
Changes in certain working capital components and other assets and liabilities excluding the impact of acquisition and divestitures:			
Decrease (increase) in accounts receivable	181.7	(238.0)	(118.3)
Decrease (increase) in inventories	284.6	32.2	(249.8)
(Increase) decrease in prepaid expenses and other current assets	(69.6)	14.1	(11.2)
Increase (decrease) in accounts payable, accrued liabilities and income taxes payable	298.0	(220.0)	330.9
Cash provided by operations	3,164.2	1,736.1	1,936.3 (3)(4)

Direct Method

Direct method is to directly put operating activities on the statement, e.g.,

\$ in millions	Year ended December 31		
	2007	2006	2005
Operating Activities			
Sources of Cash—Continuing Operations			
Cash received from customers			
Progress payments	\$ 7,490	\$ 6,797	\$ 6,644
Other collections	24,570	23,303	23,622
Insurance proceeds received	125	100	89
Income tax refunds received	52	60	88
Interest received	21	45	78
Other cash receipts	34	42	51
Total sources of cash—continuing operations	32,292	30,347	30,572
Uses of Cash—Continuing Operations			
Cash paid to suppliers and employees	(28,024)	(27,389)	(27,028)
Interest paid	(355)	(366)	(404)
Income taxes paid	(905)	(678)	(419)
Excess tax benefits from stock-based compensation	(52)	(27)	
Payments for litigation settlements	(33)	(11)	(99)
Other cash payments	(19)	(12)	(31)
Total uses of cash—continuing operations	(29,388)	(28,513)	(27,981)
Cash provided by continuing operations	2,904	1,834	2,591
Cash (used in) provided by discontinued operations	(14)	(78)	36
Net cash provided by operating activities	2,890	1,756	2,627

where **interest payments and receipts** are improperly included in the operating activities (**should be in the financial section**). **Tax cash flows** are also all included in the operating activities (**should be allocated to operating and financing**).

Similarly, direct method directly put investing activities on the statement, e.g.,

Cash used by investing activities:			
Purchases of short-term investments	(3,724.4)	(2,908.7)	(1,865.6)
Maturities and sales of short-term investments	2,787.6	2,390.0	2,246.0
Additions to property, plant and equipment	(335.1)	(455.7)	(449.2)
Disposals of property, plant and equipment	10.1	32.0	1.9
Increase in other assets, net of other liabilities	(11.2)	(47.0)	(21.8)
Settlement of net investment hedges	5.5	191.3	(76.0)
Acquisition of subsidiary, net of cash acquired (Note 4)	—	—	(571.1)
Proceeds from divestitures (Note 17)	—	—	246.0
Cash used by investing activities	(1,267.5)	(798.1)	(489.8)

where **transactions in financial assets** are improperly included in the investing activities (should be in the financial section).

Remember in **Chapter 10** we have learned how to split working cash from cash and cash equivalents. So we should split *change in operating cash* from *change in cash and cash equivalents*, too.

		<i>used for investment in operating assets, should be classified in investment section</i>	
Increase in operating cash		\$ -0.8	
Increase in financial assets		788.8	
Change in cash and cash equivalents		\$ 788.0 million	

Also, there are some non-cash transactions that should be adjusted:

- Acquisitions with shares
- Asset exchanges
- Assets acquired with debt
- Capitalized leases
- Installment purchases
- Debt converted to equity

To sum up, we can adjust the following items to get **FCF** or financing cash flow (F):

GAAP Free Cash Flow		GAAP Financing Flow	
- Increase in operating cash	1	+ Increase in cash equivalents	
+Purchase of financial assets	2	+ Purchase of financial assets	
- Sale of financial assets	2	- Sales of financial assets	
+ Net cash interest outflow (after tax)	3,4	+ Net cash interest outflow (after tax)	
- Noncash investments	5	- Noncash financing	
= <u>Free Cash Flow</u>		= <u>Financing Cash Flow</u>	

Adjustments Summary

After reformulating, we have

Cash flow from Operations	C
- Cash investments	-I
<hr/>	
= Free Cash Flow from Operating Activities	=FCF
<hr/>	
Cash Paid to Shareholders	d
+ Cash Paid to Debtholders and Issuers	+F
<hr/>	
=Cash Paid for Financing Activities	=Cash paid for Financing

Reformulated Cash Flow Statement

However, the FCF we get using the reformulating method may not reconcile to the 2 methods we have learned.

Reasons for Different FCF

- *Other assets* and *Other liabilities* are not identified as either operating or financing;
- *Cash dividends* in the cash flow statement differ from dividends in the equity statement;
- *Cash from share issues* in the cash flow statement may differ from share issues in the equity statement;
- Details for adjustments are not available;
- GAAP's treatment of employee stock options (see [Chapter 9](#));
- Cash flow numbers of *foreign subsidiaries* are translated at average exchange rates whereas balance sheet numbers are translated at end-of-year exchange rates.

Chapter 12: The Analysis of Profitability

Two Drivers of Residual Earnings

Recall that in [Chapter 5](#) we have

$$RE_t = (ROCE_t - \text{Required Return}) CSE_{t-1}$$

which means 2 drivers of RE are

- ROCE
- Growth (CSE)

In this chapter we will discuss the drivers of ROCE.

What Drives ROCE

$$\text{ROCE} = \frac{\text{CI}}{\text{CSE}} = \frac{\text{OI} - \text{NFE}}{\text{CSE}} = \frac{\text{OI}}{\text{NOA}} \times \frac{\text{NOA}}{\text{CSE}} - \frac{\text{NFE}}{\text{NFO}} \times \frac{\text{NFO}}{\text{CSE}} = \text{RNOA} \times \text{Capitalization Ratio} - \text{NBC} \times \text{FLEV}$$

which means ROCE is a weighted average between RNOA and NBC.

We continue to decompose it:

$$\begin{aligned}\text{ROCE} &= \text{RNOA} \times (1 + \text{FLEV}) - \text{NBC} \times \text{FLEV} \\ &= \text{RNOA} + \text{FLEV} \times (\text{RNOA} - \text{NBC}) \\ &= \text{RNOA} + \text{FLEV} \times \text{Operating Spread}\end{aligned}$$

which means ROCE would be greater than RNOA only when the company has positive NFO and operating spread.

Futhermore, we can decompose RNOA to have

$$\begin{aligned}\text{ROCE} &= \frac{\text{OI}}{\text{Sales}} \times \frac{\text{Sales}}{\text{NOA}} + \text{FLEV} \times \text{Operating Spread} \\ &= \text{PM} \times \text{ATO} + \text{FLEV} \times \text{Operating Spread}\end{aligned}$$

where PM is profit margin and ATO is asset turnover ratio.

Usually, PM and ATO have negative correlation, e.g., real estate companies have high PM and low ATO while supermarkets have low PM and high ATO.

Power of Leverage

Financial Leverage (FLEV)

Suppose a company has positive operating spread.

Since we have

$$\text{ROCE} = \text{RNOA} + \text{FLEV} \times \text{Operating Spread}$$

higher FLEV leads to higher ROCE.

If the company has negative NFO, i.e., it has positive NFA, it can pay dividends to shareholders to increase its negative FLEV and to increase its ROCE.

Operating Liability Leverage (OLLEV)

Note that we have

$$\text{RNOA} = \frac{\text{OI}}{\text{NOA}}$$

and we can decompose it like ROCE:

$$\begin{aligned}\text{ROCE} &\Rightarrow \text{RNOA} \\ \text{CI} &\Rightarrow \text{OI} \\ \text{CSE} &\Rightarrow \text{NOA} \\ \text{NOA} &\Rightarrow \text{OA} \\ \text{NFO} &\Rightarrow \text{OL}\end{aligned}$$

The operating profitability without operating liabilities would be

$$\text{Return on Operating Assets (ROOA)} = \frac{\text{OI} + \text{Implicit Interest (After Tax)}}{\text{OA}}$$

where

$$\text{Implicit Interest (After Tax)} = \text{Short-Term Borrowing Rate (After Tax)} \times \text{OL}$$

Through the similar decomposition we have

$$RNOA = ROOA + OLLEV \times OL \text{ Spread}$$

where

$$OLLEV = \frac{OL}{NOA}$$

$$OL \text{ Spread} = ROOA - \text{Short-Term Borrowing Rate (After Tax)}$$

Suppose a company has positive OL spread, higher OLLEV leads to higher RNOA.

Leverage Effects on ROCE

We can write ROCE as

$$\begin{aligned} ROCE &= ROOA + (RNOA - ROOA) + (ROCE - RNOA) \\ &= \text{Return with No Leverage} + \text{Effect of OL} + \text{Effect of FLEV} \end{aligned}$$

Example: Relationship between Rates of Return and Leverage

Suppose a firm has a return on common equity of 13.4 percent, a net after-tax borrowing cost of 4.5 percent, and a return of 11.2 percent on net operating assets of \$405 million.

We can calculate its financial leverage as follows:

$$\begin{aligned} ROCE &= RNOA + FLEV \times (RNOA - NBC) \\ 13.4\% &= 11.2\% + FLEV \times (11.2\% - 4.5\%) \implies FLEV = 0.3284 \end{aligned}$$

Also, suppose the firm has a short-term borrowing rate of 4.0 percent after tax and a return on operating assets of 8.5 percent.

We can calculate its operating liability leverage as follows:

$$\begin{aligned} RNOA &= ROOA + OLLEV \times (ROOA - \text{Short-Term Borrowing Rate (After Tax)}) \\ 11.2\% &= 8.5\% + OLLEV \times (8.5\% - 4.0\%) \\ \implies OLLEV &= 0.6 \end{aligned}$$

Now the firm reports its total assets is \$715 million.

We can calculate items in reformulated balance sheet as follows (amounts in million):

$$\begin{aligned} FLEV &= \frac{NFO}{CSE} \\ 0.3284 &= \frac{NFO}{\$405 - NFO} \implies NFO \approx \$100 \end{aligned}$$

$$\begin{aligned} OLLEV &= \frac{OL}{NOA} \\ 0.6 &= \frac{OL}{\$405} \implies OL = \$243 \end{aligned}$$

$$CSE = NOA - NFO = \$405 - \$100 = \$305$$

$$OA = NOA + OL = \$405 + \$243 = \$648$$

$$FA = \text{Total Assets} - OA = \$715 - \$648 = \$67$$

$$FO = NFO + FA = \$100 + \$67 = \$167$$

Comparison to Traditional Ratio

RNOA VS. ROA

$$RNOA = \frac{OI}{NOA}$$

$$ROA = \frac{NI}{\text{Total Assets}}$$

- RNOA focuses on operation while ROA mixes both operation and financing;
- ROA uses net income instead of comprehensive income as numerator.

FLEV VS. Debt-to-Equity Ratio

$$FLEV = \frac{NFO}{CSE} = \frac{FO - FA}{CSE}$$

$$\text{Debt-to-Equity Ratio} = \frac{\text{Total Debt}}{\text{Equity}} = \frac{OL + FO}{CSE}$$

FLEV focuses on financing while debt-to-equity ratio mixes both operation and financing.

Further Breakdown

Profit Margin

We can write PM as

$$PM = \text{Sales PM} + \text{Other OI PM}$$

Sales PM is sustainable while some items in other operating income PM are unsustainable.

Asset Turnover Ratio

We can invert ATO to be

$$\frac{1}{ATO} = \frac{NOA}{\text{Sales}}$$

and we can break down NOA to do further analysis.

Net Borrowing Cost

We can write NBC as

$$\begin{aligned} NBC &= \frac{NFE}{NFO} = \frac{FE - FI}{NFO} = \frac{\text{After-Tax Interest on FO} - \text{After-Tax Interest on FA} + \dots}{NFO} \\ &\approx \frac{\text{After-Tax Interest on FO}}{NFO} - \frac{\text{After-Tax Interest on FA}}{NFO} \\ &= \frac{FO}{NFO} \times \frac{\text{After-Tax Interest on FO}}{FO} - \frac{FA}{NFO} \times \frac{\text{After-Tax Interest on FA}}{FA} \\ &= \frac{FO}{NFO} \times \text{After-Tax Borrowing Cost} - \frac{FA}{NFO} \times \text{After-Tax Return of FA} \end{aligned}$$

which is a weighted average between after-tax borrowing cost and after-tax return of financial assets.

Chapter 13: The Analysis of Growth and Sustainable

Value-Added Growth

Book growth and earnings growth are both growth, but they do not create value.

The value-added growth is AEG that we have introduced in chapter 6, which is also called RE growth.

Sustainable Earnings

Sustainable earnings are earnings that can be repeated in the future and which can grow. Also called **core earnings** or **persistent earnings**.

Unsustainable earnings are also called **unusual earnings** or **transitory earnings**.

Thus, OI can be written as

$$\begin{aligned} \text{OI} &= \text{Core OI} + \text{Unusual Items} \\ &= (\text{Core OI from Sales} + \text{Core Other OI}) + \text{Unusual Items} \end{aligned}$$

Accounting Quality Watch

Deferred Revenue

Firms can defer too much earnings to the future and thus create too much earnings growth. Conversely, firms can defer too little earnings and so report unsustainable earnings currently.

Restructuring Charges

Firms can make excessive restructuring charges in one year and bleed them back to earnings in future years, giving the appearance of growth.

Selling, General and Administrative Expense (SG&A)

SG&A expense is a large, aggregated number that covers a multiple of sins. We should penetrate its composition.

Gains and Losses on Asset Sales

These are often hidden in SG&A expense, but are not a part of the core business.

R&D and Advertising

Firms can increase earnings by temporarily reducing R&D and advertising expenditures. This not only inflates current earnings but damages future earnings that the expenditures would otherwise produce.

Pension Accounting

Pension accounting brings prices into the income statement with the danger that earnings can reflect price bubbles. Returns on pension plan assets are commingled with core operating income from the business, contaminating profit margins. Expected returns on plan assets can be overestimated.

Cherry Picking

Firms can cherry pick realized gains on investments into the income statement and report unrealized losses in the equity statement. Restate the income statement of a comprehensive income basis.

Changes in Estimates

Firms can affect earnings by changes in estimates (of bad debts, warranty liabilities, and accrued expenses).

Analysis of Changes in ROCE

Note that we can write

$$\begin{aligned} \text{RNOA} &= \frac{\text{OI}}{\text{NOA}} \\ &= \frac{\text{Core OI from Sales}}{\text{NOA}} + \frac{\text{Core Other OI}}{\text{NOA}} + \frac{\text{Unusual Items}}{\text{NOA}} \\ &= \text{Core Sales PM} \times \text{ATO} + \frac{\text{Core Other OI}}{\text{NOA}} + \frac{\text{Unusual Items}}{\text{NOA}} \end{aligned}$$

and thus change of RNOA should be

$$\begin{aligned}\Delta \text{RNOA}_{t+1} = & \Delta \text{Core Sales PM}_{t+1} \times \text{ATO}_t + \text{Core Sales PM}_{t+1} \times \Delta \text{ATO}_{t+1} \\ & + \Delta \left(\frac{\text{Core Other OI}}{\text{NOA}} \right)_{t+1} + \Delta \left(\frac{\text{Unusual Items}}{\text{NOA}} \right)_{t+1}\end{aligned}$$

[!TIP]

Suppose $z_t = x_t \cdot y_t$, we have

$$\begin{aligned}z_{t+1} - z_t &= x_{t+1} \cdot y_{t+1} - x_t \cdot y_t \\ &= (x_{t+1} - x_t) \cdot y_{t+1} + x_t \cdot y_{t+1} + x_t \cdot (y_{t+1} - y_t) - x_t \cdot y_{t+1} \\ &= (x_{t+1} - x_t) \cdot y_{t+1} + x_t \cdot (y_{t+1} - y_t)\end{aligned}$$

Fixed Costs VS. Variable Costs

$$\text{Sales PM} = \frac{\text{Gross Margin}}{\text{Sales}} = \frac{\text{Sales} - \text{Variable Costs} - \text{Fixed Costs}}{\text{Sales}} = \frac{\text{Contribution Margin}}{\text{Sales}} - \frac{\text{Fixed Costs}}{\text{Sales}}$$

where $\text{Contribution Margin} = \text{Sales} - \text{Variable Costs}$ measures the change income from a change in one dollar of sales, and $\frac{\text{Contribution Margin}}{\text{Sales}}$ is called **contribution margin ratio**.

Operating Leverage Measures

There are 2 measures of operating leverage (OLEV), one is the sensitivity of income to changes in sales:

$$\text{OLEV} = \frac{\text{Contribution Margin}}{\text{OI}} = \frac{\text{Contribution Margin Ratio}}{\text{PM}}$$

[!NOTE]

OLEV is not OLLEV!

The other measure is the ratio of fixed costs to variable costs:

$$\text{OLEV} = \frac{\text{Fixed Costs}}{\text{Variable Costs}}$$

Under this measure, we have

$$\% \Delta \text{Core OI} = \text{OLEV} \times \% \Delta \text{Core Sales}$$

Effect of Changes in Financing

Remember

$$\text{ROCE} = \text{RNOA} + \text{FLEV} \times \text{Operating Spread}$$

Similar to ΔRNOA , we have

$$\Delta \text{ROCE}_{t+1} = \Delta \text{RNOA}_{t+1} + \Delta \text{FLEV}_{t+1} \times \text{Operating Spread}_t + \text{FLEV}_{t+1} \times \Delta \text{Operating Spread}_{t+1}$$

where the sum of last 2 terms is the effect of changes in financing.

In $\Delta \text{Operating Spread}$, we have explained ΔRNOA . Similarly, the change in NBC can be written as

$$\text{NBC} = \frac{\text{Core NFE}}{\text{NFO}} + \frac{\text{Unusual NFE}}{\text{NFO}}$$

to distinguish sustainable part and unsustainable part.

Growth in CSE

Since $\text{CSE} = \text{NOA} - \text{NFO}$, we have

$$\begin{aligned}
\Delta CSE_{t+1} &= \Delta NOA_{t+1} - \Delta NFO_{t+1} \\
&= \Delta \left(\text{Sales} \times \frac{1}{ATO} \right)_{t+1} - \Delta NFO_{t+1} \\
&= \Delta \text{Sales}_{t+1} \times \left(\frac{1}{ATO} \right)_t + \text{Sales}_{t+1} \times \Delta \left(\frac{1}{ATO} \right)_{t+1}
\end{aligned}$$

Procedure of Valuation

1. Identify dirty surplus and calculate ROCE from statement of shareholders' equity;
2. Reformulate balance sheet;
3. Reformulate income statement;
4. Decompose ROCE—profitability analysis;
5. Analyze change in ROCE—sustainability of earnings;
6. Analyze growth;
7. Forecast future ROCE and growth;
8. Valuation.

Understanding P/B and P/E through RE

Normal P/B and Normal P/E

Normal P/B ($P/B = 1$) means book values are expected to grow at equity cost of capital, i.e., $RE = 0$.

Normal P/E (see [Chapter 6](#)) means earnings are expected to grow at equity cost of capital, i.e., $AE = 0$.

The Molodovsky Effect and Growth Effect

In 1953, Molodovsky discovered that **P/E ratios are higher at the bottom of the business cycle than at the top of the cycle**. The figure below can explain this counterintuitive observation:

		P/B		
		High FRE>0	Normal FRE=0	Low FRE<0
P/E	High FRE>CRE	A FRE>0 CRE<FRE	B CRE<0 FRE=0	C FRE<0 CRE<FRE
	Normal FRE=CRE	D CRE>0 CRE=FRE	E CRE=FRE=0	F CRE<0 CRE=FRE
	Low FRE<CRE	G FRE>0 CRE>FRE	H CRE>0 FRE=0	I FRE<0 CRE>FRE

FRE = Expected future residual earnings

CRE = Current residual earnings

From the blue cells B and H we can see that, at the bottom of the business cycle, a firm that with a normal P/B has negative current RE, but this results in a high P/E; conversely, at the top of the cycle, this firm has positive current RE while P/E is low.

Similarly, the pattern in green cells A, C, G and I are affected by the Molodovsky effect. But these cells are also affected by growth. **Stocks in cells A and C are growth stocks but those in C are starting at a very low base.**