

Financial Statements Forecasting

The objective of financial statements modeling, that is, creating pro forma financial statements, is to make financial projections for the future that can be used to make decisions. Financial statements models are probably the most widely used type of financial model and they are used extensively in corporate finance for planning, credit analysis, mergers and acquisitions analysis, business valuations, and many other applications. Financial statement models are especially useful to answer “what if” questions. Depending on the application, the models may be created for abbreviated financial statements or they may be created with extensive details including various supporting schedules that feed into the primary financial statements. Even for making minor decisions it is always safer to do projections with financial statement models instead of doing back-of-the-envelope calculations; it significantly reduces the chances of leaving out certain items and making wrong projections.

Review of Theory and Concepts

Financial statement modeling generally involves modeling all the three primary financial statements: the income statement, the balance sheet, and the statement of cash flows. This last one, however, does not have to be modeled independently because it is derived from the other two. The models almost always include a series of financial indicators that can be used to make decisions. It is also customary to prepare a number of sensitivity tables or charts to show how some of the projections (outputs of the model) will change with changes in the values of one or more inputs to the model, and a few scenarios to show what certain key financial indicators of the company may look like under different circumstances in the future.

Although all applications do not call for developing a full-fledged financial forecasting model, it helps to understand what that involves and how it is done so that you can then adapt it to a specific problem at hand. The key steps in developing a financial statement model are:

- Step 1: Understand the expected uses of the model and the required outputs.
- Step 2: Collect historical data for the company, its industry, and its major competitors.
- Step 3: Understand the company's plan and develop a comprehensive set of modeling assumptions.
- Step 4: Build the model and debug it.
- Step 5: Improve the model based on feedback.

STEP 1: UNDERSTAND THE EXPECTED USES OF THE MODEL

Although most financial statements forecasting models are structurally similar, they have to be customized for each application. It is essential to understand up front why the model is being created, what outputs are expected from it, and what types of decisions will be based on those outputs. As with all models, it does not pay to get started unless you know where you are going and why. To take one simple example: if you know what kind of outputs will be required, you can design your spreadsheets accordingly, and when the time comes to create reports you will not have to redo many things.

STEP 2: COLLECT HISTORICAL DATA

Financial statement forecasting models have to start with at least some historical financial statements for the company. While the bare minimum may be last year's balance sheet, it is unlikely that you can produce useful projections based on only this. Try to get historical financial statements for at least three years—five is better—and make sure that they are based on consistent accounting policies. Unlike in some other applications, here nothing needs to correct to the last dollar or, depending on the size of the corporation, to the last million dollars; however, the statements should be generally consistent. It is also essential that you collect some of the explanatory material (the footnotes) that goes with the statements. You would need to develop a good understanding of the recent history of the corporation, and much of the useful information is usually buried in the footnotes.

You also need to collect some historical data for the company's industry and its major competitors. You will need the information to create some benchmarks to judge if the company has been doing well or poorly and where the room for improvement is. If possible, get some industry forecasts for market growth, pricing trends, and so on, and some general economic forecasts for expected GDP growth, interest rate trends, and so forth.

STEP 3: UNDERSTAND THE COMPANY'S PLANS AND DEVELOP A COMPREHENSIVE SET OF MODELING ASSUMPTIONS

This is a key step, but most people tend to skip it. You cannot produce any forecast without knowing what the company's plans are for the future. Sure, you can

put together a model, throw in some assumptions, and churn out some numbers. But what good are they going to do for anybody?

For example, a company may be considering building a new warehouse to expand its sales. This will probably require investment in not just the warehouse but in additional working capital and other things. However, the action is expected to increase sales, and the cost of goods sold and other expenses will increase in tandem as well. Unless you have a good handle on these numbers your forecasts will not be useful.

In your model, you will need to forecast each line item in the income statement and balance sheet with the exception of (1) the line items that depend on the other line items, such as subtotals, and (2) the line item or items that you are going to use as the plug. (I will explain what the plug is shortly.) So you need to develop a comprehensive set of assumptions on how you will forecast each of these line items. (In the modeling section I show you an example of what this may look like.) Let us discuss how you create this set of assumptions.

Forecasting Line Items

There is no one right way to forecast any line item; the method you choose depends on your understanding of the business and what you think will produce good forecasts. The one method that people think of right away but which generally does not work well is regression analysis. If you see any obvious trends in the historical data, use them. Usually, however, the number of data points available are so few that you can judge any trend just by looking at the numbers as well as you will be able to do using formal regression analysis.

The method used most often (and the one that you should try first) may be called sales-driven forecasting. For example, in some businesses and for some companies, the ratio of cost of goods sold (COGS) to sales may be a fairly stable number so that you may decide to project cost of goods sold as the same percentage of projected sales. However, you may also believe, based on your analysis of the industry, management's plans, and so on, that the company will be able to improve the ratio over the years, in which case you can build this improvement into your model. In either case you are tying it to sales, and this is sales-driven forecasting.

Many other line items in the financial statements tend to be sales-driven as well, and because of this, most financial statement forecasting models use sales growth rate as the key independent variable. To decide which line items can be projected as percentage of sales, it is customary to create what are known as common size statements, which are simply the regular financial statements in which every line has been divided by the sales for the year.

If you look at the common size statements for a company for the past few years, you will be able to spot some stable relationships as well as some trends, and you can use them at least for the first round of forecasting. You may be able to find some such relationships in other financial indicators as well and use that informa-

tion to forecast certain line items. You should always try to confirm these relationships using industry data and use a combination of industry numbers and company numbers to decide what specific percentage numbers to use in any forecast.

There is another set of assumptions that may be called policy assumptions that you would need to incorporate in your model. For example, management may have its own target debt to equity ratio, dividend growth rate, and so on. Needless to say, all these assumptions should be documented in your list of assumptions.

The “Plug”

Even if you forecast all the line items reasonably well, at first your balance sheet will not balance (except in rare situations by luck). The amount by which the balance sheet does not balance at first is called the “plug” amount because it is the amount you have to plug into the balance sheet to balance it. Theoretically, the company can balance the balance sheet by changing any line item or combination of line items, that is, by using them as the plug. As a practical matter, though, it has to use line items on which the company has discretion. For example, a company cannot use accounts payable as the plug line because it has very little flexibility to increase that line. (It can, of course decrease it by paying its bills faster, but that would be wasting money.)

Usually, then, one or more of the cash and marketable securities, short-term debt, long-term debt, and equity lines are used as the plug. Because of this, the plug amount is generally called discretionary funding needed (DFN). (There is no universally accepted name, but when you use a term similar to this, everyone understands what you mean.) DFN can be positive or negative.

From the point of view of finance people, determining how big a plug a particular course of action will require and how best to fill that gap are two of the key reasons for doing financial statements modeling. The models give us not just the size of the plug but also the information and tools we need to decide how best to fill it. For example, the model may show us that if we use debt as the plug, it will increase the company’s debt ratios to unacceptable levels. In this case, we may want to consider selling new stocks or look for other ways to reduce the size of the necessary plug.

We will also see that instead of just specifying that one particular line item should be used as the plug, we can design the models to meet additional objectives such as maintain a target level of debt to equity ratio or a maximum amount of short-term debt.

STEP 4: BUILD THE MODEL AND DEBUG IT

The best way—maybe the only way—to learn how to build financial statement models is to work through a number of them, and this is what we will do in the

modeling section. Let me mention a few things here that you need to keep in mind when building your model.

One of the important advantages of the universally used double-entry bookkeeping system is that it automatically maintains certain essential ties between the income statement and the balance sheet for actual transactions and does not let them get out of line from each other. But because we do not use double-entry bookkeeping in modeling financial statements, we have to consciously maintain these ties. Here are some of them and a few other issues to keep in mind.

Depreciation

The difference between the accumulated depreciation at the beginning and the end of a year should equal the depreciation expense on the income statement. The depreciation expense is generally estimated based on some assumption (for example, as a percentage of sales) or from a depreciation schedule using information on when the depreciable assets were put on the books, their assumed lives, and the depreciation method to use. It therefore should be calculated first and then accumulated depreciation for the end of a year should be calculated as the sum of the accumulated depreciation at the end of the previous year plus the (income statement) depreciation expense for the year. Generally net property, plant and equipment (PP&E) should be calculated as the gross PP&E less the accumulated depreciation.

Retained Earnings

As the name implies, the retained earnings for the end of a year should be calculated as the retained earnings at the end of the previous year plus earnings retained for the year, meaning net income available to holders of common equity less common dividend paid.

Interest Expense

Unlike depreciation and retained earnings, the interest expense does not have to directly tie to any item on the balance sheet or income statement. You can enter almost any interest expense and still create a balanced balance sheet. Nonetheless, interest expense should be calculated based on interest rates and debt balances and not by using a trend in interest expense or some other method. This means that interest expense on long-term debt should be based on the existing rates on them by referring to the long-term debt schedule that all companies maintain. If some long-term debt is projected to be paid off during the forecast period, the reduction in the long-term portion of the interest expense should be based on the interest rates that the maturing debt going off the book carried. Interest expense on short-term debt should be based on projected balances and short-term interest rates.

Interest expense should generally be calculated based on the average debt balance for a year. If debt is used as the plug, as it often is, this will create a circular reference; the debt level will depend on the interest expense and the interest expense will depend on the debt level. Excel can easily handle this.

Sign Convention and Formatting of Financial Statements

In preparing financial statements and associated schedules, you should consciously choose as consistent a sign convention for the various items as possible. Opinions differ on what is consistent, though, and that is why you find people using different conventions. For example, some people prefer to enter cost of sales as a negative number in which case it has to be added to sales to calculate gross operating income. In the models in this book, I have shown cost of sales as a positive number and, therefore, it has to be subtracted from sales. If you follow my approach, selling, general, and administrative expenses and depreciation (on the income statement) should also be shown as positive numbers in order to be consistent. For certain other items, what would be the consistent approach may not be clear. Make sure that you do not add a number that should be subtracted based on the convention you are using and vice versa.

You should put some effort into making your financial statements attractive and easy to read. For statements that you will print out and distribute, it is often best to format them without Excel's grid lines and add lines to indicate subtotals. I will show you in Model 1 one possible approach to making your financial statements look good. If you make a conscious effort, you will have no problem developing even better designs.

STEP 5: IMPROVE THE MODEL BASED ON FEEDBACK

It may not be any exaggeration to say that once you have a model and a set of outputs, the important and fun part of the work begins. You will be surprised to find how flexible, informative, and useful these models can be. Remember that a model is only as good as the assumption built into it. Most of the times you will build a model to help the users make certain decisions, so you will have to get feedback from them and update the model based on different or additional assumptions to make it more realistic and useful. In the models we build, you will see how one can start with a simple model and keep adding more and more information and features into it.

THE LEVEL OF DETAILS IN A MODEL

The level of detail in a model should depend on the application. For example, for regular work you may forecast depreciation using a growth rate, a percentage of

sales, or PP&E. For important work, though, it may be appropriate to build a separate depreciation schedule using a schedule of the assets on the books, their expected lives, and the depreciation method that would be actually used. The output from this schedule can then be fed into the depreciation line on the income statement. It is possible to create similar sub-models for many of the other line items, and at times it may be appropriate to do so. Remember, however, that projections are projections, and just using more detail 'does not automatically improve their quality. As a matter of fact, a good case can be made for starting with a fairly simple model and adding details only as you become convinced that the additions will improve the model's projections.

THE STATEMENT OF CASH FLOWS

While the accrual basis accounting we use has many advantages, its major disadvantage is that it obscures vital information about what is happening with the company on a cash basis. (In this chapter, and most of the time in discussions of financial statements, the word cash refers to not just cash but short-term marketable securities as well because they can be quickly and easily converted into cash at or close to their values on the books.) Cash is the lifeblood of a business. If we do not pay attention to how much cash a company is generating and what it is doing with it, a company may seem to be doing very well on an accrual basis while it slides towards a financial crisis or even bankruptcy.

Because of the importance of cash, the statement of cash flows has become the third primary financial statement. Its objective is to explain the change in the cash account for an accounting period (usually a quarter or year) in terms of other—mostly balance sheet—accounts. In other words, it tries to explain how this change in cash position occurred. Users of financial statement use the statement of cash flows to better understand what is going on with a company and make important decisions.

The Three Categories of Cash Flows

The statement of cash flows classifies cash receipts and payments into operating, investing, and financing activities.

- Operating activities mostly involve income statement items. Net income and depreciation are generally the largest components of cash flow from operating activities.
- Investing activities involve changes in long-term assets. For many companies, capital expenditure is the major component of cash flow for investing activities.
- Financing activities primarily involve cash flows related to borrowings and shareholders' equity.

While everyone breaks down the statement of cash flows into these three categories of activities, the names they use for the three categories vary somewhat.

Modeling the Statement of Cash Flows

The statement of cash flows is the easiest of the three primary financial statements to model. We actually do not have to model it separately; it can be derived from the projected income statement and balance sheet. Somehow many people have difficulty with this statement and end up with statements of cash flows that do not “work,” meaning the sum of the cash flows from the three categories of activities does not match the change in cash, as it must.

One way to avoid this problem is to recognize that the statement of cash flows is based on a rearrangement of the basic equation relating assets to liabilities and shareholders' equity, which is:

$$\text{Assets} = \text{Liabilities} + \text{Shareholders' Equity}$$

If we measure each of these variables in terms of changes (Δ), we can rewrite this equation as:

$$\Delta \text{Assets} = \Delta \text{Liabilities} + \Delta \text{Shareholders' Equity}$$

Now if we break down the assets into cash and non-cash assets and rearrange the equation slightly, it becomes:

$$\Delta \text{Cash} = \Delta \text{Liabilities} + \Delta \text{Shareholders' Equity} - \Delta \text{Non-Cash Assets}$$

The change in the cash account (that is, the difference between the end-of-year cash balance minus the beginning-of-year cash balance) must therefore automatically equal the changes on the right-hand side, provided that we remember to put the minus signs in front of the change in the non-cash asset lines (which is equivalent to taking for them the difference between beginning-of-year and end-of-year balances instead of the other way around).

One more thing we have to do is organize these changes in the line items in the three categories of cash flows we use in the statement of cash flows. Sometimes when it is not clear what a line item represents (for example, the ones labeled “other”), it may be difficult to decide which category it should be put in. If it is a relatively large number, you may want to investigate it further to categorize it correctly; otherwise taking your best guess usually works fine.

One question that should come to your mind at this point is: “Where is net income in this equation?” If you mechanically follow this equation, your statement of cash flows will have no net income line because there is no net income line in the balance sheet. All statements of cash flows, however, start with net income. Where does it come from?

The answer is that the net income is a part of the change in shareholders' equity. In a simple situation, the change in shareholders' equity will be the same as the change in retained earnings, which is equal to net income minus dividends paid. So in the statement of cash flows, you will have to break down the change in shareholders' equity into two lines: net income and dividends paid.

In more complex situations where a company has issued or bought back shares during the period, the change in the shareholders' equity will not equal net income minus dividends paid. The difference will be the issuance or repurchase of stocks (or a few other possible transactions or changes). These will become one or more additional lines in the statements of cash flows. Sometimes it may be more informative and, therefore, desirable to break down some of the other line items as well. If you conform to the approach we discussed, the sum of all the cash flows can only equal the change in cash.

FREE CASH FLOW

The regular financial statements, even the statement of cash flows, do not provide a good measure or explanation of the cash that a company is generating or consuming. Free cash flow is the measure generally used for that. Free cash flow is a company's true operating cash flow. It is the total after-tax cash flow generated by the company that is available for distribution to all providers of the company's capital: creditors as well as shareholders. It can be thought of as the after-tax cash flow that would be available to the company's shareholders if the company had no debt. Free cash flow is before financing and, therefore, is not affected by the company's financial structure.

For forecast periods you can also conceptually think of free cash flow as the cash that the company can afford to distribute after providing for all the funds needed to execute its plans. We calculate free cash flow in a few steps, usually starting with the net operating profit after taxes (NOPAT).

NOPAT

As the name implies, NOPAT is the profit from operations less (cash) taxes attributable to it. The definition requires an explanation. First, profits from operations exclude income from any sources that are not considered part of the company's normal operations. For this reason, interest expenses will be excluded from it. Interest income on normal levels of operating cash and marketable securities should be included in NOPAT because the company needs a certain amount of cash for operations. However, if for some reason the company holds cash in excess of what may be needed for operations, then the interest income (and the related taxes) on the excess amount should be excluded from NOPAT.

Second, the tax deducted from NOPAT should reflect only cash taxes that would be due on the pre-tax operating income. The distinction between cash taxes and book taxes need to be made because companies often book taxes that are not paid in cash immediately.

For most purposes, we can back into NOPAT from reported net income. First we should take out any non-operating income (after-tax amounts) from net income. Then we should add back the after-tax amount of interest expense. (We calculate the after-tax amount of interest expense by applying the company's statutory tax rate to the pre-tax interest expense.) Finally, to reflect only cash taxes we should make adjustments for any non-cash taxes. For example, if the company's deferred taxes went up for the year, it usually means that the company booked more taxes than were due in cash. We should therefore deduct any increase in the deferred tax balances on the balance sheet.

Gross Cash Flow

Once we have estimated NOPAT, we should add the depreciation expense to NOPAT to calculate the gross cash flow from operations. The obvious reasoning is that depreciation is a non-cash expense.

Various Investments

From the gross cash flow we have to deduct the various investments the company made during the year. Capital expenditures or increases in gross PP&E are likely to be a major component here. As a company expands, it also has to make additional investments in working capital and other things. All such investments related to operation should be deducted from the gross cash flow to arrive at the free cash flow.

Uses of the Free Cash Flow

Both to understand what the company did with the free cash flow and to make sure that we calculated it right, it is good to look at the *uses* side of the free cash flow. Since the free cash flow, if positive, is the money available for distributions to the providers of the company's capital, most of it is distributed to them. Such distributions would normally include interest payments (the after-tax amount because it is tax deductible), dividend payments, loan repayments, and stock repurchases. Sometimes the company may choose to invest some of the free cash flow in some non-operating assets or even hold part of it as excess cash. We can add up all these uses of free cash flow to make sure that the total matches the available free cash flow.

If a company's free cash flow is negative, it means that the company is consuming more cash than it is generating. We should then ask where the money is going (may be the company is going through a big expansion phase) and how the company is raising the money (may be it is borrowing more or drawing down from a non-operating cash balance it had built up).

In the modeling section, we will build a model to calculate free cash flow from standard financial statements.

Free Cash Flow and Business Valuation

Probably the most important application of the concept of free cash flow occurs in business valuation. You have heard it said many times that the value of a company or business is equal to the present value of all its future cash flows. The right cash flow to use in this calculation is the free cash flow because from the investors' point of view, the value of a company should depend on the cash flows that the investors can expect to get from the company over the years. It is the free cash flow that the company will be able to distribute to them.

Incidentally, the discount rate to use in such valuations should be appropriate for the risk of this free cash flow. It turns out that most of the time the after-tax weighted average cost of capital (WACC) for the company is the right discount rate.

Modeling Examples

My approach to presenting the models in this and the following chapters have been influenced by the series of excellent books on spreadsheet modeling by Professor Craig W. Holden of the Kelley School of Business, Indiana University. Over the years, both my students and I have found his approach to presenting spreadsheet models to be very effective. I want to acknowledge my debt to him.

MODEL 1: HISTORICAL FINANCIAL STATEMENTS

The Problem

Historical income statements and balance sheets for Vitex Corp. for 1999–2002 are shown in Figure 6.1. In these statements, identify all the numbers that should be calculated based on other numbers in them and replace these numbers with the appropriate formulas. Then reformat the statements to look like Figures 6.2 and 6.3 to make them more attractive and readable. (Start with the statements in the worksheet “Inputs” in the file for this model, which has the statements without the equations in them.)

	A	B	C	D	E	F
1	Historical Income Statements and Balance Sheets for Vitex Corp.					
2						
3	Income Statement (\$ Million)					
4		Year Ending Dec. 31,				
5		1999	2000	2001	2002	
6	Sales	\$1,234.9	\$1,251.7	\$1,300.4	\$1,334.4	
7	Cost of Sales	\$679.1	\$659.0	\$681.3	\$667.0	
8	Gross Operating Income	\$555.8	\$592.7	\$619.1	\$667.4	
9						
10	Selling, General & Admn. Expenses	\$339.7	\$348.6	\$351.2	\$373.3	
11	Depreciation	\$47.5	\$52.0	\$55.9	\$75.2	
12	Other net (Income)/Expenses	(\$11.8)	(\$7.6)	(\$7.0)	(\$8.2)	
13	EBIT	\$180.4	\$199.7	\$219.0	\$227.1	
14						
15	Interest (Income)	(\$1.3)	(\$1.4)	(\$1.7)	(\$2.0)	
16	Interest Expense	\$16.2	\$15.1	\$20.5	\$23.7	
17	Pre-Tax Income	\$165.5	\$186.0	\$200.2	\$205.4	
18						
19	Income Taxes	\$56.8	\$64.2	\$67.5	\$72.6	
20	Net Income	\$108.7	\$121.8	\$132.7	\$132.8	
21						
22	Dividends	\$38.3	\$38.7	\$39.8	\$40.1	
23	Addition to Retained Earnings	\$70.4	\$83.1	\$92.9	\$92.7	
24						
25	Balance Sheet (\$ Million)					
26	Assets					
27	Cash and Marketable Securities	\$25.6	\$23.0	\$32.1	\$28.4	
28	Accounts Receivable	\$99.4	\$102.9	\$107.3	\$120.1	
29	Inventories	\$109.6	\$108.0	\$114.9	\$116.8	
30	Other Current Assets	\$96.7	\$91.4	\$103.7	\$97.5	
31	Total Current Assets	\$331.3	\$325.3	\$358.0	\$362.8	
32						
33	Property, Plant and Equipment, Gross	\$680.9	\$734.3	\$820.8	\$913.1	
34	Accumulated Depreciation	\$244.8	\$296.8	\$352.7	\$427.9	
35	Property, Plant and Equipment, Net	\$436.1	\$437.5	\$468.1	\$485.2	
36						
37	Other Non-Current Assets	\$203.2	\$205.1	\$407.0	\$456.3	
38	Total Non-Current Assets	\$639.3	\$642.6	\$875.1	\$941.5	
39						
40	Total Assets	\$970.6	\$967.9	\$1,233.1	\$1,304.3	
41						
42	Liabilities and Shareholders' Equity					
43	Accounts Payable	\$82.8	\$77.1	\$71.8	\$80.5	
44	Short-Term Debt	\$39.1	\$29.7	\$79.8	\$110.3	
45	Other Current Liabilities	\$152.0	\$123.8	\$172.1	\$111.3	
46	Total Current Liabilities	\$273.9	\$230.6	\$323.7	\$302.1	
47						
48	Long-Term Debt	\$163.5	\$145.0	\$201.8	\$218.1	
49	Deferred Income Taxes	\$22.3	\$19.6	\$15.0	\$12.7	
50	Other Non-Current Liabilities	\$100.6	\$80.1	\$115.0	\$94.5	
51	Total Liabilities	\$560.3	\$475.3	\$655.5	\$627.4	
52						
53	Paid-In Capital	\$46.9	\$46.1	\$38.2	\$44.8	
54	Retained Earnings	\$363.4	\$446.5	\$539.4	\$632.1	
55	Total Shareholders' Equity	\$410.3	\$492.6	\$577.6	\$676.9	
56						
57	Total Liabilities and Shareholders' Equity	\$970.6	\$967.9	\$1,233.1	\$1,304.3	
58						
59						
60	Other Data					
61	Stock price (year-end)	\$55.50	\$65.30	\$55.70	\$51.40	
62	Average number of shares outstanding (millions)	48.0	47.3	46.8	46.2	
63						
64						

FIGURE 6.1 Model 1: Historical income statements and balance sheets for Vitex Corp.

Income Statement for Vitex Corp.				
Millions of Dollars				
	Year Ending Dec. 31,			
	1999	2000	2001	2002
Sales	\$1,234.9	\$1,251.7	\$1,300.4	\$1,334.4
Cost of Sales	\$679.1	\$659.0	\$681.3	\$667.0
Gross Operating Income	\$555.8	\$592.7	\$619.1	\$667.4
Selling, General & Admn. Expenses	\$339.7	\$348.6	\$351.2	\$373.3
Depreciation	\$47.5	\$52.0	\$55.9	\$75.2
Other net (Income)/Expenses	(\$11.8)	(\$7.6)	(\$7.0)	(\$8.2)
EBIT	\$180.4	\$199.7	\$219.0	\$227.1
Interest (Income)	(\$1.3)	(\$1.4)	(\$1.7)	(\$2.0)
Interest Expense	\$16.2	\$15.1	\$20.5	\$23.7
Pre-Tax Income	\$165.5	\$186.0	\$200.2	\$205.4
Income Taxes	\$56.8	\$64.2	\$67.5	\$72.6
Net Income	\$108.7	\$121.8	\$132.7	\$132.8
Dividends	\$38.3	\$38.7	\$39.8	\$40.1
Addition to Retained Earnings	\$70.4	\$83.1	\$92.9	\$92.7

FIGURE 6.2 Model 1: Example of well-formatted income statements for Vitex Corp.

Balance Sheet for Vitex Corp.				
Millions of Dollars				
	Year Ending Dec. 31,			
	1999	2000	2001	2002
Assets				
Cash and Marketable Securities	\$25.6	\$23.0	\$32.1	\$28.4
Accounts Receivable	\$99.4	\$102.9	\$107.3	\$120.1
Inventories	\$109.6	\$108.0	\$114.9	\$116.8
Other Current Assets	\$96.7	\$91.4	\$103.7	\$97.5
Total Current Assets	\$331.3	\$325.3	\$358.0	\$362.8
Property, Plant and Equipment, Gross	\$680.9	\$734.3	\$820.8	\$913.1
Accumulated Depreciation	\$244.8	\$296.8	\$352.7	\$427.9
Property, Plant and Equipment, Net	\$436.1	\$437.5	\$468.1	\$485.2
Other Non-Current Assets	\$203.2	\$205.1	\$407.0	\$456.3
Total Non-Current Assets	\$639.3	\$642.6	\$875.1	\$941.5
Total Assets	\$970.6	\$967.9	\$1,233.1	\$1,304.3
Liabilities and Shareholders' Equity				
Accounts Payable	\$82.8	\$77.1	\$71.8	\$80.5
Short-Term Debt	\$39.1	\$29.7	\$79.8	\$110.3
Other Current Liabilities	\$152.0	\$123.8	\$172.1	\$111.3
Total Current Liabilities	\$273.9	\$230.6	\$323.7	\$302.1
Long-Term Debt	\$163.5	\$145.0	\$201.8	\$218.1
Deferred Income Taxes	\$22.3	\$19.6	\$15.0	\$12.7
Other Non-Current Liabilities	\$100.6	\$80.1	\$115.0	\$94.5
Total Liabilities	\$560.3	\$475.3	\$655.5	\$627.4
Paid-In Capital	\$46.9	\$46.1	\$38.2	\$44.8
Retained Earnings	\$363.4	\$446.5	\$539.4	\$632.1
Total Shareholders' Equity	\$410.3	\$492.6	\$577.6	\$676.9
Total Liabilities and Shareholders' Equity	\$970.6	\$967.9	\$1,233.1	\$1,304.3

FIGURE 6.3 Model 1: Example of well-formatted balance sheets for Vitex Corp.

From these income statements and balance sheets create the corresponding statements of cash flows as shown in Figure 6.4. Create the statements of cash flows on a separate worksheet and link them to the income statements and balance sheets so that none of the numbers in them has to be reentered manually.

Modeling Strategy

Replace all subtotals and totals in both the income statements and balance sheets with equations. In doing so, be consistent with the sign convention I have used. Otherwise you will get wrong answers. For example, I have shown Cost of Sales as a positive number and, therefore, it has to be subtracted from Sales to calculate Gross Operating Income.

To create the statement of cash flows, review the earlier discussion about it if necessary. At the bottom of the statement create an additional section to calculate the difference between the beginning- and end-of-year Cash and Marketable Securities balances to double-check the same number from the statements of cash flows.

	A	B	C	D	E	F
1	Statements of Cash Flows for Vitex Corp.					
2	Millions of Dollars					
3						
4		Year Ending Dec. 31:				
5		1999	2000	2001	2002	
6	Cash Flows from Operations					
7	Net Income		\$121.8	\$132.7	\$132.8	
8	Depreciation Expense		\$52.0	\$55.9	\$75.2	
9	Decrease/(Increase) in Accounts Receivable		(\$3.5)	(\$4.4)	(\$12.8)	
10	Decrease/(Increase) in Inventories		\$1.6	(\$6.9)	(\$1.9)	
11	Decrease/(Increase) in Other Current Assets		\$5.3	(\$12.3)	\$6.2	
12	Increase/(Decrease) in Accounts Payable		(\$5.7)	(\$5.3)	\$9.7	
13	Increase/(Decrease) in Other Current Liabilities		(\$28.2)	\$48.3	(\$60.8)	
14	Increase/(Decrease) in Deferred Income Taxes		(\$2.7)	(\$4.6)	(\$2.3)	
15	Increase/(Decrease) in Other Non-Current Liabilities		(\$20.5)	\$34.9	(\$20.5)	
16	Total Cash Flows from Operations		\$120.1	\$238.3	\$124.6	
17						
18	Cash Flows from Investing					
19	(Additions to) Property, Plant & Equipment		(\$53.4)	(\$86.5)	(\$92.3)	
20	(Investment) in Other Non-Current Assets		(\$1.9)	(\$201.9)	(\$49.3)	
21	Total Cash Flows from Investing		(\$55.3)	(\$288.4)	(\$141.6)	
22						
23	Cash Flows from Financing					
24	From Issuance/(Repayment) of Short-Term Debt		(\$9.4)	\$50.1	\$30.5	
25	From Issuance/(Repayment) of Long-Term Debt		(\$18.5)	\$56.8	\$16.3	
26	From Sale/(Repurchase) of Equity		(\$0.8)	(\$7.9)	\$6.6	
27	Cash Dividends Paid to Shareholders		(\$38.7)	(\$39.8)	(\$40.1)	
28	Total Cash Flows from Financing		(\$67.4)	\$59.2	\$13.3	
29						
30	Net Change in Cash & Marketable Securities		(\$2.6)	\$9.1	(\$3.7)	
31						
32						
33	Beginning Cash & Marketable Securities		\$25.6	\$23.0	\$32.1	
34	Ending Cash & Marketable Securities		\$23.0	\$32.1	\$28.4	
35	Net Change in Cash & Marketable Securities		(\$2.6)	\$9.1	(\$3.7)	
36						
37						

FIGURE 6.4 Model 1: Statements of cash flows for Vitex Corp.

Building the Model

1. **Enter formulas to calculate subtotals and totals:** Here are the formulas you have to enter in the income statement for the year 1999:

- To calculate Gross Operating Income, in B8 enter =B6-B7.
- To calculate EBIT, in B13 enter =B8-SUM(B10:B12).
- To calculate Pre-Tax income, in B17 enter =B13-SUM(B15:B16).
- To calculate Net Income, in B20 enter =B17-B19.
- To calculate Addition to Retained Earnings, in B23 enter =B20-B22.

For the 1999 balance sheet, enter the following:

- To calculate Total Current Assets, in B31 enter =SUM(B27:B30).
- To calculate Net PP&E, in B35 enter =B33-B34.
- To calculate Total Non-Current assets, in B38 enter =B35+B37.
- To calculate Total Assets, in B40 enter =B31+B38.
- To calculate Total Current Liabilities, in B46 enter =SUM(B43:B45).
- To calculate Total Liabilities, in B51 enter =B46+SUM(B48:B50).
- To calculate Total Shareholders' Equity, in B55 enter =B53+B54.
- To calculate Total Liabilities and Shareholders' Equity, in B57 enter =B51+B55.

Copy the formulas into the columns for 2000–2002.

2. **Create formulas for other items:** Accumulated Depreciation for a year should be calculated as Accumulated Depreciation for the previous year plus the Depreciation (expense) for the current year from the income statement. To calculate it for 2000, in C34 enter the formula =B34+C11. Copy the formula into D34:E34 for 2001-2002. (We cannot use the formula for 1999 because we do not have the Accumulated Depreciation for 1998.)

Retained Earnings for a year would equal Retained Earnings from the previous year plus the Addition to Retained Earnings for the current year. For 2000, in C54 enter the formula =B54+C23 and copy it into D54:E54. As before, we cannot use the formula for 1999.

3. **Create the statement of cash flows:** In a new worksheet, create the headings and labels as shown. Notice how I have labeled each line to clearly indicate what a positive or negative number will mean. For example, Decrease/(Increase) in Accounts Receivable means that a positive number will indicate a decrease in Accounts Receivable; a negative number will indicate an increase. We want a decrease to appear as a positive number because that will indicate an addition to (or source of) cash and, therefore, it should be added to Net Income and other sources of cash. In creating the formula for this, we have to make sure that a decrease will come out as a positive number. Make sure you fully understand the sign convention indicated for each item by its label.

For Net Income select C7, enter an equal sign, click on the tab for the worksheet IS & BS (or whatever name you gave to the worksheet where you created the income statement and balance sheets), click on C20, and press Enter. You will see the formula =IS & BS!C20.

For Depreciation Expense, select C8, enter an equals sign, click the tab for the IS & BS worksheet, click C11, and press Enter.

For Accounts Receivable, select C9, enter an equals sign, click the tab for IS & BS, click B28, insert a minus sign, click C28, and press Enter. In C9 you will see the formula =IS & BS!B28-IS & BS!C28. As I discussed before, to get the right sign, this equation must be entered as B28-C28, and not the other way around. You have to use the same convention for all assets accounts and the opposite convention for all the liability and shareholders' equity accounts.

Enter similar formulas for all the other lines, being careful about the sign convention.

For subtotals, in C16 enter =SUM(C7:C15), and enter similar formulas in C21 and C28. Finally, to calculate Net Change in Cash & Marketable Securities, in C30 enter the formula =C16+C21+C28.

For a check, in C33 enter the formula =IS & BS!B27 and in C34 the formula =IS & BS!C27, using the pointing method as usual. Then in C35 enter =C34-C33. The result should match the number in C30 in both magnitude and sign. (Note that the beginning of the year is the same as the end of the previous year.)

Copy all the formulas into the columns for 2001 and 2002. Because we do not have the numbers for 1998, we cannot create the statement of cash flows for 1999.

4. **Create the formatted income statement and balance sheets:** Create these following the examples shown in Figures 6.2 and 6.3. To turn off the regular grid lines, select Tools ⇒ Options, select the View tab and then in the Window options section deselect Gridlines. This change applies only to the worksheet that was active (selected) at the time you made the change.

If you can come up with other ideas to make your financial statements look better, feel free to use them, but make sure that your statements look at least as good as the example. From here on I will use the regular worksheet formats, but you should use fancier formats like these when handing out any of your important work.

Testing the Model

Because here you have the actual income statements and balance sheets, as long as your numbers agree with them, your model should be correct. For the statement of cash flows, we created an independent check, which is the best way to test all statements of cash flows.

Uses of the Model

This model should enhance your understanding of financial statements and their interconnections. You will find this knowledge useful in both understanding them and building other financial statement models.

MODEL 2: COMMON SIZE STATEMENTS

The Problem

Create common size income statements and balance sheets for Vitex Corp. from the corresponding historical statements for 1999–2002 and then calculate the four-year averages for each line item expressed as percentage of sales.

Modeling Strategy

It is generally convenient and useful to create common size statements in a set of columns next to the regular statements. So start with the spreadsheet you created in Model 1 and work with the same sheet. Some people create the common size statements for each year in the column next to the column for the regular statements for the same year, thereby interspersing the two types of statements. I prefer to create the common size statements as a separate set because then it is easier to calculate averages as we will need to do and it is also easy to hide them if necessary.

Doing the calculations for this model is simple. You need to create just one formula using the right mixed reference and then you can copy it into all the cells for all the years. Calculate the averages in a column next to the common size statements.

Building the Model

1. **Create the headings for the common size statements:** Make a copy of the spreadsheet you created in Model 1 and create the heading for the common size statements in columns G:J as shown in Figure 6.5. Note that in the figure I have hidden the regular statement columns B:E, but I am doing the calculations based on them. You will need them open to write your formulas.
2. **Create the formulas for the common size statements:** In G6 enter the formula $=B6/B\$6$ and then copy it into all the cells for the income statements and balance sheets for all the years. Format them for percentage with one decimal point.
3. **Calculate the averages:** Create the column for averages with the proper heading. In K6 enter the formula $=SUM(G6:J6)/4$ and copy it into the rest of the column.

Testing the Model

There is not much to test in this model. Still, visually check the numbers in just one row to make sure that the formulas have copied over correctly.

	A	G	H	I	J	K	L
1	Historical Common Size Statements for Vitex Corp.						
2							
3	Income Statement	Common Size Statements					
4		Year Ending Dec. 31,					
5		1999	2000	2001	2002	Average	
6	Sales	100.0%	100.0%	100.0%	100.0%	100.0%	
7	Cost of Sales	55.0%	52.6%	52.4%	50.0%	52.5%	
8	Gross Operating Income	45.0%	47.4%	47.6%	50.0%	47.5%	
9							
10	Selling, General & Admn. Expenses	27.5%	27.9%	27.0%	28.0%	27.6%	
11	Depreciation	3.8%	4.2%	4.3%	5.6%	4.5%	
12	Other Net (Income)/Expenses	-1.0%	-0.6%	-0.5%	-0.6%	-0.7%	
13	EBIT	14.6%	16.0%	16.8%	17.0%	16.1%	
14							
15	Interest (Income)	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	
16	Interest Expense	1.3%	1.2%	1.6%	1.8%	1.5%	
17	Pre-Tax Income	13.4%	14.9%	15.4%	15.4%	14.8%	
18							
19	Income Taxes	4.6%	5.1%	5.2%	5.4%	5.1%	
20	Net Income	8.8%	9.7%	10.2%	10.0%	9.7%	
21							
22	Dividends						
23	Addition to Retained Earnings						
24							
25	Balance Sheet						
26	Assets						
27	Cash and Marketable Securities	2.1%	1.8%	2.5%	2.1%	2.1%	
28	Accounts Receivable	8.0%	8.2%	8.3%	9.0%	8.4%	
29	Inventories	8.9%	8.6%	8.8%	8.8%	8.8%	
30	Other Current Assets	7.8%	7.3%	8.0%	7.3%	7.6%	
31	Total Current Assets	26.8%	26.0%	27.5%	27.2%	26.9%	
32							
33	Property, Plant and Equipment, Gross	55.1%	58.7%	63.1%	68.4%	61.3%	
34	Accumulated Depreciation	19.8%	23.7%	27.1%	32.1%	25.7%	
35	Property, Plant and Equipment, Net	35.3%	35.0%	36.0%	36.4%	35.7%	
36							
37	Other Non-Current Assets	16.5%	16.4%	31.3%	34.2%	24.6%	
38	Total Non-Current Assets	51.8%	51.3%	67.3%	70.6%	60.2%	
39							
40	Total Assets	78.6%	77.3%	94.8%	97.7%	87.1%	
41							
42	Liabilities and Shareholders' Equity						
43	Accounts Payable	6.7%	6.2%	5.5%	6.0%	6.1%	
44	Short-Term Debt	3.2%	2.4%	6.1%	8.3%	5.0%	
45	Other Current Liabilities	12.3%	9.9%	13.2%	8.3%	10.9%	
46	Total Current Liabilities	22.2%	18.4%	24.9%	22.6%	22.0%	
47							
48	Long-Term Debt	13.2%	11.6%	15.5%	16.3%	14.2%	
49	Deferred Income Taxes	1.8%	1.6%	1.2%	1.0%	1.4%	
50	Other Non-Current Liabilities	8.1%	6.4%	8.8%	7.1%	7.6%	
51	Total Liabilities	45.4%	38.0%	50.4%	47.0%	45.2%	
52							
53	Paid-In Capital	3.8%	3.7%	2.9%	3.4%	3.4%	
54	Retained Earnings	29.4%	35.7%	41.5%	47.4%	38.5%	
55	Total Shareholders' Equity	33.2%	39.4%	44.4%	50.7%	41.9%	
56							
57	Total Liabilities and Shareholders' Equity	78.6%	77.3%	94.8%	97.7%	87.1%	
58							
59							

FIGURE 6.5 Model 2: Historical common size statements for Vitex Corp.

Uses of the Model

I discussed the uses of the common size statements earlier. Now you can see by looking across each row and the averages which items can be forecast as percentage of sales and which you will need to forecast using some other approach. These statements give you a lot of insight into the company and point out issues you need to investigate. For example, you may want to investigate how the company has managed to bring down its ratio of Cost of Sales to Sales, is this improvement sustainable, is it now in line with the industry, and so on.

MODEL 3: FINANCIAL INDICATORS

The Problem

From the income statements, balance sheets, and other data provided calculate the financial indicators for Vitex Corp. for 1999–2002 shown in Figure 6.6.

Modeling Strategy

It is usually easiest and most convenient to calculate the financial indicators on the same worksheet and the same columns as the corresponding income statement and

	A	B	C	D	E	F
64	Financial Indicators for Vitex Corp.	1999	2000	2001	2002	
65	Valuation Ratios					
66	EPS	\$2.26	\$2.58	\$2.83	\$2.87	
67	Dividend per Share	\$0.80	\$0.82	\$0.85	\$0.87	
68	P/E Ratio	24.5	25.3	19.6	17.9	
69	P/B (price to book) Ratio	6.5	6.3	4.5	3.5	
70	Dividend Payout Ratio	35%	32%	30%	30%	
71						
72	Profitability Ratios					
73	Return on Equity (ROE)		27.0%	24.8%	21.2%	
74	Return on Sales (ROS)	14.6%	16.0%	16.8%	17.0%	
75						
76	Growth Rates					
77	EPS Growth Rate		13.7%	10.0%	1.4%	
78	Dividend Growth Rate		2.6%	3.9%	2.1%	
79	Sales Growth Rate		1.4%	3.9%	2.6%	
80	EBIT Growth Rate		10.7%	9.7%	3.7%	
81	Net Income Growth Rate		12.1%	8.9%	0.1%	
82						
83	Liquidity Ratios					
84	Current Ratio	1.21	1.41	1.11	1.20	
85	Quick Ratio	0.46	0.55	0.43	0.49	
86						
87	Operating Efficiency Ratios					
88	Inventory Turnover Ratio	6.2	6.1	5.9	5.7	
89	Receivable Turnover Ratio	12.4	12.2	12.1	11.1	
90						
91	Leverage Ratios					
92	Total Debt to Total Capitalization	33.1%	26.2%	32.8%	32.7%	
93	Long-Term Debt to Total Capitalization	26.7%	21.7%	23.5%	21.7%	
94	Total Debt to Equity	49.4%	35.5%	48.8%	48.5%	
95						
96	Coverage Ratios					
97	Times Interest Earned (TIE)	11.1	13.2	10.7	9.6	
98	Cash Coverage Ratio	14.1	16.7	13.4	12.8	
99						
100						

FIGURE 6.6 Model 3: Historical financial indicators for Vitex Corp.

the balance sheet. As I pointed out earlier, sometimes different people use slightly different definitions for the same indicator. If one of the numbers shown does not agree with what you get, check below to see what definition I have used here. Also, these are only a few indicators, albeit some of the most important ones. One could calculate many other indicators depending on the intended use.

Building the Model

1. **Create headings and labels:** Create the headings and labels as shown. I am using the worksheet from Model 1, and the same column for each year starting at row 64 for this section.
2. **Calculate the valuation indicators:** Use the following definitions. Enter the formulas in one column for one year, copy them over for the other years, and format the cells appropriately.
 - EPS: Net income divided by the average number of shares outstanding. In B66 enter $=B20/B62$.
 - Dividend per share: Dividend paid divided by average number of shares outstanding. In B67 enter $=B22/B62$. You generally do not have to calculate the dividend per share because it is known and it is multiplied by the average number of shares outstanding to calculate the total dividend paid.
 - P/E ratio: Price divided by EPS. In B68 enter $=B61/B66$.
 - P/B (price to book) ratio: Price divided by book value (that is, total shareholders' equity) per average number of shares outstanding. In B69 enter the formula $=B61/B55*B62$.
 - Dividend payout ratio: Total dividend paid out divided by net income. In B70 enter $=B22/B20$.
3. **Calculate profitability ratios:** Proceed as before with the following definitions:
 - Return on equity (ROE): Net income divided by average shareholders' equity. Average here means average of the year-end numbers from the previous year and this year. If you use this definition, then you cannot calculate it for 1999. People sometimes calculate ROE based on just the year-beginning equity number as well. In C73 enter the formula $=C20/((B55+C55)/2)$.
 - Return on sales (ROS): EBIT divided by sales. In B74 enter $=B13/B6$.
4. **Calculate growth rates:** To calculate EPS growth rate, in C77 enter the formula $=C66/B66-1$. Calculate the other growth rate similarly. Note that dividend growth rate is calculated based on dividend per share even though it is called just dividend growth rate.
5. **Calculate liquidity ratios:** Proceed as before with the following definitions:
 - Current ratio: Current assets divided by current liabilities. In B84 enter the formula $=B31/B46$.
 - Quick ratio: Cash and marketable securities plus accounts receivable divided by current liabilities. Some people use only cash and marketable securities in the numerator. In B85 enter the formula $=(B27+B28)/B46$.

6. **Calculate operating efficiency ratios:** Proceed as before with the following definitions:
 - Inventory turnover: Cost of sales divided by inventories. In B88 enter the formula $=B7/B29$.
 - Receivable turnover: Sales divided by receivables. In B89 enter $=B6/B28$.
7. **Calculate leverage ratios:** Proceed as before with the following definitions:
 - Total debt to total capitalization ratio: (Short-term debt + long-term debt)/(short-term debt + long-term debt + total shareholders' equity). In B92 enter the $=(B44+B48)/(B44+B48+B55)$.
 - Long-term debt to total capitalization: Long-term debt/(short-term debt + long-term debt + total shareholders' equity). In B93 enter $=B48/(B44+B48+B55)$.
 - Total debt to equity: (Short-term debt + long-term debt)/total shareholders' equity. In B94 enter $=(B44+B48)/B55$.
8. **Calculate leverage ratios:** Proceed as before with the following definitions:
 - Times interest earned: EBIT divided by interest expense. In B97 enter $=B13/B16$. Because often only net interest expense, that is, interest expense net of interest income, is available, this is used in the numerator. Here I am using gross interest expense because it is available separately.
 - Cash coverage ratio: (EBIT + depreciation)/interest expense. In B98 enter $=(B13+B11)/B16$.

Testing the Model

Here you can check the numbers against those in the figure. Otherwise, though, you have to check them by hand calculations as well as by judging them for reasonableness. For example, ROE up to 30% may be reasonable, but higher values should be double-checked.

Uses of the Model

Although this model does not require much skill, you will calculate and use financial indicators extensively both to evaluate the historical performance of companies and to judge the reasonableness of your projected financial statements and make policy decisions. For these reasons, you should always include a number of key financial indicators in all your financial statements forecasting models.

MODEL 4: FINANCIAL STATEMENT FORECASTING WITH UNBALANCED BALANCE SHEET

The Problem

You have been asked to prepare projected financial statements for Vitex Corp. for 2003–2006 starting with the historical statements for 1999–2002. For your fore-

A		B
1	Assumptions for Forecasting Model	
2		
3		Assumption
4	Income Statement	
5	Sales	Will grow at 5%, based on input from management
6	Cost of Sales	52% of sales, little better than historical average
7	Selling, General & Admn. Expenses	29% of sales, based on expected worsening
8	Depreciation	8% of Gross PP&E, based on analysis of depreciation schedules
9	Other Net (Income)/Expenses	-0.7% of sales, based on historical average
10	Interest Income	Calculate based on average balance and interest rate specified later
11	Interest Expense	For STD calculate based on average balance and interest rate specified later
12		For LTD interest expense will remain unchanged at \$13.5 million
13	Income Taxes	35% of pre-tax income
14		
15	Balance Sheet	
16	Assets	
17	Cash and Marketable Securities	2.1% of sales based on historical average
18	Accounts Receivable	8.4% of sales, based on historical average
19	Inventories	8.8% of sales, based on historical average
20	Other Current Assets	7.6% of sales, based on historical average
21	Property, Plant and Equipment, Gross	Will grow at 11% per year, based on discussion with management
22	Accumulated Depreciation	Calculated from other items
23	Property, Plant and Equipment, Net	Calculated from other items
24	Other Non-Current Assets	Will grow at 10% per year, based on discussion with management
25		
26	Liabilities and Shareholders' Equity	
27	Accounts Payable	6.1% of sales, same as historical average
28	Short-Term Debt	Hold level constant at year-end 2002 level
29	Other Current Liabilities	8.3% of sales, same as 2002
30	Long-Term Debt	Will remain unchanged at 2002 level
31	Deferred Income Taxes	1.4% of sales, based on historical average
32	Other Non-Current Liabilities	7.6% of sales, based on historical average
33	Paid-in Capital	Will remain unchanged at 2002 level
34	Retained Earnings	Calculated from other items
35		
36	Other Assumptions	
37	Dividend payout ratio	40%, based on discussion with management
38	Interest on short-term debt	7%, based on economic forecast
39	Interest on long-term debt	Rates embedded in existing debt, annual expense \$13.5 million
40	Interest on cash & marketable securities	6%, based on economic forecast
41	Number of shares outstanding	Will remain unchanged
42	P/E ratio	Will decline to 16 in 2003 and then improve to 18, 20, and 22 in the following years
43		

FIGURE 6.7 Model 4: Assumptions for financial statements forecasting.

cast, use the assumptions shown in Figure 6.7 but make your model flexible enough so that a user can easily play “what if” games. Include a set of key financial indicators that the management can use to judge the effects of different decisions.

As indicated in the assumptions, hold the levels of both short-term and long-term debts constant. This will result in an unbalanced balance sheet. Show the difference as the discretionary funding needed in a separate line.

Model characteristics: Both short-term debt (STD) and long-term debt (LTD) are held constant. No plug is used to balance the balance sheet, so it is likely to be unbalanced.

Modeling Strategy

As I have emphasized before, the assumptions are the key to forecasting models like this. For any such model, it is best to create a detailed assumption sheet like Figure 6.7 and keep it in the same workbook so that both you and others can tell quickly how the model is projecting each line item.

Start by going through each assumption in conjunction with the common size financial statements you created in Model 2. In some places you may not quite agree with an assumption, but I have suggested these assumptions in part to stress that there is no one way of forecasting any particular line item. You need to be flexible and use whatever method is likely to work best for an item.

Build the model on a copy of the workbook from Model 3 and add to it the spreadsheet for the statements of cash flows. In the main spreadsheet (see Figure 6.8), set up the headings for 2003–2006 next to the columns for the historical data and a column for forecasting factor, the ratio, or growth rate you will use to forecast a particular line.

Based on the assumptions sheet, start entering formulas for each line. Do not “hard code” any ratio or growth rate because then they will be difficult to change to ask “what if” questions. For each line, you need to only enter the formula in the cell for the year 2003 and then you should be able to copy it for the other years.

Your projected balance will almost certainly not balance because we are not using any plug here. Set up a line for discretionary funding need (DFN) below the balance sheet and show in it the DFN, calculated as the difference between total asset and total liabilities and total shareholders’ equity. We discussed before the implications of the DFN being positive or negative.

Once the income statements and balance sheets are done, you only have to copy and paste their formulas from the previous years to calculate the financial indicators. You can create the statements of cash flows the same way.

Building the Model

1. **Set up the forecast columns:** Start with a copy of the worksheet with the historical financial statements and financial indicators from Model 3. Create the heading for 2003–2006 and add the heading for Forecasting Factor. You may want to separate the forecasting period from the historical period by a heavy border like the one I have created; you may also want to hide the years 1999–2001 so that your working columns will be on the screen.
2. **Create income statement formulas:** Proceed line by line as follows by looking up the assumption for the line and then implementing it in a formula. In most cases you can create the formula for 2003 and then copy it to the other years. In addition, you can copy over all the formulas for subtotals and totals from the historical period.

	A	E	F	G	H	I	J
1	Income Statement and Balance Sheet for Vitex Corp.						
2							
3	Income Statement (\$ Million)		Forecast Period				Forecasting Factor
4		2002	2003	2004	2005	2006	
5		\$1,334.4	\$1,401.1	\$1,471.2	\$1,544.7	\$1,622.0	5.0%
6	Sales	\$667.0	\$728.6	\$765.0	\$803.3	\$843.4	52.0%
7	Cost of Sales	\$667.4	\$672.5	\$706.2	\$741.5	\$778.5	
8	Gross Operating Income	\$373.3	\$406.3	\$426.6	\$448.0	\$470.4	29.0%
9	Selling, General & Admn. Expenses	\$75.2	\$81.1	\$90.0	\$99.9	\$110.9	8.0%
10	Depreciation	(\$8.2)	(\$9.8)	(\$10.3)	(\$10.8)	(\$11.4)	-0.7%
11	Other Net (Income)/Expenses	\$227.1	\$194.9	\$199.8	\$204.4	\$208.6	
12	EBIT	(\$2.0)	(\$1.7)	(\$1.8)	(\$1.9)	(\$2.0)	6.0%
13	Interest (Income)	\$23.7	\$21.2	\$21.2	\$21.2	\$21.2	7.0%
14	Interest Expense	\$205.4	\$175.5	\$180.4	\$185.1	\$189.4	
15	Pre-Tax Income	\$72.6	\$61.4	\$63.1	\$64.8	\$66.3	35.0%
16	Income Taxes	\$132.8	\$114.0	\$117.3	\$120.3	\$123.1	
17	Net Income	\$40.1	\$45.6	\$46.9	\$48.1	\$49.2	40.0%
18	Dividends	\$92.7	\$68.4	\$70.4	\$72.2	\$73.9	
19	Addition to Retained Earnings						
20							
21	Balance Sheet (\$ Million)						
22	Assets	\$28.4	\$29.4	\$30.9	\$32.4	\$34.1	2.1%
23	Cash and Marketable Securities	\$120.1	\$117.7	\$123.6	\$129.8	\$136.2	8.4%
24	Accounts Receivable	\$116.8	\$123.3	\$129.5	\$135.9	\$142.7	8.8%
25	Inventories	\$97.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
26	Other Current Assets	\$362.8	\$376.9	\$395.7	\$415.5	\$436.3	
27	Total Current Assets	\$913.1	\$1,013.5	\$1,125.0	\$1,248.8	\$1,386.2	11.0%
28	Property, Plant and Equipment, Gross	\$427.9	\$509.0	\$599.0	\$698.9	\$809.8	
29	Accumulated Depreciation	\$485.2	\$504.6	\$526.0	\$549.9	\$576.4	
30	Property, Plant and Equipment, Net	\$456.3	\$501.9	\$552.1	\$607.3	\$668.1	10.0%
31	Other Non-Current Assets	\$941.5	\$1,006.5	\$1,078.2	\$1,157.2	\$1,244.4	
32	Total Non-Current Assets	\$1,304.3	\$1,383.4	\$1,473.9	\$1,572.8	\$1,680.7	
33	Total Assets	\$80.5	\$85.5	\$89.7	\$94.2	\$98.9	6.1%
34	Liabilities and Shareholders' Equity	\$110.3	\$110.3	\$110.3	\$110.3	\$110.3	
35	Accounts Payable	\$111.3	\$116.3	\$122.1	\$128.2	\$134.6	8.3%
36	Short-Term Debt	\$302.1	\$312.1	\$322.1	\$332.7	\$343.9	
37	Other Current Liabilities	\$218.1	\$218.1	\$218.1	\$218.1	\$218.1	
38	Total Current Liabilities	\$12.7	\$19.6	\$20.6	\$21.6	\$22.7	1.4%
39	Long-Term Debt	\$94.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
40	Deferred Income Taxes	\$627.4	\$656.3	\$672.7	\$689.9	\$707.9	
41	Other Non-Current Liabilities	\$44.8	\$44.8	\$44.8	\$44.8	\$44.8	
42	Total Liabilities	\$632.1	\$700.5	\$770.9	\$843.1	\$916.9	
43	Paid-In Capital	\$676.9	\$745.3	\$815.7	\$887.9	\$961.7	
44	Retained Earnings	\$1,304.3	\$1,401.6	\$1,488.3	\$1,577.7	\$1,669.7	
45	Total Shareholders' Equity						
46	Total Liabilities and Shareholders' Equity						
47							
48	Discretionary Funding Need (DFN)		(\$18.2)	(\$14.4)	(\$5.0)	\$11.1	
49							
50							
51							
52							
53							
54							
55							
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57							
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59							
60							
61							

FIGURE 6.8 Model 4: Projected financial statements for Vitex Corp. showing DFN.

In the following instructions I will assume that you have already formatted a particular cell in the Forecasting Factor column so that instead of saying enter 0.05, I will say enter 5%. If you plan to format a cell afterwards then you should enter 0.05 instead of 5%.

- Sales: The assumption is it will grow at 5%. Enter it in J6 and then in F6 enter the formula $=E6*(1+\$J\$6)$.
 - Cost of Sales: It should be 52% of Sales. In J7 enter 52% and then in F7 enter the formula $=F6*\$J\7 .
 - SG&A: Assumed to be 29% of sales. In J10 enter 29% and then in F10 enter the formula $=F6*\$J\10 .
 - Depreciation: Supposed to be 8% of gross PP&E. Enter 8% in J11 and then in F11 enter $=F33*\$J\11 .
 - Other net (income)/expense: Should be -0.7% of sales. Enter -0.7% in J12 and then in F12 enter the formula $=F6*\$J\12 .
 - Interest (income): Assumed to be at 6% rate on the average balance. Enter 6% in J15 and then in F15 enter the formula $=\$J\$15*(E27+F27)/2$.
 - Interest expense: Is supposed to be \$13.5 million for long-term debt plus 7% on average short-term debt balance. In J16 enter 7% and then in F16 enter the formula $=13.5+\$J\$16*(E44+F44)/2$.
 - Income taxes: Should be 35% of pre-tax income. Enter 35% in J19 and then in F19 enter $=F17*\$J\19 .
 - Dividends: Assumed to be 40% of net income. In J22 enter 40% and then in F22 enter $=F20*\$J\22 .
3. **Create balance sheet formulas other than for short-term debt:** Enter the balance sheet formulas as before.
- Current assets: All the current asset items are calculated as percentages of sales. Enter the appropriate percentage values in J27:J30, in F27 enter the formula $=F\$6*\$J\$27$, and then copy it into the rest of the cells in F27:I30.
 - Gross PP&E: Supposed to grow at 11% per year. In J33 enter 11% and in F33 enter the formula $=E33*(1+\$J\$33)$.
 - Accumulated depreciation and Net PP&E are calculated as in the historical periods. Copy the formulas from there.
 - Other non-current assets: Expected to grow at 10% per year. Enter 10% in J37 and in F37 enter the formula $=E37*(1+\$J\$37)$.
 - Accounts payable: Should be 6.1% of sales. Enter it in J43 and then in F43 enter $=F6*\$J\43 .
 - Short-term debt: Based on the assumptions make it the same as the year-end 2002 number for all the years.
 - Other current liabilities: Assumed to be 8.3% of sales. Enter 8.3% in J45 and then in F45 enter $=F6*\$J\45 .
 - Long-term debt: Will remain constant. Enter the same number as in 2002.
 - Deferred taxes and other non-current liabilities: Supposed to be 1.4% and 7.6% of sales, respectively. Enter the formulas for them the same way we have been doing.
 - Paid in capital: Will remain constant. Enter the same number as in 2002.

- Retained earnings: Calculate as previous year's retained earnings plus current year's addition to retained earnings. In F54 enter the formula =E54+F23 and copy it into the cells for the other years.
4. Calculate DFN: Insert 3 lines below the balance sheet and in row 59 enter the label Discretionary Funding Need (DFN). In F59 enter the formula =F40-F57 to calculate the DFN and copy it into G59:I59.
 5. Calculate the financial indicators: To be able to match the row numbers in your worksheet to the one shown in Figure 6.9, make sure that you have the label Other Data in row 63 of your worksheet. Copy the same formulas that we used for the historical period. The only exception is the P/E ratios, for which you have to enter 16, 18, 20, and 22 for the four years, and the stock price now has to be calculated from the EPS and the P/E ratios. For the latter,

	A	E	F	G	H	I	J
60							
61							
62		2002	2003	2004	2005	2006	
63	Other Data						
64	Stock Price (year-end)	\$51.40	\$39.50	\$45.69	\$52.09	\$58.64	
65	Average Number of Shares Outstanding (millions)	46.2	46.2	46.2	46.2	46.2	
66							
67	Financial Indicators						
68	Valuation Ratios						
69	EPS	\$2.87	\$2.47	\$2.54	\$2.60	\$2.67	
70	Dividend per Share	\$0.87	\$0.99	\$1.02	\$1.04	\$1.07	
71	P/E Ratio	17.9	16.0	18.0	20.0	22.0	
72	P/B (price to book) Ratio	3.5	2.4	2.6	2.7	2.8	
73	Dividend Payout Ratio	30%	40%	40%	40%	40%	
74							
75	Profitability Ratios						
76	Return on Equity (ROE)	21.2%	16.0%	15.0%	14.1%	13.3%	
77	Return on Sales (ROS)	17.0%	13.9%	13.6%	13.2%	12.9%	
78							
79	Growth Rates						
80	EPS Growth Rate	1.4%	-14.1%	2.8%	2.6%	2.3%	
81	Dividend Growth Rate	2.1%	13.8%	2.8%	2.6%	2.3%	
82	Sales Growth Rate	2.6%	5.0%	5.0%	5.0%	5.0%	
83	EBIT Growth Rate	3.7%	-14.2%	2.6%	2.3%	2.1%	
84	Net Income Growth Rate	0.1%	-14.1%	2.8%	2.6%	2.3%	
85							
86	Liquidity Ratios						
87	Current Ratio	1.20	1.21	1.23	1.25	1.27	
88	Quick Ratio	0.49	0.47	0.48	0.49	0.50	
89							
90	Operating Efficiency Ratios						
91	Inventory Turnover Ratio	5.7	5.9	5.9	5.9	5.9	
92	Receivable Turnover Ratio	11.1	11.9	11.9	11.9	11.9	
93							
94	Leverage Ratios						
95	Total Debt to Total Capitalization	32.7%	30.6%	28.7%	27.0%	25.5%	
96	Long-Term Debt to Total Capitalization	21.7%	20.3%	19.1%	17.9%	16.9%	
97	Total Debt to Equity	48.5%	44.1%	40.3%	37.0%	34.1%	
98							
99	Coverage Ratios						
100	Times Interest Earned (TIE)	9.6	9.2	9.4	9.6	9.8	
101	Cash Coverage Ratio	12.8	13.0	13.7	14.3	15.1	
102							

FIGURE 6.9 Model 4: Projected financial indicators for Vitex Corp.

in F64 enter the formula =F69*F71 and copy it into the other cells. Because the balance sheet is not balanced, these numbers will not be quite correct. However, with the assumptions we are using, the DFN numbers are small and so the indicators are not too far off.

6. **Create the statements of cash flows:** To create the statements of cash flows (Figure 6.10), you only have to create the additional headings for the projection columns and copy over the formulas from the historical data area. Because the balance sheet is not balanced, the change in cash and marketable securities line from your statements of cash flow will differ from the “check” numbers. (The differences are related to the DFNs. See if you can reconcile them.)

Testing the Model

You have to thoroughly check a model like this. First check it line by line making sure you are using the right assumptions and the formulas you have entered are correct. Also make sure that you have copied over all the formulas for sub-totals and totals as well as for calculating the retained earnings and accumulated

	A	E	F	G	H	I	J
1	Statement of Cash Flows for Vitex Corp.						
2	Millions of Dollars						
3							
4							
5		2002	2003	2004	2005	2006	
6	Cash Flows from Operations						
7	Net Income	\$132.8	\$114.0	\$117.3	\$120.3	\$123.1	
8	Depreciation Expense	\$75.2	\$81.1	\$90.0	\$99.9	\$110.9	
9	Decrease/(Increase) in Accounts Receivable	(\$12.8)	\$2.4	(\$5.9)	(\$6.2)	(\$6.5)	
10	Decrease/(Increase) in Inventories	(\$1.9)	(\$6.5)	(\$6.2)	(\$6.5)	(\$6.8)	
11	Decrease/(Increase) in Other Current Assets	\$6.2	(\$9.0)	(\$5.3)	(\$5.6)	(\$5.9)	
12	Increase/(Decrease) in Accounts Payable	\$8.7	\$5.0	\$4.3	\$4.5	\$4.7	
13	Increase/(Decrease) in Other Current Liabilities	(\$60.8)	\$5.0	\$5.8	\$6.1	\$6.4	
14	Increase/(Decrease) in Deferred Income Taxes	(\$2.3)	\$6.9	\$1.0	\$1.0	\$1.1	
15	Increase/(Decrease) in Other Non-Current Liabilities	(\$20.5)	\$12.0	\$5.3	\$5.6	\$5.9	
16	Total Cash Flows from Operations	\$124.6	\$210.9	\$206.3	\$219.2	\$232.9	
17							
18	Cash Flows from Investing						
19	(Additions to) Property, Plant & Equipment	(\$92.3)	(\$100.4)	(\$111.5)	(\$123.8)	(\$137.4)	
20	(Investment) in Other Non-Current Assets	(\$49.3)	(\$45.6)	(\$50.2)	(\$55.2)	(\$60.7)	
21	Total Cash Flows from Investing	(\$141.6)	(\$146.1)	(\$161.7)	(\$179.0)	(\$198.1)	
22							
23	Cash Flows from Financing						
24	From Issuance/(Repayment) of Short-Term Debt	\$30.5	\$0.0	\$0.0	\$0.0	\$0.0	
25	From Issuance/(Repayment) of Long-Term Debt	\$16.3	\$0.0	\$0.0	\$0.0	\$0.0	
26	From Sale/(Repurchase) of Equity	\$6.6	\$0.0	\$0.0	\$0.0	\$0.0	
27	Cash Dividends Paid to Shareholders	(\$40.1)	(\$45.6)	(\$46.9)	(\$48.1)	(\$49.2)	
28	Total Cash Flows from Financing	\$13.3	(\$45.6)	(\$46.9)	(\$48.1)	(\$49.2)	
29							
30	Net Change in Cash & Marketable Securities	(\$3.7)	\$19.2	(\$2.3)	(\$7.9)	(\$14.4)	
31							
32							
33	Beginning Cash & Marketable Securities	\$32.1	\$28.4	\$29.4	\$30.9	\$32.4	
34	Ending Cash & Marketable Securities	\$28.4	\$29.4	\$30.9	\$32.4	\$34.1	
35	Net Change in Cash & Marketable Securities	(\$3.7)	\$1.0	\$1.5	\$1.5	\$1.6	
36							

FIGURE 6.10 Model 4: Projected statements of cash flows for Vitex Corp.

depreciation correctly. After that, look through the financial indicators and make sure that the variations from the historical numbers and among the four projected years seem consistent with the assumptions.

Uses of the Model

Even before we fix the problem that the balance sheet is not balanced it should be obvious that a model like this is essential for planning and other applications that I mentioned earlier. You can change any of the assumptions and see its impact. For example, the current projections paint a fairly bleak picture for the company. What steps can it take to improve things? What will happen if it can tighten up SG&A costs and reduce the ratio of SG&A to sales? You can check this out as well as many other possibilities quickly.

You can make the model even more flexible. For example, here we have assumed that growth rates or ratios to sale remain constant for all the four years. We could easily set up four different forecasting factors for the four years in four different columns and use them in the model. Writing and copying formulas using them will be easy. However, you should not get carried away with building in additional flexibilities. They generally require coming up with more and more assumptions and beyond a certain points these assumptions can just become a numbers game because our ability to see into the future in detail is quite limited. You should always try to use the minimum number of assumptions and not the maximum number.

We can also build into a model like this certain decision rules and constraints to see what the statements will look like under them. We will explore some such possibilities in the next few models.

MODEL 5: FINANCIAL STATEMENT FORECASTING, VERSION 1

The Problem

We saw in Model 4 that most of the time projected balance sheets will be out of balance and will indicate a need for discretionary financing. Modify the model so that it will automatically balance the balance sheet by adjusting the short-term debt, that is, using short-term debt as the plug. Keep all other assumptions the same.

Model characteristics: LTD is held constant and the balance sheet is balanced by varying STD, which can go negative (that is, it is not constrained to being zero or positive).

Modeling Strategy

We cannot just balance the balance sheet by adding the DFN amount to the short-term debt because any change in the short-term debt will change the inter-

est expense, which will change the short-term debt needed to balance the balance sheet and so forth. We have a circular reference here because the interest expense on short-term debt is supposed to be calculated based on the average balance for the year. If the interest expense were to be calculated using the year-beginning balance, which is fixed, then we would not have a circular reference and we would be able to balance the balance sheet by adding the DFN amount to the short-term debt.

You can think of the circular reference in more detail as follows: any change in short-term debt will change the interest expense, which will change the net income, which will change the retained earnings, which will change the short-term debt needed to bring the balance sheet into balance. If you are not familiar with circular reference, look it up in Chapter 3: Advanced Excel Features. As I explain there, to set up a circular reference you do not have to do anything other than turn on iteration and then just write your formulas the normal way. Excel will take care of the rest.

But what formula would you use to calculate short-term debt? It should equal total assets minus the sum of all liabilities and shareholders' equity lines other than the short-term debt line itself.

Because you will start with Model 4, once the income statements and balance sheets are updated, the financial indicators as well as the statements of cash flows will automatically update and will now have the correct numbers.

Building the Model

Start with a copy of Model 4 and make sure that Excel's iteration is on. Even though a circular reference is involved, you do not need to change the way the interest expense is calculated.

Because short-term debt is going to be the plug that balances the balance sheet, it must equal the difference between total assets and all other liabilities and total shareholders' equity. In F44 enter the formula `=F40-F55-SUM(F48:F50)-F43-F45`. The balance sheets will balance and the DFNs will become zero as in Figure 6.11. If you do a comparison with the balance sheet from Model 4, you will see that the change in the short-term debt (from the previous year-end balance) is a little different from the DFN we had there because of the effect of including the change in debt in the interest expense calculation.

Testing the Model

The only change we have made is in the calculation of the short-term debt. The balanced balance sheet is an indication that the model is working. To check that the circular reference is working properly, calculate the interest expense by hand using the debt balances from the balance sheet and make sure that it matches the model's result.

	A	E	F	G	H	I	J
1	Income Statement and Balance Sheet for Vitex Corp.						
2							
3	Income Statement (\$ Million)						
4							
5		2002	2003	2004	2005	2006	Forecasting Factor
6	Sales	\$1,334.4	\$1,401.1	\$1,471.2	\$1,544.7	\$1,622.0	6.0%
7	Cost of Sales	\$667.0	\$728.6	\$765.0	\$803.3	\$843.4	52.0%
8	Gross Operating Income	\$667.4	\$672.5	\$706.2	\$741.5	\$778.5	
9							
10	Selling, General & Admn. Expenses	\$373.3	\$406.3	\$426.6	\$448.0	\$470.4	29.0%
11	Depreciation	\$75.2	\$81.1	\$90.0	\$99.9	\$110.9	8.0%
12	Other Net(Income)/Expenses	(\$8.2)	(\$9.8)	(\$10.3)	(\$10.8)	(\$11.4)	-0.7%
13	EBIT	\$227.1	\$194.9	\$199.8	\$204.4	\$208.6	
14							
15	Interest (Income)	(\$2.0)	(\$1.7)	(\$1.8)	(\$1.9)	(\$2.0)	6.0%
16	Interest Expense	\$23.7	\$20.6	\$20.0	\$20.5	\$21.4	7.0%
17	Pre-Tax Income	\$205.4	\$176.1	\$181.6	\$185.8	\$189.3	
18							
19	Income Taxes	\$72.6	\$61.6	\$63.6	\$65.0	\$66.2	35.0%
20	Net Income	\$132.8	\$114.5	\$118.0	\$120.8	\$123.0	
21							
22	Dividends	\$40.1	\$45.8	\$47.2	\$48.3	\$49.2	40.0%
23	Addition to Retained Earnings	\$92.7	\$68.7	\$70.8	\$72.5	\$73.8	
24							
25	Balance Sheet (\$ Million)						
26	Assets						
27	Cash and Marketable Securities	\$28.4	\$29.4	\$30.9	\$32.4	\$34.1	2.1%
28	Accounts Receivable	\$120.1	\$117.7	\$123.6	\$129.8	\$136.2	8.4%
29	Inventories	\$116.8	\$123.3	\$129.5	\$135.9	\$142.7	8.8%
30	Other Current Assets	\$97.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
31	Total Current Assets	\$362.8	\$376.9	\$395.7	\$415.6	\$436.3	
32							
33	Property, Plant and Equipment, Gross	\$913.1	\$1,013.5	\$1,125.0	\$1,248.8	\$1,386.2	11.0%
34	Accumulated Depreciation	\$427.9	\$509.0	\$599.0	\$698.9	\$809.8	
35	Property, Plant and Equipment, Net	\$485.2	\$504.6	\$526.0	\$549.9	\$576.4	
36							
37	Other Non-Current Assets	\$456.3	\$501.9	\$552.1	\$607.3	\$668.1	10.0%
38	Total Non-Current Assets	\$941.5	\$1,006.5	\$1,078.2	\$1,157.2	\$1,244.4	
39							
40	Total Assets	\$1,304.3	\$1,383.4	\$1,473.9	\$1,572.8	\$1,680.7	
41							
42	Liabilities and Shareholders' Equity						
43	Accounts Payable	\$80.5	\$85.5	\$89.7	\$94.2	\$98.9	6.1%
44	Short-Term Debt	\$110.3	\$91.8	\$95.2	\$104.3	\$120.4	
45	Other Current Liabilities	\$111.3	\$116.3	\$122.1	\$128.2	\$134.6	8.3%
46	Total Current Liabilities	\$302.1	\$293.6	\$307.0	\$326.8	\$354.0	
47							
48	Long-Term Debt	\$218.1	\$218.1	\$218.1	\$218.1	\$218.1	
49	Deferred Income Taxes	\$12.7	\$19.6	\$20.6	\$21.6	\$22.7	1.4%
50	Other Non-Current Liabilities	\$94.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
51	Total Liabilities	\$627.4	\$637.8	\$657.5	\$683.9	\$718.1	
52							
53	Paid-In Capital	\$44.8	\$44.8	\$44.8	\$44.8	\$44.8	
54	Retained Earnings	\$632.1	\$700.8	\$771.6	\$844.1	\$917.9	
55	Total Shareholders' Equity	\$676.9	\$745.6	\$816.4	\$888.9	\$962.7	
56							
57	Total Liabilities and Shareholders' Equity	\$1,304.3	\$1,383.4	\$1,473.9	\$1,572.8	\$1,680.7	
58							
59	Discretionary Funding Need (DFN)		\$0.0	\$0.0	\$0.0	\$0.0	
60							
61							

FIGURE 6.11 Model 5: Projected financial statements for Vitex Corp. with balanced balance sheets.

Uses of the Model

This model has all the versatilities of Model 4 and it also produces the correct answers in that the balance sheet is balanced and the interest expense ties to the debt levels. However, what if under some changes in assumptions the company generates enough additional cash to pay off all the short-term debt? Under this model we will end up with a negative short-term debt, which makes sense if we think of it as investment of excess funds, but at the very least it may look confusing, and to the extent that interest rate on investments is different from interest rate on debt, the net income will not be exactly right. We will make the necessary modifications in the next model.

MODEL 6: FINANCIAL STATEMENT FORECASTING, VERSION 2

The Problem

In Model 5 we saw that under the assumptions made, Vitex's performance is projected to be weak for 2003–2006. In looking for ways to improve performance, management wants to know what the projections will look like if it can accomplish the following: lower the ratio of cost of sales to sales to 50%, and slow the growth rates of both gross PP&E and other non-current assets to 8% per year.

Model characteristics: Same as Version 1 but with different forecasting factors (input assumptions) that make STD negative in certain years. (LTD is held constant and the balance sheet is balanced by varying STD, which can go negative because it is not constrained to being zero or positive).

Modeling Strategy

Because of the way we have set up the model by using forecasting factors instead of hard coding the different assumptions, making these changes are easy. Reflect the suggested changes in the Assumptions sheet, which you should always do to keep track of things, and then change the three forecasting factors in the Model sheet.

Building the Model

Start with a copy of Model 5 and change the three forecasting factors. The results should match those shown in Figure 6.12.

Discussion of the Results

As expected, if these operating goals can be achieved, then Vitex's performance will improve significantly over the years. Study the financial statements and the

	A	E	F	G	H	I	J
1	Income Statement and Balance Sheet for Vitex Corp.						
2							
3	Income Statement (\$ Million)						
4							
5		2002	2003	2004	2005	2006	Forecasting Factor
6	Sales	\$1,334.4	\$1,401.1	\$1,471.2	\$1,544.7	\$1,622.0	5.0%
7	Cost of Sales	\$667.0	\$700.6	\$735.6	\$772.4	\$811.0	50.0%
8	Gross Operating Income	\$667.4	\$700.6	\$735.6	\$772.4	\$811.0	
9							
10	Selling, General & Admn. Expenses	\$373.3	\$406.3	\$426.6	\$448.0	\$470.4	29.0%
11	Depreciation	\$75.2	\$78.9	\$85.2	\$92.0	\$99.4	8.0%
12	Other Net (Income)/Expenses	(\$8.2)	(\$9.8)	(\$10.3)	(\$10.8)	(\$11.4)	-0.7%
13	EBIT	\$227.1	\$225.2	\$234.0	\$243.2	\$252.6	
14							
15	Interest (Income)	(\$2.0)	(\$1.7)	(\$1.8)	(\$1.9)	(\$2.0)	6.0%
16	Interest Expense	\$23.7	\$18.9	\$14.9	\$11.3	\$7.5	7.0%
17	Pre-Tax Income	\$205.4	\$207.9	\$221.0	\$233.8	\$247.1	
18							
19	Income Taxes	\$72.6	\$72.8	\$77.3	\$81.8	\$86.5	35.0%
20	Net Income	\$132.8	\$135.2	\$143.6	\$152.0	\$160.6	
21							
22	Dividends	\$40.1	\$54.1	\$57.5	\$60.8	\$64.2	40.0%
23	Addition to Retained Earnings	\$92.7	\$81.1	\$86.2	\$91.2	\$96.4	
24							
25	Balance Sheet (\$ Million)						
26	Assets						
27	Cash and Marketable Securities	\$28.4	\$29.4	\$30.9	\$32.4	\$34.1	2.1%
28	Accounts Receivable	\$120.1	\$117.7	\$123.6	\$129.8	\$136.2	8.4%
29	Inventories	\$116.8	\$123.3	\$129.5	\$135.9	\$142.7	8.8%
30	Other Current Assets	\$97.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
31	Total Current Assets	\$362.8	\$376.9	\$395.7	\$415.5	\$436.3	
32							
33	Property, Plant and Equipment, Gross	\$913.1	\$986.1	\$1,065.0	\$1,150.2	\$1,242.3	8.0%
34	Accumulated Depreciation	\$427.9	\$506.8	\$592.0	\$684.0	\$783.4	
35	Property, Plant and Equipment, Net	\$485.2	\$479.4	\$473.0	\$466.2	\$458.9	
36							
37	Other Non-Current Assets	\$456.3	\$492.8	\$532.2	\$574.8	\$620.8	8.0%
38	Total Non-Current Assets	\$941.5	\$972.2	\$1,005.3	\$1,041.0	\$1,079.7	
39							
40	Total Assets	\$1,304.3	\$1,349.1	\$1,401.0	\$1,456.6	\$1,516.0	
41							
42	Liabilities and Shareholders' Equity						
43	Accounts Payable	\$80.5	\$85.5	\$89.7	\$94.2	\$98.9	6.1%
44	Short-Term Debt	\$110.3	\$45.1	(\$5.5)	(\$58.4)	(\$113.4)	
45	Other Current Liabilities	\$111.3	\$116.3	\$122.1	\$128.2	\$134.6	8.3%
46	Total Current Liabilities	\$302.1	\$246.9	\$206.3	\$164.1	\$120.2	
47							
48	Long-Term Debt	\$218.1	\$218.1	\$218.1	\$218.1	\$218.1	
49	Deferred Income Taxes	\$12.7	\$19.6	\$20.6	\$21.6	\$22.7	1.4%
50	Other Non-Current Liabilities	\$94.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
51	Total Liabilities	\$627.4	\$591.1	\$556.8	\$521.2	\$484.2	
52							
53	Paid-In Capital	\$44.8	\$44.8	\$44.8	\$44.8	\$44.8	
54	Retained Earnings	\$632.1	\$713.2	\$799.4	\$890.6	\$986.9	
55	Total Shareholders' Equity	\$676.9	\$758.0	\$844.2	\$935.4	\$1,031.7	
56							
57	Total Liabilities and Shareholders' Equity	\$1,304.3	\$1,349.1	\$1,401.0	\$1,456.6	\$1,516.0	
58							
59	Discretionary Funding Need (DFN)		\$0.0	\$0.0	\$0.0	\$0.0	
60							
61							

FIGURE 6.12 Model 6: Projected financial statements for Vitex Corp. with negative short-term debt.

various financial indicators from this version with those from the previous version to see how these changes affect them and if the changes agree with what you intuitively expected. Trying to guess how any change in assumptions will affect the statements and financial indicators and then confirming your intuitions by making the changes in the model is one of the best ways to develop a deeper understanding of financial statements. I strongly recommend that you spend some time playing such “what if” games on your own.

Under the new assumptions, Vitex will generate enough excess cash over the years to pay off all the short-term debt. Because the short-term debt is used as the only line that can be changed to balance the balance sheet (for example, we are not allowing repayment of long-term debt) in the outer years, the excess cash generated actually makes the short-term debt negative. We therefore need to incorporate some additional financial policies in the model to handle this situation.

You will also notice that the dividends increase sharply in 2003 onwards, in part because we have required that 40% of net income is paid out in dividends every year. However, corporations generally prefer to grow dividends at a steady pace instead of allowing them to jump around with earnings. We will see that we can incorporate more sophisticated dividend policies into the model to reflect the way management is likely set dividends in the future.

MODEL 7: FINANCIAL STATEMENT FORECASTING, VERSION 3

The Problem

In the previous model, we saw that under certain circumstances the short-term debt level can go negative because the company generates cash in excess of what can be used to pay off all short-term debt. In practice, this obviously cannot happen, and a company may pursue the following policy: Maintain a specified minimum level of C&MS, use excess cash beyond that to pay off STD, and if all STD is paid off then deposit excess cash in the C&MS account. Modify Model 6 to incorporate this policy. Assume that the desired minimum level for C&MS is zero.

Model characteristics: Builds on Version 2, which has the same modeling logic as Version 1 but a few different input assumptions. STD used as the plug but is not allowed to go negative. Once all STD is paid off, any additional cash is used to build C&MS. Minimum level for C&MS is zero. (LTD is held constant.)

Modeling Strategy

The output of the model is shown in Figure 6.13. The logic to impose the required constraints is somewhat complex and we have to build it up in steps. Let us start by assuming that the C&MS account does not even exist. In this case, we can calculate a value for STD—let us call it P —that will balance the balance sheet. We can calculate P as:

	A	E	F	G	H	I	J
1	Income Statement and Balance Sheet for Vitex Corp.						
2							
3	Income Statement (\$ Million)						
4				Forecast Period			Forecasting Factor
5		2002	2003	2004	2005	2006	
6	Sales	\$1,334.4	\$1,401.1	\$1,471.2	\$1,544.7	\$1,622.0	5.0%
7	Cost of Sales	\$667.0	\$700.6	\$735.6	\$772.4	\$811.0	50.0%
8	Gross Operating Income	\$667.4	\$700.6	\$735.6	\$772.4	\$811.0	
9							
10	Selling, General & Admn. Expenses	\$373.3	\$406.3	\$426.6	\$448.0	\$470.4	29.0%
11	Depreciation	\$75.2	\$78.9	\$85.2	\$92.0	\$99.4	8.0%
12	Other Net (Income)/Expenses	(\$8.2)	(\$9.8)	(\$10.3)	(\$10.8)	(\$11.4)	-0.7%
13	EBIT	\$227.1	\$226.2	\$234.0	\$243.2	\$252.6	
14							
15	Interest (Income)	(\$2.0)	(\$0.9)	(\$1.1)	(\$3.8)	(\$7.1)	6.0%
16	Interest Expense	\$23.7	\$17.9	\$14.0	\$13.5	\$13.5	7.0%
17	Pre-Tax Income	\$205.4	\$208.1	\$221.1	\$233.5	\$246.2	
18							
19	Income Taxes	\$72.6	\$72.8	\$77.4	\$81.7	\$86.2	35.0%
20	Net Income	\$132.8	\$135.3	\$143.7	\$151.8	\$160.0	
21							
22	Dividends	\$40.1	\$54.1	\$57.5	\$60.7	\$64.0	40.0%
23	Addition to Retained Earnings	\$92.7	\$81.2	\$86.2	\$91.1	\$96.0	
24							
25	Balance Sheet (\$ Million)						
26	Assets						
27	Cash and Marketable Securities	\$28.4	\$0.0	\$36.5	\$90.8	\$147.1	
28	Accounts Receivable	\$120.1	\$117.7	\$123.6	\$129.8	\$136.2	8.4%
29	Inventories	\$116.8	\$123.3	\$129.5	\$135.9	\$142.7	8.8%
30	Other Current Assets	\$97.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
31	Total Current Assets	\$362.8	\$347.5	\$401.4	\$473.9	\$549.4	
32							
33	Property, Plant and Equipment, Gross	\$913.1	\$986.1	\$1,065.0	\$1,150.2	\$1,242.3	8.0%
34	Accumulated Depreciation	\$427.9	\$506.8	\$592.0	\$684.0	\$783.4	
35	Property, Plant and Equipment, Net	\$485.2	\$479.4	\$473.0	\$466.2	\$458.9	
36							
37	Other Non-Current Assets	\$456.3	\$492.8	\$532.2	\$574.8	\$620.8	8.0%
38	Total Non-Current Assets	\$941.5	\$972.2	\$1,005.3	\$1,041.0	\$1,079.7	
39							
40	Total Assets	\$1,304.3	\$1,319.6	\$1,406.6	\$1,514.9	\$1,629.0	
41							
42	Liabilities and Shareholders' Equity						
43	Accounts Payable	\$80.5	\$85.5	\$89.7	\$94.2	\$98.9	6.1%
44	Short-Term Debt	\$110.3	\$15.6	\$0.0	\$0.0	\$0.0	
45	Other Current Liabilities	\$111.3	\$116.3	\$122.1	\$128.2	\$134.6	8.3%
46	Total Current Liabilities	\$302.1	\$217.4	\$211.8	\$222.4	\$233.6	
47							
48	Long-Term Debt	\$218.1	\$218.1	\$218.1	\$218.1	\$218.1	
49	Deferred Income Taxes	\$12.7	\$19.6	\$20.6	\$21.6	\$22.7	1.4%
50	Other Non-Current Liabilities	\$94.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
51	Total Liabilities	\$627.4	\$561.6	\$562.4	\$579.6	\$597.6	
52							
53	Paid-In Capital	\$44.8	\$44.8	\$44.8	\$44.8	\$44.8	
54	Retained Earnings	\$632.1	\$713.3	\$799.5	\$890.6	\$986.6	
55	Total Shareholders' Equity	\$676.9	\$758.1	\$844.3	\$935.4	\$1,031.4	
56							
57	Total Liabilities and Shareholders' Equity	\$1,304.3	\$1,319.6	\$1,406.6	\$1,514.9	\$1,629.0	
58							
59							
60							
61							

FIGURE 6.13 Model 7: Projected financial statements for Vitex Corp. with no negative short-term debt.

$$P = \text{Sum of all asset accounts except C\&MS} \\ - \text{Sum of all liability and shareholders' equity accounts except STD}$$

P will balance the balance sheet (ignoring C&MS), but it can go negative. Let us define STD as:

$$\text{STD} = \text{Max}(P, 0)$$

Once STD is calculated using this condition, the full balance sheet (including the C&MS account) must also balance. Therefore, we can calculate the C&MS using the equation:

$$\text{C\&MS} = \text{Total liabilities and shareholders' equity} \\ - \text{Sum of all asset accounts except C\&MS}$$

The key difference between this equation and the one for P is that here we are using the total liabilities and shareholders' equity including the STD. Make sure you understand the logic, and once you do you can easily implement it starting with a copy of Model 6.

Building the Model

Start with a copy of Model 6.

1. **Calculate STD:** In cell F44, enter the formula `=MAX((SUM(F28:F30)+F38)-(F55+SUM(F48:F50)+F43+F45),0)`. The first argument of the MAX function is the P we defined above. The first part of it relates to the asset side and the second part to the liability side following the definition. Copy and paste the formula into the cells for the other years.
2. **Calculate C&MS:** In cell F27 enter the formula `=F57-(SUM(F28:F30)+F38)`. Copy and paste the formula into the cells for the other years.

Testing the Model

Check to make sure that the balance sheet is balanced and STD does not go negative. You should also check the interest income and interest expense numbers to make sure that they tie to the balance sheet numbers. Remember that they are being calculated based on the average balances. Even though the C&MS balance at the end of year 2003 is projected to be zero, the average balance is not zero and there is some interest income in 2003.

Uses of the Model

This is a more realistic model. It does not necessarily provide more useful information, but it is better than handing someone a balance sheet with negative debt numbers because that may confuse some people and they may even consider it to be wrong.

MODEL 8: FINANCIAL STATEMENT FORECASTING, VERSION 4

The Problem

In Model 7 we set the minimum level for C&MS at zero. Most corporations, though, would want to have some C&MS in hand. Modify the model so that C&MS will be a minimum of \$20 million and will be higher if there is excess cash left after all STD is repaid.

Model Characteristics: Builds on Version 3. STD is used as the plug but is not allowed to go negative. Minimum level for C&MS is \$20 million. Once all STD is paid off, any additional cash is used to build C&MS. (LTD is held constant.)

Modeling Strategy

The financial statements for this model are shown in Figure 6.14. The logic for this model is similar to that for Version 3 except that here instead of completely ignoring the C&MS account to start with, we can assume that it has a fixed balance of \$20 million. We will therefore add 20 to the asset side in our calculation for P. After that, we can calculate the C&MS account using the same formula as before because the full balance sheet has to balance. Think through the logic and then implement it starting with a copy of Model 7.

Building the Model

Start with a copy of Model 7. In J27 enter 20 as the minimum required balance for C&MS. Then in F44 enter the formula `=MAX((SUM(F28:F30)+F38+J27)-(F55+SUM(F48:F50)+F43+F45),0)`.

The only change here is that we are including the minimum required C&MS on the asset side by including the reference to the cell \$J\$27.

Testing the Model

Test it by first making sure that the C&MS balance is 20, but not higher, as long as STD is positive. It should go above that level only when STD drops to zero. To make sure that the logic is working properly, vary the minimum C&MS level and make sure that the model is responding appropriately.

Uses of the Model

This model is even more realistic than the previous model because all corporations would want to keep a minimum balance in the C&MS account. This level does not have to be constant. For example, if the corporation wants to maintain a C&MS level tied to sales, (for example, 2.1% of sales as in the original assumptions), we can enter 2.1% in cell J27 and then in F44 enter the formula `=MAX((SUM(F28:F30)+F38+J27*F6)-(F55+SUM(F48:F50)+F43+F45),0)` and copy and paste it for the other years.

	A	E	F	G	H	I	J
1	Income Statement and Balance Sheet for Vitex Corp.						
2							
3	Income Statement (\$ Million)						
4							
5							
6		2002	2003	2004	2005	2006	Forecasting Factor
6	Sales	\$1,334.4	\$1,401.1	\$1,471.2	\$1,544.7	\$1,622.0	5.0%
7	Cost of Sales	\$667.0	\$700.6	\$735.6	\$772.4	\$811.0	50.0%
8	Gross Operating Income	\$667.4	\$700.6	\$735.6	\$772.4	\$811.0	
9							
10	Selling, General & Admn. Expenses	\$373.3	\$406.3	\$426.6	\$448.0	\$470.4	29.0%
11	Depreciation	\$75.2	\$78.9	\$85.2	\$92.0	\$99.4	8.0%
12	Other Net (Income)/Expenses	(\$8.2)	(\$9.8)	(\$10.3)	(\$10.8)	(\$11.4)	-0.7%
13	EBIT	\$227.1	\$225.2	\$234.0	\$243.2	\$252.6	
14							
15	Interest (Income)	(\$2.0)	(\$1.5)	(\$1.7)	(\$3.8)	(\$7.1)	6.0%
16	Interest Expense	\$23.7	\$18.6	\$14.7	\$13.5	\$13.5	7.0%
17	Pre-Tax Income	\$205.4	\$208.0	\$221.0	\$233.5	\$246.2	
18							
19	Income Taxes	\$72.6	\$72.8	\$77.3	\$81.7	\$86.2	35.0%
20	Net Income	\$132.8	\$135.2	\$143.6	\$151.8	\$160.0	
21							
22	Dividends	\$40.1	\$54.1	\$57.5	\$60.7	\$64.0	40.0%
23	Addition to Retained Earnings	\$92.7	\$81.1	\$86.2	\$91.1	\$96.0	
24							
25	Balance Sheet (\$ Million)						
26	Assets						
27	Cash and Marketable Securities	\$28.4	\$20.0	\$36.4	\$90.7	\$147.0	20
28	Accounts Receivable	\$120.1	\$117.7	\$123.6	\$129.8	\$136.2	8.4%
29	Inventories	\$116.8	\$123.3	\$129.5	\$135.9	\$142.7	8.8%
30	Other Current Assets	\$97.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
31	Total Current Assets	\$362.8	\$367.5	\$401.3	\$473.8	\$549.3	
32							
33	Property, Plant and Equipment, Gross	\$913.1	\$986.1	\$1,055.0	\$1,150.2	\$1,242.3	8.0%
34	Accumulated Depreciation	\$427.9	\$506.8	\$592.0	\$684.0	\$783.4	
35	Property, Plant and Equipment, Net	\$485.2	\$479.4	\$473.0	\$466.2	\$458.9	
36							
37	Other Non-Current Assets	\$456.3	\$492.8	\$532.2	\$574.8	\$620.8	8.0%
38	Total Non-Current Assets	\$941.5	\$972.2	\$1,005.3	\$1,041.0	\$1,079.7	
39							
40	Total Assets	\$1,304.3	\$1,339.6	\$1,406.6	\$1,514.8	\$1,628.9	
41							
42	Liabilities and Shareholders' Equity						
43	Accounts Payable	\$80.5	\$85.5	\$89.7	\$94.2	\$98.9	6.1%
44	Short-Term Debt	\$110.3	\$35.7	\$0.0	\$0.0	\$0.0	
45	Other Current Liabilities	\$111.3	\$116.3	\$122.1	\$128.2	\$134.6	8.3%
46	Total Current Liabilities	\$302.1	\$237.4	\$211.8	\$222.4	\$233.6	
47							
48	Long-Term Debt	\$218.1	\$218.1	\$218.1	\$218.1	\$218.1	
49	Deferred Income Taxes	\$12.7	\$19.6	\$20.6	\$21.6	\$22.7	1.4%
50	Other Non-Current Liabilities	\$94.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
51	Total Liabilities	\$627.4	\$581.6	\$562.4	\$579.6	\$597.6	
52							
53	Paid-In Capital	\$44.8	\$44.8	\$44.8	\$44.8	\$44.8	
54	Retained Earnings	\$632.1	\$713.2	\$799.4	\$890.5	\$986.5	
55	Total Shareholders' Equity	\$676.9	\$758.0	\$844.2	\$935.3	\$1,031.3	
56							
57	Total Liabilities and Shareholders' Equity	\$1,304.3	\$1,339.6	\$1,406.6	\$1,514.8	\$1,628.9	
58							
59							
60							
61							

FIGURE 6.14 Model 8: Projected financial statements for Vitex Corp. with minimum cash balance.

MODEL 9: FINANCIAL STATEMENT FORECASTING, VERSION 5

The Problem

One problem you will notice with the current projections is that because management is willing to go up to a dividend payout ratio of 40% (from 30% in 2002) and EPS is growing, the dividend goes up sharply in 2003. Management generally wants to grow dividend at a steady pace and so it may want to impose the additional condition that dividend per share will not be increased by more than 10% in any year. Incorporate this additional restriction on the Version 4 model.

Model Characteristics: STD is used as the plug but is not allowed to go negative. Once all STD is paid off, any additional cash is used to build C&MS. Minimum level for C&MS is \$20 million. LTD remains constant. Dividend payout can go up to 40% but dividend per share cannot grow more than 10% in any year.

Modeling Strategy

This is another realistic constraint and is easy to implement. In calculating total dividend amount for a year, the model now has to calculate it in two ways, once as 40% of net income and once at a per share dividend rate 10% higher than the previous year and then select the lower of the two.

It is important to remember that the growth rate constraint is on dividend per share and not total dividend. If number of shares outstanding remains the same then the two are the same; but if shares outstanding increase or decrease then they will not be. You have to apply the constraint carefully on the right variable.

Building the Model

Start with a copy of Model 8. In J21, enter 10% to use for the constraint on dividend growth rate. Then in cell F22 enter the formula `=MIN(F20*J22, E22*(1+J21)*F65/E65)`. The first argument here calculates the total dividend based on the payout ratio constraint as before. The second argument calculates the total dividend for the current year using the maximum growth rate allowable per year. The multiplication by F65/E65 effectively first converts the previous year's total dividend to a per share number, and then converts the maximum allowable per share dividend for the current year to a total dividend number.

Testing the Model

You can check the model by changing some of the numbers to make sure that under different conditions different constraints become binding. You can also look at the dividend growth rates from before (Model 8) and after applying the new constraints (this model) and notice that dividend is now growing at 10% per year whereas it was growing much faster before.

Uses of the Model

This model again shows that once you have the basic structure of a forecasting model, you can easily add conditions to make it more and more realistic.

MODEL 10: FINANCIAL STATEMENT FORECASTING, VERSION 6

The Problem

In practice, long-term debts come due over time. For preliminary planning it is often assumed that as they come due, long-term debt will be paid off and be effectively replaced by STD because it is the balancing account. Modify Model 9 to accommodate a long-term debt repayment schedule. Assume that any long-term debt repaid carries an interest rate of 9% per year.

Model Characteristics: STD is used as the plug but is not allowed to go negative. Once all STD is paid off, any additional cash is used to build C&MS. Minimum level for C&MS is \$20 million. LTD is paid off as they mature based on a schedule. Dividend payout can go up to 40%, but dividend per share cannot grow more than 10% in any year.

Modeling Strategy

The projected financial statements for this model are shown in Figure 6.15. If long-term debt level on the balance sheet is reduced as they mature based on the specified schedule, the model as it is set up will automatically make the necessary adjustments to the STD and C&MS accounts and maintain a balanced balance sheet.

You have to reduce the interest expense for the long-term debt that is being paid off. Because we are calculating interest expense based on average balance, the reduction for the first year will have to be calculated on half the repayment in the first year. For the second year it will be on the full repayment for the first year plus half of the repayment for the second year, and so forth. We have to take this somewhat complex approach because our interest expense calculation already includes total interest expense on all the long-term debt that is outstanding at the end of 2002. We are now deducting the reduction in long-term interest expense relative to that.

Building the Model

Start with a copy of Model 9.

1. **Create LTD repayment schedule:** In row 59, enter the label "Long-term debt repayment for the year" and in F59:I59 enter the debt amounts to be repaid in different years.

	A	E	F	G	H	I	J
1	Income Statement and Balance Sheet for Vitex Corp.						
2							
3	Income Statement (\$ Million)						
4		Forecast Period					Forecasting
5		2002	2003	2004	2005	2006	Factor
6	Sales	\$1,334.4	\$1,401.1	\$1,471.2	\$1,544.7	\$1,622.0	5.0%
7	Cost of Sales	\$667.0	\$700.6	\$735.6	\$772.4	\$811.0	50.0%
8	Gross Operating Income	\$667.4	\$700.6	\$735.6	\$772.4	\$811.0	
9							
10	Selling, General & Admn. Expenses	\$373.3	\$406.3	\$426.6	\$448.0	\$470.4	29.0%
11	Depreciation	\$75.2	\$78.9	\$85.2	\$92.0	\$99.4	8.0%
12	Other Net (Income)/Expenses	(\$8.2)	(\$9.8)	(\$10.3)	(\$10.8)	(\$11.4)	-0.7%
13	EBIT	\$227.1	\$225.2	\$234.0	\$243.2	\$252.6	
14							
15	Interest (Income)	(\$2.0)	(\$1.5)	(\$1.2)	(\$2.4)	(\$4.7)	6.0%
16	Interest Expense	\$23.7	\$18.0	\$12.4	\$9.1	\$6.8	7.0%
17	Pre-Tax Income	\$205.4	\$208.6	\$222.8	\$236.5	\$250.5	9.0%
18							
19	Income Taxes	\$72.6	\$73.0	\$78.0	\$82.8	\$87.7	35.0%
20	Net Income	\$132.8	\$135.6	\$144.8	\$153.7	\$162.8	
21							10%
22	Dividends	\$40.1	\$44.1	\$48.5	\$53.4	\$58.7	40.0%
23	Addition to Retained Earnings	\$92.7	\$91.5	\$96.3	\$100.3	\$104.1	
24							
25	Balance Sheet (\$ Million)						
26	Assets						
27	Cash and Marketable Securities	\$28.4	\$20.0	\$20.0	\$60.5	\$94.9	20
28	Accounts Receivable	\$120.1	\$117.7	\$123.6	\$129.8	\$136.2	8.4%
29	Inventories	\$116.8	\$123.3	\$129.5	\$135.9	\$142.7	8.8%
30	Other Current Assets	\$97.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
31	Total Current Assets	\$362.8	\$367.5	\$384.9	\$443.6	\$497.1	
32							
33	Property, Plant and Equipment, Gross	\$913.1	\$986.1	\$1,065.0	\$1,150.2	\$1,242.3	8.0%
34	Accumulated Depreciation	\$427.9	\$506.8	\$592.0	\$684.0	\$783.4	
35	Property, Plant and Equipment, Net	\$485.2	\$479.4	\$473.0	\$466.2	\$458.9	
36							
37	Other Non-Current Assets	\$456.3	\$492.8	\$532.2	\$574.8	\$620.8	8.0%
38	Total Non-Current Assets	\$941.5	\$972.2	\$1,005.3	\$1,041.0	\$1,079.7	
39							
40	Total Assets	\$1,304.3	\$1,339.6	\$1,390.1	\$1,484.6	\$1,576.8	
41							
42	Liabilities and Shareholders' Equity						
43	Accounts Payable	\$80.5	\$85.5	\$89.7	\$94.2	\$98.9	6.1%
44	Short-Term Debt	\$110.3	\$50.3	\$3.1	\$0.0	\$0.0	
45	Other Current Liabilities	\$111.3	\$116.3	\$122.1	\$128.2	\$134.6	8.3%
46	Total Current Liabilities	\$302.1	\$252.1	\$214.9	\$222.4	\$233.6	
47							
48	Long-Term Debt	\$218.1	\$193.1	\$178.1	\$158.1	\$128.1	
49	Deferred Income Taxes	\$12.7	\$19.6	\$20.6	\$21.6	\$22.7	1.4%
50	Other Non-Current Liabilities	\$94.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
51	Total Liabilities	\$627.4	\$571.3	\$525.4	\$519.6	\$507.6	
52							
53	Paid-in Capital	\$44.8	\$44.8	\$44.8	\$44.8	\$44.8	
54	Retained Earnings	\$632.1	\$723.6	\$819.9	\$920.2	\$1,024.3	
55	Total Shareholders' Equity	\$676.9	\$768.4	\$864.7	\$965.0	\$1,069.1	
56							
57	Total Liabilities and Shareholders' Equity	\$1,304.3	\$1,339.6	\$1,390.1	\$1,484.6	\$1,576.8	
58							
59	Long-term Debt Repayment for the Year		25	15	20	30	
60							
61							

FIGURE 6.15 Model 10: Projected financial statements for Vitex Corp. with declining long-term debt.

2. **Adjust long-term debt levels:** In F48 enter the formula $=E48-F59$ to reduce long-term debt balance from previous year-end by the planned repayment for the projection year. Copy the formula over for the other years.
3. **Adjust interest expense:** In cell J17 enter the long-term interest rate of 9% to be used for repayments. Insert comments in J16 and J17 to explain what the two different rates are.

In cell F16 enter the formula $=13.5+J\$16*(E44+F44)/2-(\$F59/2)*J\$17$. This reduces the interest expense by the interest on half the long-term debt to be repaid during the year.

In cell G16 enter the formula $=13.5+J\$16*(F44+G44)/2-(\$F59+\$G59/2)*J\17 for reasons explained earlier.

In cell H16 enter the formula $=13.5+J\$16*(G44+H44)/2-(\$F59+\$G59+\$H59/2)*J\$17$.

In cell I16 enter the formula $=13.5+J\$16*(H44+I44)/2-(\$F59+\$G59+\$H59+\$I59/2)*J\17 .

Testing the Model

Check that the long-term debt balance is declining by the correct amounts. Check the interest expense numbers by hand calculation. Although it is not necessary to do so, as a challenge see if you can reconcile the total debt and C&MS account balances for this Model with those in Model 9. (Hint: You may find it easier to do so if you first set the interest rates to zero.)

Uses of the Model

This is another step in making the model realistic. In practice, a model like this can be tied to a corporation's debt repayment schedule and the interest rate reductions can be based on the interest rates on the actual debts maturing. The assumption that as long-term debts mature they will be replaced by short-term debt may not be completely realistic. Management may want to impose a policy of maintaining a specific relationship between short-term and long-term debt (for example, long-term debt will be 60% of total debt).

MODEL 11: FINANCIAL STATEMENT FORECASTING, VERSION 7

The Problem

Management has decided that, in the projections, it wants to maintain a target capital structure of 30% debt and 70% equity. Within debt, it wants to have 40% short-term debt and 60% long-term debt. Stocks will be issued or bought back as needed at the average price for the year. As before, stock price at the end of each year will be estimated based on the assumed P/E ratios applied to the EPS

for the year just ended and calculated using the average number of shares that were outstanding during the year. The interest rate on long-term debt, whether issued or repaid, will be at 9%. Calculate C&MS as 2.1% of sales.

Model Characteristics: Total capitalization is used as plug and target capital structure is maintained. C&MS balance is calculated as percentage of sale. Dividend payout can go up to 40%, but dividend per share cannot grow more than 10% in any year.

Modeling Strategy

The financial statements for this model are shown in Figures 6.16 and 6.17. Start by noting all the changes to be made in the assumptions sheet.

The key difference in this model is that the total capitalization (the sum of short-term debt, long-term debt, and total shareholders' equity) is now the plug. Every year you have to calculate the plug amount as the difference between total assets and the sum of all other liability items, and then allocate it among the three categories of capital in the target proportions.

For simplicity, assume that the paid-in capital remains unchanged—although in practice, if stocks are issued or repurchased, this account will be adjusted. If you had enough information, you could easily allocate any stock issuance or repurchase between paid-in capital and retained earnings. But here do all the adjustments in the retained earnings account because financially it makes no difference. This also means that you will not calculate retained earnings as the sum of the previous year's retained earnings and the current year's addition to it anymore. Instead, after you have calculated the retained earnings as discussed (that is, based on the plug), you can calculate the stock issuance or repurchase amount as the difference between last year's retained earnings plus the current year's addition minus the current year's retained earnings.

How many shares you will have to sell or buy back will depend on the stock price, which will involve a circular reference as follows: the average stock price for the year will depend on the year-end stock price, which will depend on the EPS, which will depend on the average number of shares outstanding during the year, which in turn will depend on the number of shares you will have to sell or buy back. As we have seen before, you do not have to do anything special to set up the circular reference. As long as you enter the right formulas in the cells and iteration is turned on, Excel will take care of the rest.

(You can calculate the average number of shares outstanding as the sum of the average number of shares outstanding during the previous year plus the number of new shares issued or minus the number of shares repurchased during the current year. This will be an approximate number. To calculate a better number, you would have to know the number of shares outstanding at the end of the previous year. Try to understand why this is true and how you will calculate the average number of shares outstanding if you know the number of shares outstanding at the end of the previous year.)

	A	E	F	G	H	I	J
1	Income Statement and Balance Sheet for Vitex Corp.						
2							
3	Income Statement (\$ Million)						
4				Forecast Period			Forecasting
5		2002	2003	2004	2005	2006	Factor
6	Sales	\$1,334.4	\$1,401.1	\$1,471.2	\$1,544.7	\$1,622.0	5.0%
7	Cost of Sales	\$667.0	\$700.6	\$735.6	\$772.4	\$811.0	50.0%
8	Gross Operating Income	\$667.4	\$700.6	\$735.6	\$772.4	\$811.0	
9							
10	Selling, General & Admn. Expenses	\$373.3	\$406.3	\$426.6	\$448.0	\$470.4	29.0%
11	Depreciation	\$75.2	\$78.9	\$85.2	\$92.0	\$99.4	8.0%
12	Other Net (Income)/Expenses	(\$8.2)	(\$9.8)	(\$10.3)	(\$10.8)	(\$11.4)	-0.7%
13	EBIT	\$227.1	\$225.2	\$234.0	\$243.2	\$252.6	
14							
15	Interest (Income)	(\$2.0)	(\$1.7)	(\$1.8)	(\$1.9)	(\$2.0)	6.0%
16	Interest Expense	\$23.7	\$20.1	\$19.4	\$20.3	\$21.3	7.0%
17	Pre-Tax Income	\$205.4	\$206.8	\$216.4	\$224.7	\$233.3	9.0%
18							
19	Income Taxes	\$72.6	\$72.4	\$75.7	\$78.7	\$81.6	35.0%
20	Net Income	\$132.8	\$134.4	\$140.7	\$146.1	\$151.6	
21							10%
22	Dividends	\$40.1	\$43.1	\$46.0	\$49.3	\$53.1	40.0%
23	Addition to Retained Earnings	\$92.7	\$91.3	\$94.7	\$96.8	\$98.6	
24							
25	Balance Sheet (\$ Million)						
26	Assets						
27	Cash and Marketable Securities	\$28.4	\$29.4	\$30.9	\$32.4	\$34.1	2.1%
28	Accounts Receivable	\$120.1	\$117.7	\$123.6	\$129.8	\$136.2	8.4%
29	Inventories	\$116.8	\$123.3	\$129.6	\$135.9	\$142.7	8.8%
30	Other Current Assets	\$97.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
31	Total Current Assets	\$362.8	\$376.9	\$395.7	\$415.5	\$436.3	
32							
33	Property, Plant and Equipment, Gross	\$913.1	\$986.1	\$1,065.0	\$1,150.2	\$1,242.3	8.0%
34	Accumulated Depreciation	\$427.9	\$506.8	\$592.0	\$684.0	\$783.4	
35	Property, Plant and Equipment, Net	\$485.2	\$479.4	\$473.0	\$466.2	\$458.9	
36							
37	Other Non-Current Assets	\$456.3	\$492.8	\$532.2	\$574.8	\$620.8	8.0%
38	Total Non-Current Assets	\$941.5	\$972.2	\$1,005.3	\$1,041.0	\$1,079.7	
39							
40	Total Assets	\$1,304.3	\$1,349.1	\$1,401.0	\$1,456.6	\$1,516.0	
41							
42	Liabilities and Shareholders' Equity						
43	Accounts Payable	\$80.5	\$85.5	\$89.7	\$94.2	\$98.9	6.1%
44	Short-Term Debt	\$110.3	\$122.5	\$126.8	\$131.4	\$136.4	12.0%
45	Other Current Liabilities	\$111.3	\$116.3	\$122.1	\$128.2	\$134.6	8.3%
46	Total Current Liabilities	\$302.1	\$324.3	\$338.7	\$353.9	\$369.9	
47							
48	Long-Term Debt	\$218.1	\$183.8	\$190.2	\$197.1	\$204.6	18.0%
49	Deferred Income Taxes	\$12.7	\$19.6	\$20.6	\$21.6	\$22.7	1.4%
50	Other Non-Current Liabilities	\$94.5	\$106.5	\$111.8	\$117.4	\$123.3	7.6%
51	Total Liabilities	\$627.4	\$634.2	\$661.3	\$690.0	\$720.5	
52							
53	Paid-In Capital	\$44.8	\$44.8	\$44.8	\$44.8	\$44.8	
54	Retained Earnings	\$632.1	\$670.0	\$694.9	\$721.8	\$750.7	
55	Total Shareholders' Equity	\$676.9	\$714.8	\$739.7	\$766.6	\$795.5	
56							
57	Total Liabilities and Shareholders' Equity	\$1,304.3	\$1,349.1	\$1,401.0	\$1,456.6	\$1,516.0	
58							
59	Stock Issuance/(buyback) (in dollars)		(\$53.4)	(\$69.8)	(\$69.9)	(\$69.6)	
60	Stock Issuance/(buyback) (in millions of shares)		(1.1)	(1.3)	(1.1)	(0.9)	
61							
62							
63	Other Data						
64	Stock price (year-end)	\$51.40	\$47.67	\$57.82	\$68.45	\$79.90	
65	Average number of shares outstanding (millions)	46.2	45.1	43.8	42.7	41.7	
66							
67	Financial Indicators						
68	Valuation Ratios						
69	EPS	\$2.87	\$2.98	\$3.21	\$3.42	\$3.63	
70	Dividend per Share	\$0.87	\$0.95	\$1.05	\$1.16	\$1.27	
71	P/E Ratio	17.9	16.0	18.0	20.0	22.0	
72	P/B (price to book) Ratio	3.5	3.0	3.4	3.8	4.2	
73	Dividend Payout Ratio	30%	32%	33%	34%	35%	
74							

FIGURE 6.16 Model 11: Projected financial statements for Vitex Corp. with capital structure constraints.

	A	E	F	G	H	I
1	Statement of Cash Flows for Vitex Corp.					
2	Millions of Dollars					
3						
4			Forecast Period			
5		2002	2003	2004	2005	2006
6	Cash Flows from Operations					
7	Net Income	\$132.8	\$134.4	\$140.7	\$146.1	\$151.6
8	Depreciation Expense	\$75.2	\$78.9	\$85.2	\$92.0	\$99.4
9	Decrease/(Increase) in Accounts Receivable	(\$12.8)	\$2.4	(\$5.9)	(\$6.2)	(\$6.5)
10	Decrease/(Increase) in Inventories	(\$1.9)	(\$6.5)	(\$6.2)	(\$6.5)	(\$6.8)
11	Decrease/(Increase) in Other Current Assets	\$6.2	(\$9.0)	(\$5.3)	(\$5.6)	(\$5.9)
12	Increase/(Decrease) in Accounts Payable	\$8.7	\$5.0	\$4.3	\$4.5	\$4.7
13	Increase/(Decrease) in Other Current Liabilities	(\$60.8)	\$5.0	\$5.8	\$6.1	\$6.4
14	Increase/(Decrease) in Deferred Income Taxes	(\$2.3)	\$6.9	\$1.0	\$1.0	\$1.1
15	Increase/(Decrease) in Other Non-Current Liabilities	(\$20.5)	\$12.0	\$5.3	\$5.6	\$5.9
16	Total Cash Flows from Operations	\$124.6	\$229.1	\$224.9	\$237.1	\$249.9
17						
18	Cash Flows from Investing					
19	(Additions to) Property, Plant & Equipment	(\$92.3)	(\$73.0)	(\$78.9)	(\$85.2)	(\$92.0)
20	(Investment) in Other Non-Current Assets	(\$49.3)	(\$36.5)	(\$39.4)	(\$42.6)	(\$46.0)
21	Total Cash Flows from Investing	(\$141.6)	(\$109.6)	(\$118.3)	(\$127.8)	(\$138.0)
22						
23	Cash Flows from Financing					
24	From Issuance/(Repayment) of Short-Term Debt	\$30.5	\$12.2	\$4.3	\$4.6	\$5.0
25	From Issuance/(Repayment) of Long-Term Debt	\$16.3	(\$34.3)	\$6.4	\$6.9	\$7.4
26	From Sale/(Repurchase) of Equity	\$6.6	(\$53.4)	(\$69.8)	(\$69.9)	(\$69.6)
27	Cash Dividends Paid to Shareholders	(\$40.1)	(\$43.1)	(\$46.0)	(\$49.3)	(\$53.1)
28	Total Cash Flows from Financing	\$13.3	(\$118.5)	(\$105.1)	(\$107.8)	(\$110.3)
29						
30	Net Change in Cash & Marketable Securities	(\$3.7)	\$1.0	\$1.5	\$1.5	\$1.6
31						
32						
33	Beginning Cash & Marketable Securities	\$32.1	\$28.4	\$29.4	\$30.9	\$32.4
34	Ending Cash & Marketable Securities	\$28.4	\$29.4	\$30.9	\$32.4	\$34.1
35	Net Change in Cash & Marketable Securities	(\$3.7)	\$1.0	\$1.5	\$1.5	\$1.6
36						
37						

FIGURE 6.17 Model 11: Projected financial statements of cash flows for Vitex Corp.

The interest expense calculation will also be a little more complex. The base line \$13.5 million expense for long-term debt has to be adjusted by additions to or reductions in long-term debt at the interest rate of 9%. However, this rate will have to be applied to the cumulative change through the end of the previous year plus the average change during the past year.

Notice that now neither short-term nor long-term debt balances can go negative, and you can calculate the C&MS balance independently as 2.1% of sales.

Finally, you will need to reflect the stock issuance or repurchase in the statement of cash flows by changing the formulas there. In the historical period we assumed that the change in paid-in capital reflected stock issuance or repurchase. Now you have to use the stock issuance or repurchase that you calculate in conjunction with the balance sheet.

Building the Model

Start with a copy of Model 10. As always, unless otherwise noted, you can copy the formula for 2003 into the cells for the other years.

1. **Calculate STD:** In J44 enter $(30\% \times 40\% =)12\%$ to reflect the percentage of STD in total capitalization. In F44 enter the formula $=(F\$40-(F\$43+F\$45+F\$49+F\$50))*\$J44$. As discussed, the plug here is the amount of total assets (the first term), less the total of all liabilities other than debt (the second term).
2. **Calculate LTD:** In J48 enter $(30\% \times 60\% =)18\%$ to reflect the percentage of LTD in total capitalization. In F48 enter the formula $=(F\$40-(F\$43+F\$45+F\$49+F\$50))*\$J48$, which is similar to the formula for STD.
3. **Calculate shareholders' equity:** Make the paid-in capital in each year from 2003 to 2006 the same as the year-end 2002 number. To calculate retained earnings, in F54 enter the formula $=(F\$40-(F\$51+F\$53))$. This is the amount needed to balance the balance sheet, and now that you have calculated STD and LTD based on the specified capital structure, this will automatically make total shareholders' equity the right percentage (70%) of total capital as well.
4. **Calculate stock issuance/(buyback) in dollars:** Enter the appropriate label in A59. In F59 enter the formula $=F55-(E55+F23)$. It calculates the stock repurchase/issuance as the difference between what the retained earnings would have been without them and what it has been calculated to be. Calculated this way, buybacks will be negative, which is generally the sign convention used.
5. **Calculate the number of stock issuance/(buyback):** Enter the appropriate label in A60. In F60 enter the formula $=F59/((E64+F64)/2)$. This uses the average stock price for the calculation.
6. **Adjust the average number of shares outstanding:** To calculate the average number of shares outstanding during a year, in F65 enter the formula $=E65+F60$. (As mentioned before, this is approximate.)
7. **Change calculation of C&MS:** In J27 enter 2.1% and then in F27 enter $=F6*\$J\27 to calculate the C&MS as a percentage of sales.
8. **Calculate interest expense:** In J17 enter 9% for the marginal long-term interest rate and put explanatory comments in J16 and J17. (I am using J17 here because it is a nearby empty cell. Attaching the comment is essential to avoid confusion.)

To calculate interest expense, in F16 enter $=13.5+\$J\$16*(E44+F44)/2+\$J\$17*((F48-E48)/2)$. The last part of the formula calculates the adjustment to the long-term interest expense of \$13.5 million (on the long-term debt existing at the end of 2002) that will result from the change in the average balance in long-term debt over the year. Writing the average change in LTD as $(F48-E48)$ takes care of the proper sign of the interest expense adjustment.

You cannot copy this formula for the other years. In G16 enter the formula $=13.5+\$J\$16*(F44+G44)/2+\$J\$17*((F48-E48)+(G48-F48)/2)$. As discussed, this calculates the cumulative change in LTD through the end of the previous year and adds to it the average change for the current year. This formula can be copied into the other years.

9. **Make changes to statements of cash flows:** The only change needed is in the line "From Sale/(Repurchase) of Equity." In F26 enter the formula

=(Model!F54+Model!F53)-(Model!E54+Model!E53+Model!F23) and copy it for the other years. (Use of this formula is instructive, but you could also enter =Model!F59 and so forth.)

Testing the Model

To make sure that the capital structure is on target, check the Leverage Ratios section of the financial indicators. You have to check the calculations related to share repurchase by hand and do the same for the interest expense calculations. The most important test is to look at the numbers that have changed and ask, "Does it make sense?" For example, ask yourself why the model is buying back stocks. To understand why, look at the statement of cash flows to see how the extra cash is being generated and how it is being used to adjust the different components of capital. Since equity is 70% of the capital structure, bulk of the excess cash is going to buying back stock.

Uses of the Model

This model demonstrates how informative and comprehensive such a model can be. If you try to do the calculations by hand instead of taking this systematic approach, it is almost certain that you will miss taking into consideration a number of factors and you will never be sure if the numbers are correct. It also provides lot of flexibility to incorporate additional policies. For example, after looking at the results, management may decide that they want to make the capital structure adjustment slowly over a few years. For this, you will have to set up year-by-year capital structure targets and use them in the model. It is relatively easy to do.

MODEL 12: FINANCIAL STATEMENTS SENSITIVITY ANALYSIS

The Problem

One of the major uses of financial statement forecasting models is to do sensitivity analysis. We can see the effect of making changes in any of the input (independent) variables on the other dependent variable by making the changes in the model. But trying these out one at a time does not provide us a comprehensive picture. Your management wants to see how Net Income, EPS, dividend per share, and stock price will change for 2006 for sales growth rates from 1% to 10% per year over the years. Create a one-input data table to show this information. Also create a two-input data table to show how EBIT for 2003 will depend on cost of sales to sales ratio and sales growth rate in a reasonable range. (Use Model 11 for your analysis.)

Model Characteristics: Total capitalization is used as plug and target capital structure is maintained. C&MS balance is calculated as percentage of sale. Dividend payout can go up to 40%, but dividend per share cannot grow more than 10% in any year.

Modeling Strategy

Once you have a working, fully tested model, choosing the right independent and dependent variables for sensitivity analysis is an important challenge. It is so easy to do these in Excel that the tendency is to drown management with numbers. Instead of taking that easy way out, you need to devote some time to decide which sensitivity analyses will be most informative to look at.

In this case, the problem already specifies the tables to prepare. Data Table is the ideal tool for doing this analysis. Remember that it is easiest to create data tables in the same sheet that has the independent and dependent variables. Start with a copy of Model 11 and set up your data tables at the bottom of the Model sheet. Use appropriate formatting, and so on to make them look attractive. The results are shown in Figure 6.18.

	A	E	F	G	H	I	J
105	Sensitivity Analysis for Vitex Corp.						
106							
107			For 2006				
108			Net Income	EPS	Div./Share	Stock Price	
109			\$151.6	\$3.63	\$1.27	\$79.90	
110	Sales growth rates per year >	1.0%	\$118.6	\$2.80	\$1.12	\$61.52	
111		2.0%	\$126.5	\$2.99	\$1.20	\$65.83	
112		3.0%	\$134.7	\$3.20	\$1.27	\$70.32	
113		4.0%	\$143.0	\$3.41	\$1.27	\$75.04	
114		5.0%	\$151.6	\$3.63	\$1.27	\$79.90	
115		6.0%	\$160.5	\$3.86	\$1.27	\$84.93	
116		7.0%	\$169.6	\$4.10	\$1.27	\$90.11	
117		8.0%	\$179.0	\$4.34	\$1.27	\$95.44	
118		9.0%	\$188.6	\$4.59	\$1.27	\$100.95	
119		10.0%	\$198.5	\$4.85	\$1.27	\$106.61	
120							
121							
122							
123							
124			EBIT for 2003				
125							
126	Cost of sales to sales ratio >		48.0%	49.0%	50.0%	51.0%	52.0%
127	Sales growth rates per year >	1.0%	\$240.5	\$227.0	\$213.6	\$200.1	\$186.6
128		2.0%	\$243.7	\$230.1	\$216.5	\$202.9	\$189.2
129		3.0%	\$246.8	\$233.1	\$219.4	\$205.6	\$191.9
130		4.0%	\$250.0	\$236.1	\$222.3	\$208.4	\$194.5
131		5.0%	\$253.2	\$239.2	\$225.2	\$211.1	\$197.1
132		6.0%	\$256.3	\$242.2	\$228.0	\$213.9	\$199.8
133		7.0%	\$259.5	\$245.2	\$230.9	\$216.7	\$202.4
134		8.0%	\$262.7	\$248.2	\$233.8	\$219.4	\$205.0
135		9.0%	\$265.8	\$251.3	\$236.7	\$222.2	\$207.6
136		10.0%	\$269.0	\$254.3	\$239.6	\$225.0	\$210.3
137							

FIGURE 6.18 Model 12: Sensitivity analysis based on financial statements for Vitex Corp.

Building the Model

Start with a copy of Model 11.

1. **Create the one-input data table:** Enter the range of values for sales growth rate in E110:E119. Enter the labels in F108:I108. These are only labels; Excel does not understand them. To indicate where Excel should get the Net Income numbers from, in F109 enter =I20, in G109 enter =I69, in H109 enter =I70, and in I109 enter =I64. Select E109:I119 and select Data (Table. In Column input cell, enter =\$J\$6 by pointing to indicate the cell for the sales growth rate, and click OK. Format the table appropriately.
2. **Create the two-input data table:** Enter the sales growth rates in E127:E136 and the cost of sales to sales ratios in F126:J126. In E126 enter =F13 to indicate where Excel should get the values for the EBIT for 2003 from. (Because this looks odd, I have hidden the content of the cell using custom formatting with just a semicolon (;).

Select E126:J136 and select Data ⇒ Table. In Row input cell, enter \$J\$7 (by pointing) to tell Excel where to substitute the values for cost of sales to sales ratios. In Column input cell, enter =\$J\$6 by pointing to indicate the cell for the sales growth rate. Click OK. Format the table appropriately.

Testing the Model

It is easiest to test the data tables by checking if they have the right numbers for input values you are currently using on your worksheet. For example, because your worksheet currently uses 5% for sales growth rate and 50% for cost of sales to sales ratio, your current EBIT number for 2003 should match the corresponding number in the data table.

Uses of the Model

These types of sensitivity tables may be considered the fruits of your modeling. This is what management needs to see to make decisions. Of course, you cannot get to this point until you have a correct and realistic model.

MODEL 13: FINANCIAL STATEMENTS SCENARIO ANALYSIS

The Problem

The management also wants to look at a few scenarios for the future because sensitivity analysis of the type that can be done with Data Table can show sensitivity with respect to only one or two input variables per table. Starting with Model

11, do a scenario analysis for an optimistic and pessimistic scenario defined by management as follows:

- Optimistic scenario: Sales growth rate 7% per year, Cost of sales to sales ratio 49%, SG&A to sales ratio 28%, and Gross PP&E growth rate 7% per year.
- Pessimistic scenario: Sales growth rate 3% per year, Cost of sales to sales ratio 51%, SG&A to sales ratio 30%, and Gross PP&E growth rate 9% per year.

In your output, show the values for Net Income, EPS, Dividend per share, ROE, and Times interest earned for both 2003 and 2006.

Model characteristics: Total capitalization is used as plug and target capital structure is maintained. C&MS balance is calculated as percentage of sale. Dividend payout can go up to 40%, but dividend per share cannot grow more than 10% in any year.

Modeling Strategy

As I discussed before, what output of a model one should look at to make decisions is itself an important decision. Here, of course, you are told what to present, but this is just an example. It takes a good understanding of the business and the model to specify meaningful scenarios and outputs to look at.

The output for this problem is shown in Figure 6.19. Start with a copy of Model 11. You will not be able to have the Scenario Manager create the right row labels. Once you have created the table with the Scenario Manager, you will have to edit the table to make it more understandable.

Building the Model

Start with a copy of Model 11.

Select Tools ⇒ Scenarios. Click Add; in Scenario name, enter Optimistic 2006, and in the Changing cells box enter the cell numbers for the independent variables (J6, J7, J10, and J33) by clicking the appropriate cells. Click OK, and then in the boxes for the values enter the values for the optimistic scenario. Click OK. Now click Add again to create the pessimistic scenario the same way and enter the values of the independent variables for it. Click OK.

Back in the Scenario Manager dialog box click Summary. In the Scenario Summary dialog box, make sure that the Scenario summary is selected, and then in the Results cells box enter the cell address for the output variables by pointing—separated by commas (F20, F69, F70, F76, F100, I20, I69, I70, I76, I100)—and click OK.

Excel will create the Scenario Summary table on a separate spreadsheet. Format the table and enter the appropriate row labels.

	A	B	C	D	E	F	G
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

Scenario Summary			
	Current Values	Optimistic 2006	Pessimistic 2006
	Created by Chandan Sengupta on 7/26/2003	Created by Chandan Sengupta on 7/26/2003	Created by Chandan Sengupta on 7/26/2003
Changing Cells			
Sales growth rate	5.0%	7.0%	3.0%
Cost of sales to sales ratio	50.0%	49.0%	51.0%
SG&A to sales ratio	29.0%	28.0%	30.0%
Gross PP&E growth rate	8.0%	7.0%	9.0%
Result Cells:			
2003			
Net Income	\$134.4	\$157.3	\$112.2
EPS	\$2.98	\$3.52	\$2.46
Dividend per share	\$0.95	\$0.95	\$0.95
Return on equity	19.3%	22.7%	16.1%
Times Interest earned	11.2	13.0	9.5
2006			
Net Income	\$151.6	\$195.2	\$112.2
EPS	\$3.63	\$4.84	\$2.58
Dividend per share	\$1.27	\$1.27	\$1.03
Return on equity	19.4%	25.6%	14.0%
Time Interest earned	11.8	15.5	8.7

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

FIGURE 6.19 Model 13: Scenario analysis based on financial statements for Vitex Corp.

Testing the Model

By looking at the current values, check that the input and output values are using the right cells, that is, you entered the right cell addresses to set up the scenarios and the outputs.

Uses of the Model

Data Table and Scenario Manager create two different types of tables to provide two different perspectives. Both are important to make real use of the financial statement forecasting models you create. Remember that the summary table created by the Scenario Manager is not dynamic. If you make any changes in your model, the table will not update automatically. You will have to create a new table following the same step. Tables created by Data Table will update automatically.

MODEL 14: CALCULATING FREE CASH FLOW

The Problem

Starting with Model 11, develop a statement to calculate the free cash flow generated by Vitex in both the historical and forecast periods and show how the free cash flow is being used.

Model Characteristics: Total capitalization is used as plug and target capital structure is maintained. C&MS balance calculated as percentage of sale. Dividend payout can go up to 40%, but dividend per share cannot grow more than 10% in any year.

Modeling Strategy

It is best to calculate free cash flow using a format similar to that of the statement of cash flows. You should be able to develop this model based on the earlier discussion in the section "Free cash flow." One problem that often arises is that without additional information it is difficult to judge which accounts with "other" in their title should be considered operating accounts. For simplicity, assume all such accounts for Vitex are operating accounts. The worksheet for this model is shown in Figure 6.20.

Building the Model

Start with a copy of Model 11. I will discuss only the formulas for the year 2000. You can copy them over for the other years. As always, whenever you can, use the pointing method to enter formulas.

1. **Create a template for the calculation:** Make a copy of the existing worksheet for statement of cash flows, change the titles and labels on it and clear all formulas. (We will actually use many of the lines from the regular cash flow

	A	C	D	E	F	G	H	I
1	Free Cash Flow Calculation for Vitex Corp.							
2	Millions of Dollars							
3								
4		Historical Period			Forecast Period			
5		2000	2001	2002	2003	2004	2005	2006
6	Net Income	\$121.8	\$132.7	\$132.8	\$134.4	\$140.7	\$146.1	\$151.6
7	Interest Expense after Taxes	\$9.8	\$13.3	\$15.4	\$13.1	\$12.6	\$13.2	\$13.9
8	Increase/(Decrease) in Deferred Income taxes	(\$2.7)	(\$4.6)	(\$2.3)	\$6.9	\$1.0	\$1.0	\$1.1
9	Net Operating Profit after Taxes (NOPAT)	\$128.9	\$141.4	\$145.9	\$154.4	\$154.3	\$160.3	\$166.6
10								
11	Depreciation Expense	\$52.0	\$55.9	\$75.2	\$78.9	\$85.2	\$92.0	\$99.4
12	Gross Cash Flow	\$180.9	\$197.3	\$221.1	\$233.3	\$239.5	\$252.4	\$265.9
13								
14	(Increase)/Decrease in Working Capital	(\$27.9)	\$10.3	(\$56.9)	(\$4.1)	(\$8.8)	(\$9.2)	(\$9.7)
15	(Additions to) Property, Plant & Equipment	(\$53.4)	(\$86.5)	(\$92.3)	(\$73.0)	(\$78.9)	(\$85.2)	(\$92.0)
16	Increase/(Decrease) in Other Non-Current Liabilities	(\$20.5)	\$34.9	(\$20.5)	\$12.0	\$5.3	\$5.6	\$5.9
17	(Investment) in Other Non-Current Assets	(\$1.9)	(\$201.9)	(\$49.3)	(\$36.5)	(\$39.4)	(\$42.6)	(\$46.0)
18	Free Cash Flow	\$77.2	(\$45.9)	\$2.1	\$131.6	\$117.7	\$121.0	\$124.2
19								
20								
21	Uses of Free Cash Flow							
22	Net Interest Expense after Taxes	(\$9.8)	(\$13.3)	(\$15.4)	(\$13.1)	(\$12.6)	(\$13.2)	(\$13.9)
23	Issuance/(Repayment) of Short-Term Debt	(\$9.4)	\$50.1	\$30.5	\$12.2	\$4.3	\$4.6	\$5.0
24	From Issuance/(Repayment) of Long-Term Debt	(\$18.5)	\$56.8	\$16.3	(\$34.3)	\$6.4	\$6.9	\$7.4
25	From Sale/(Repurchase) of Equity	(\$0.8)	(\$7.9)	\$6.6	(\$53.4)	(\$69.8)	(\$69.9)	(\$69.6)
26	Cash Dividends Paid to Shareholders	(\$38.7)	(\$39.8)	(\$40.1)	(\$43.1)	(\$46.0)	(\$49.3)	(\$53.1)
27	Total Uses of Free Cash Flow	(\$77.2)	\$45.9	(\$2.1)	(\$131.6)	(\$117.7)	(\$121.0)	(\$124.2)
28								
29								

FIGURE 6.20 Model 14: Free cash flow calculations for Vitex Corp.

statements. If you prefer, you can use them by cutting and pasting them at the right places. I will discuss it here as if we are starting from scratch.)

2. **Enter net income:** In C6 enter =Model!C20.
3. **Calculate interest expense after taxes:** To use the formulas for tax rate, in J7 enter 35%. In C7 enter the formula =Model!C\$16*(1-\$J\$7), which is the interest expense after tax (at the statutory rate).
4. **Make adjustment for deferred taxes:** To eliminate non-cash taxes represented by an increase in deferred tax balance, in C8 enter =Model!C49-Model!B49.
5. **Calculate NOPAT:** To calculate the NOPAT, in C9 enter the formula =SUM(C6:C8).
6. **Enter depreciation and calculate gross cash flow:** For depreciation, in C11 enter =Model!C11. Then, to calculate the gross cash flow, in C12 enter the formula =C9+C11.
7. **Deduct the investments to calculate free cash flow:** To reflect the investment in working capital, in C14 enter =(Model!B31-Model!B43-Model!B45)-(Model!C31-Model!C43-Model!C45). Note that this is a slightly different definition of working capital because it excludes short-term debt, which is part of financing.

To reflect capital expenditures or investment in PP&E, in C15 enter =Model!B33-Model!C33. You have to use gross and not net PP&E here.

For investments in the other non-current assets and liabilities, in C16 enter =Model!C50-Model!B50 and in C17 enter =Model!B37-Model!C37.

Finally, to calculate the free cash flow, in C18 enter the formula =C12+SUM(C14:C17).

8. **Enter and sum the uses of free cash flow:** For the uses of free cash flow enter the following (note that uses are negative here):

- For cash used to pay after-tax interest expense, in C22 enter =-C7.
- For cash used to pay off short-term debt, in C23 enter =Model!C44-Model!B44.
- For cash used to pay off long-term debt, in C24 enter =Model!C48-Model!B48.
- For cash used to repurchase stocks, in C25 enter =(Model!C53+Model!C54)-(Model!B53+Model!B54+Model!C23).
- For dividends paid, in C26 enter =-Model!C22.

To calculate the total use of free cash flow, in C27 enter =SUM(C22:C26). Make sure that it is equal to the free cash flow generated. (The signs will be opposite because of the sign convention we are using.)

Testing the Model

The test of the model is that the free cash flow generated must equal the total uses. Beyond this, you should analyze both the components of the free cash flow

and its uses line by line in conjunction with the balance sheet both to make sure the numbers are being calculated correctly and that they make sense.

Uses of the Model

A free cash flow statement provides important insight into the operations as well as financing of a business. For example, for Vitex Corp. it shows that the company will generate significantly more free cash flow in 2003 than in 2002 because of a much smaller investment in working capital and so forth. This improvement does not show in net income.