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2

Asset Utilization Measurements

This chapter focuses on the ratios and formulas that can be derived pricticly from the income statement. There are several that require add brackinformation from the balance sheet, as well as internation on a ion, such as employee headcount, that may not be readily discernible from published financial statements. The general intent of the one vs strools presented here is to such a company's ability to custain invales, the level of asset and expense usage required to do so, and the state robinty of its current cales and expense levels. There are also specified reading the first new as sales returns, repairs and maintenance, fringe benefits, interest expense, and overhead rates.

Each of the following sections describes the uses of a ratio or formula, explains the proper method of calculation, and gives an example. Each section also discusses how each ratio or formula can be misused, skewed, or incorrectly applied.

The ratios and formulas presented in this chapter are:

Sales to Working Capital Ratio	Discretionary Cost Ratio
Sales to Fixed Assets Ratio	Interest Expense to Debt Ratio
Sales to Administrative Expenses Ratio	Foreign Exchange Ratios
Sales to Equity Ratio	Overhead Rate
Sales per Person	Goodwill to Assets Ratio
Sales Backlog Ratio	Overhead to Cost of Sales Ratio
Sales Returns to Gross Sales Ratio	Investment Turnover
Repairs and Maintenance Expense to Fixed Assets Ratio	Break-Even Point
Accumulated Depreciation to Fixed Assets Ratio	Margin of Safety
Fringe Benefits to Wages and Salaries Expense	Tax Rate Percentage
Sales Expenses to Sales Ratio	

SALES BACKLOG RATIO

Description: The sales backlog ratio cannot be determined strictly from any standard financial statements, since the backlog is normally included only in internal management reports. Nonetheless, if the backlog information is available, this ratio should be used as an extremely useful tool for determining a company's ability to maintain its current level of production. If the ratio is dropping rapidly over several consecutive months, then it is likely that the company will soon experience a reduction in sales volume as well as over-capacity in its production and related overhead areas, resulting in imminent losses. Conversely, a rapid jump in the ratio indicates that a company cannot keep up with demand, and it may soon have customer relations problems from delayed orders and need additional capital expenditures and staff hirings to increase its productive capacity.

Formula: Divide the most current total backlog of sales orders by sales. It is gen-COV considerably over that period, due to the influence of seasonal nominator is sales over just the preceding quarter. The ro of 336

s received

on this form to is mine the number of days of sales contained within the backlog, which is achieved by comparing the backlog to the average daily sales volume that a company typically produces. This formula is:

ie

Total backlog Annual sales per 360 days

Example: The sales and backlog data for the Jabber Phone Company are shown in Table 2.4.

This table reveals that the company's sales are continuing to increase over time, while its backlog is decreasing. The change was caused by an increase in the company's productive capacity for additional cell phones. As a result, the company is gradually clearing out its backlog and converting it into sales. However,

Table 2.4					
	January	February	March		
Rolling 3-month sales	\$4,500,000	\$4,750,000	\$4,800,000		
Month-end backlog	\$2,500,000	\$2,000,000	\$1,750,000		
Sales backlog ratio	0.55:1	0.42:1	0.36:1		

0.1

Table 2.6						
	Oct	Nov	Dec	Jan	Feb	Mar
3-Month rolling sales	\$81,500	\$208,500	\$835,500	\$810,000	\$678,000	\$51,000
3-Month rolling returns	\$7,400	\$8,650	\$21,350	\$83,550	\$81,000	\$67,800
Returns ratio	8%	4%	3%	10%	12%	133%

This table shows that there is a time lag of exactly one month on all sales returns, and that the return rate is always exactly 10% when compared to the gross sales from which the returns originated. However, due to the extreme seasonality of sales, the returns ratio varies enormously from period to period, with the worst case being in January, when the returns from the massive December sales month are offset against the puny January postseason sales. To fix this problem, the controller elects to measure the ratio on a rolling three-month basis, which smooths out the ratio somewhat, as shown in Table 2.6. However, the returns attributed to the December sales month occur in January, which therefore subarcear in the March three-month rolling measurement when the for responding sales have dropped out; to avoid this problem, reporting the measure could be a lay do none month on an ongoing basis, so that the most recent month's neturns could be divided by the sales from the preceding month.

Current of states report of note masked, rendering this ratio less informative. For example, a company can offer free extra products or services to a customer who wishes to make a return rather than accepting the returned goods. Another ploy is to charge off to expense an unreasonably high or low return reserve or to roll returns into some other account. Also, unusual returns, such as products that are being called back to the factory to repair a serious flaw, may be recorded against a special loss reserve. Another variation is to shift returned goods back into finished goods inventory and then write up the value of this inventory without ever making a charge against sales. By any or all of these means, a company can hide the true amount of its sales returns.

REPAIRS AND MAINTENANCE EXPENSE TO FIXED ASSETS RATIO

Description: This ratio is useful for estimating the age of the collective group of fixed assets listed in the financial statements. If the ratio follows an increasing trend line, then the company is probably in need of some asset replacements. An increasing trend line may also be indicative of high asset-usage levels, which can prematurely require advanced levels of repair work. Of particular interest is an increasing ratio that suddenly drops with no corresponding increase in the amount of fixed assets, this indicates that a company is running out of cash and cannot afford to repair its existing assets or purchase new ones.

ACCUMULATED DEPRECIATION TO FIXED ASSETS RATIO

Description: Comparing the amount of accumulated depreciation to the gross amount of fixed assets recorded on a company's balance sheet can indicate the extent to which a company has continued to replace its existing assets with new ones on an ongoing basis. For example, if the proportion of accumulated depreciation to fixed assets is quite high, it is evidence that not too many assets have been added by a company in recent years, which may in turn lead one to suspect that there is little cash available for such investments.

Formula: Divide the total accumulated depreciation by the total amount of fixed assets. A variation on this approach is to run the same calculation for different classes of assets, in order to see if there are certain types of assets in which a comtesale.co.u pany does not appear to be making a sufficient level of investment in new assets. The formula is:

Accumulated depreciation Total fixed asset

Example: A potential acquirer is every ing the financial state the Bavariente ian Clock Company, The Chancial information (1) rever is limited and does not contained ufficient degree of informed in regarding cash flows from year to year. Consequently, the acquirer parsity to get a general idea of the company's ability to generate cash by reviewing the expenditures it has made for fixed assets. The assumption is that an increase in the ratio of accumulated depreciation to fixed assets over time is an indicator of a shortage in cash. The financial information is compiled in Table 2.8.

The ratio at the bottom of the table indicates that the company appears to have experienced a sudden drop in its cash flow in the past two years, because the amount of accumulated depreciation has skyrocketed in comparison to the fixed asset base, indicating that the company has stopped purchasing fixed assets.

Cautions: This ratio can present an incorrectly unfavorable view of a company's reinvestment policy if the company has taken an aggressive approach to depreciation, using accelerated depreciation calculations and short estimated time periods

Table 2.8					
	1999	2000	2001	2002	
Accumulated depreciation Fixed assets	\$428,000 \$2,375,000	\$500,000 \$2,500,000	\$1,205,000 \$2,410,000	\$1,940,000 \$2,425,000	
to fixed assets ratio	18%	20%	50%	80%	

Formula: Divide both recognized and unrecognized foreign currency gains and losses by net income. The formula is:

Foreign currency gains and losses Net income

A variation is to divide both recognized and unrecognized foreign currency gains and losses by total sales. This approach gives one a perspective on the size of such gains and losses in relation to total revenue generating activity. The formula is:

> Foreign currency gains and losses Total sales



Though the calculation shows that 47% of the budgeted profit was lost to foreign exchange losses, the actual reduction from the budgeted profit level was \$420,000 (actual loss of \$178,000 + budgeted profit of \$242,000). Consequently, the controller will have to continue searching to find additional causes of the loss.

Cautions: The foreign exchange ratio that uses net income as the denominator is the recommended approach, since it gives one a clear idea of the impact of these activities on a company's profits. In particular, if a large proportion of company profits comprise exchange gains, an investor should inquire as to why the company is not making more money from its core operating activities. If such a high proportion of exchange gains continues for several periods, this can be a sign that the company is relying too heavily on its foreign currency trading expertise to generate profits.

Table 2.13				
Allocations	Small Overhead Crane	Automated Loader		
Overhead rate per labor hour	\$95	\$95		
Direct labor hours used	450	125		
Overhead allocation	\$42,750	\$11,875		

variety of stamping machines and lathes. It has used a traditional overhead allocation methodology for many years, whereby it allocates its overhead costs to products based on the amount of labor hours accumulated by each one. The cost accountant suspects that this results in the overallocation of costs to some products, and underallocation elsewhere. To prove the point, the accountant constructs Table 2.13, which shows the allocation of costs to two products based on a traditional allocation using direct labor hours.

A key item in the table is the overhead rate of \$95 perdirect observed. The company's actual labor cost per hour is only \$24 so there is a lost four times as much overhead cost charged than direct labor donars. Since even estimate in the amount of direct labor hour coarged to a product will result in a charge in the overhead charge that the fourtimes greater, it is eviden that some other activity measure multiple round that will not came such large cost swings.

Decorreccountant electron switch by double allocation method by forming two cost pools. One accumulates overhead costs related to machining operations, while the other pool accumulates costs related to direct labor. The cost accountant allocates the labor overhead cost pool using direct labor hours; because the cost pool is so much smaller than before, the allocation rate will drop to \$15.92 per hour. The cost accountant allocates the other cost pool based on machine hours used; because there are thousands of machine hours in a typical month, this allocation rate will also be much smaller, at \$28.05 per hour. Table 2.14 shows overhead allocation, using the same amount of direct labor hours as before to allocate the direct labor cost pool, while also assigning machining overhead costs in an extra column. The net result of this slightly more complex approach is that the amount of overhead cost charged to the automated loader rises; the change results from the higher level of machine hours used by the automated loader. In total, the same amount of overhead costs have been allocated.

Cautions: The overhead rate is not generally used anymore for decision-making purposes, though it is still used to derive the overhead cost that is reported on the financial statements, per the requirements of Generally Accepted Accounting Principles (GAAP). One of its problems is that direct labor has historically been the most common activity measure used to derive it, even though direct labor composes an increasingly small proportion of the production process; consequently, the ratio of overhead costs to direct labor incurred is quite high, so a small change

	Small Ov	erhead Crane	Automated Loader	
Allocations	Labor Costs	Machine Costs	Labor Costs	Machine Costs
Overhead rate per unit	\$15.92	\$28.05	\$15.92	\$28.05
Direct labor hours used	450		125	
Machine hours used		500		1,120
Overhead allocation	\$7,194	\$14,025	\$1,990	\$31,416
Total allocation	\$21	,219	\$33	,406

in the direct labor applied to a product will also result in a much larger change in the amount of overhead cost that is applied to it.

0.U

Another problem is that there may be little relationship between the overhead cost pool and any single activity measure—instead, machine hours are only no ted to machine repairs and utilities, while supervisory salaries are related to an entire production line, rent is related to the square footage issue way reduction line, and so on. A properly applied activity-based costing system will avoid this is the by using a variety of activity measures to be entire the most accurate application of overhead costs.

Yet another utilize it presented by throughpunce unting; under this concept, there that matters to accept print for ability to schedule its manufacturing process around one or more between k operations within the facility. If overhead is incurred to reduce the load on the bottleneck, then profits may still increase despite the increase in expense. Under this concept, the application of overhead costs is irrelevant.

GOODWILL TO ASSETS RATIO

Description: The Financial Accounting Standards Board no longer requires companies to amortize the goodwill that is recorded on their balance sheets, preferring instead to have them write down goodwill only after determining that it has been impaired. This can cause problems for the investor, who may be faced with situations where large proportions of company assets are made up of this intangible, with no ongoing and consistent goodwill write-down that will gradually eliminate it. One can use the goodwill to assets ratio to see if there is an excessive proportion of goodwill on a company's balance sheet or if the ratio is increasing over time.

Formula: Divide unamortized goodwill by total assets. The formula is:

Unamortized goodwill Total assets

0.1

Table 2.15					
	1999	2000	2001	2002	2003
Goodwill	\$0	\$100,000	\$350,000	\$825,000	\$1,285,000
Total assets	\$500,000	\$625,000	\$1,025,000	\$1,725,000	\$2,450,000
Goodwill to assets ratio	0%	16%	34%	48%	52%

Example: The Genex Snowboard Company has purchased several of its competitors over the past few years, gradually increasing its share of the market for premium racing snowboards. However, it has made these acquisitions at a large premium over the fair market value of the underlying assets. Also, the combined entity has not seen a dramatic rise in sales or profits as a result of the acquisitions. The primary group of investors is becoming concerned that there might be a good-will write-down in the near future. Before going to company management about the issue, they review the information in Table 2.15 about the godwin to assets ratio for the past five years.

Though it is impossible to tell from the casen econombers if there is a fricipient write-down in the future, thereo (d) ral to assets ratio for the company has increased markedly over the ast lew years, and pewsbands at about one half of all assets. It appears to be time for the investor, to make their concerns known to the company provided director.

Cautions: Though the goodwill to assets ratio is a good way to highlight the possible presence of an overabundance of goodwill, there is no way to tell how much of it is likely to result in a sudden write-down. A company with only a small proportion of goodwill to assets may be just as likely to write down goodwill as a company that has an overwhelmingly large proportion of it.

OVERHEAD TO COST OF SALES RATIO

Description: A long-term trend over the past century has been a gradual replacement of direct labor costs by overhead costs within the cost of goods sold. Overhead now composes the largest proportion of costs within this category for many companies. Given its increasing importance, an overhead to cost of sales ratio is needed so that managers can see if there are continuing increases in overhead costs that require action to reduce. Several variations on this formula are noted in the following section.

Formula: Divide total overhead expenses by the cost of goods sold. In order to get some idea of the changes in this ratio over time, it is important to incorporate the same costs in the overhead cost pool in every measurement period. The formula is:

GROSS PROFIT PERCENTAGE

Description: This is one of the most important measurements derived from the income statement. It reveals the profit left over from operations after all variable costs have been subtracted from revenues. In essence, it reveals the efficiency of the production process in relation to the prices and unit volumes at which products are sold.

Formula: There are two ways to measure the gross margin. The most common approach is to add together the costs of overhead, direct materials, and direct labor; subtract the total from revenue; and then divide the result by revenue. This approach takes into account all costs that can be reasonably associated with the production process. The formula is:

Revenue – (Overhead + Direct materials + Direct labor) Revenue The trouble with this approach is the infant of the production cost are schuly variable. Under a much more strictly befined view of variable costs, only direct materials should receive the in the formula, sites (a) is me only cost that truly charges in receiver a much more align istrative costs, which typically yields a high gross margin percentage. The formula is:

> Revenue – Direct materials Revenue

Example: The Spanish Tile Company bases its sales-quoting system on the gross margin assigned to its products; prices quoted must have a gross margin of at least 25% in order to cover administrative costs and create a modest profit. Recently, the Iberian Tile Company has been taking business away from the Spanish Tile Company through more aggressive pricing. Investigation of its competitor's quoting practices reveals that it uses an alternative gross margin model that relies only on direct material costs as a deduction from revenues. This means that its competitor is always in a position to offer lower prices, because it does not incorporate direct labor and overhead costs into its pricing model. The Iberian Tile Company is in danger of quoting excessively low prices if it continues to use its gross margin model, so it focuses on how prospective sales will impact its bottleneck operation, which is the tile kiln. If a prospective sale requires a great deal of kiln time, then it is charged a much higher price than other quotes that do not use as much of this valuable resource. As a result of this survey, the Spanish Tile Company realizes that its competitor has a more precise and

- Each salaried person equals one FTE.
- The total of all hours recorded in the payroll system per month divided by 160 hours equals the number of FTEs on hourly pay.
- The total number of hours billed by temporary agencies per month divided by 160 hours equals the number of FTEs from outside agencies.
- The total billings from outsourcing services per month divided by the hourly cost of equivalent positions within the company or industry equals the total number of FTEs from outsourced functions.

This comprehensive formula, when used to plot profit per person on a trend line, allows the president to determine which managers are truly improving the efficiency of their departments and not just attempting to hide the number of personnel reporting to them.

Cautions: In a very-low-profit situation, this ratio is so small that it yields as relevant information. Also, managers can manipulate this number by shift up to unsourcing services or temporary labor services, thereby the one of the company, although costs are still boursed from outsourcing billings.

DIVIDEND PAYOUT RATIO

Description: This ratio is used by investors to see if a company is generating a sufficient level of cash flow to assure a continued stream of dividends to them. A ratio of less than one indicates that existing dividends are at a level that cannot be sustained over the long term.

Formula: Divide total annual dividend payments by annual cash flow. If there is a long-standing tradition by the board of directors of continually increasing the amount of the dividend, then annualize the last (and presumably largest) dividend only and use the resulting figure in the numerator of the calculation. The formula is:

> Total dividend payments Net income + Noncash expenses - Noncash sales

co.u **Example:** The Williams Fund is a major investor in the Continent Electric Company. The Fund is controlled by the Williams farmy where primary concern is long-term, predictable flow of cash fired it when investments. The family is concerned that electricity derend it on may be impacting here to five of Continental Gas to pay dividents It has collected information about Continental for the past three years, shown in Table 4.9.

The table it years that Continental's by poof directors is continuing to grant in-A steady drop in cash flow. At the current circum accounts of dividen is desire pace of cash flow decline, Continental will be unable to support its current dividend rate in less than two years.

Cautions: Cash flows can vary significantly by year, so calculating this ratio for one year only may not yield sufficient information about a company's ability to pay dividends over the long term. A better approach, as was used in the example, is to run a trend line on the ratio for several years to see if a general pattern of decline emerges.

Table 4.9					
	2002	2003	2004		
Total dividend	\$43,000,000	\$45,000,000	\$48,000,000		
Cash flow	\$215,000,000	\$180,000,000	\$144,000,000		
Dividend payout ratio	5:1	4:1	3:1		

Cautions: One problem with this measure is determining the point at which an account receivable is considered to be delinquent. For example, if the allowable payment period for an invoice is 30 days, most customers will pay the bill on the 30th day, so it will not arrive by mail for several more days. Consequently, using 30 days as the cutoff period will include nearly all unpaid invoices. There is no standard approach to determining the cutoff point, but it is reasonable to allow up to a week of extra time beyond the allowed payment period before classifying an invoice as delinquent.

Another problem with this measurement is determining the amount of the *average* delinquent account receivable. If the subject company is small, it is likely that there are only a few delinquent invoices, so the collection of just a few of them will significantly alter the average amount; this is less of an issue for large companies, where there are so many more outstanding invoices that the collection of one or two will not have a significant impact on the average amount outstanding.

Description: Although changes in which policies and collection outivities can alter the ratio of accounts level of profitability. The days sales in receivables index is a simple approach for determining if this may be the case. The underlying concept for the index is that the offsetting entry to a false sale will be accounts receivable, which will therefore increase, since there is no way that the false receivable can be collected and converted into cash. A sudden jump in the proportion of accounts receivable to sales can therefore be construed as being caused by the addition of false sales.

Formula: Divide the sales in period two (the most recent period) by accounts receivable for the same period. Then run the same calculation for period one (the preceding period), and divide the result into the ratio for period two. The formula is:

Accounts receivable in period two Sales in period two

Accounts receivable in period one

Example: The management of the Optico Fiber Company, a publicly held manufacturer of fiber cables and connection equipment, is suspicious of a sudden rise

The preceding two formulas use the entire cost of goods sold in the numerator, which includes direct labor, direct materials, and overhead. However, only direct material costs directly relate to the level of raw materials inventory. Consequently, a clearer relationship is shown by comparing the value of direct materials expense to raw materials inventory, yielding a raw materials turnover figure. This measurement can also be divided into 365 days to yield the number of days of raw materials on hand. The formula is:

Direct materials expense Raw materials inventory

The preceding formula does not yield as clear a relationship between direct material expense and work-in-process or finished goods, since these two categories of inventory also include cost allocations for direct labor and overhead. However, if these added costs can be stripped out of the work-in-process and finished goods valuations, then there are reasonable grounds for comparing them to the piper parterials expense as a valid ratio.

5 Turns per year

To determine the number of days of inventory on hand, the CFO divides the number of turns per year into 365 days:

Table 5.4			
Balance Sheet Line Item	Amount		
Cost of goods sold	\$4,075,000		
Direct materials expense	\$1,550,000		
Raw materials inventory	\$388,000		
Total inventory	\$815,000		

\$1,750,000 Total purchases \$157,000 Ending accounts payable

11.1 Accounts payable turnover

Cautions: The same cautions noted for the accounts payable days measurement apply to the accounts payable turnover calculation as well.

CURRENT RATIO

Description: The current ratio is used by lenders to determine whether a company has a sufficient level of liquidity to pay its liabilities. A current ratio of 1:1 is con-Formula: Divide all current assets by all current liabilities. The formation of the formati sidered to be the absolute minimum level of acceptable liquidity, whereas a ratio

current financial health of Example: Apr ourchaser is interested the plus retail chair the element is for common maladies. The purchaser obtains the information in Table 5.6 about the company for the past three years.

The rapid increase in the amount of current assets indicates that the retail chain has probably gone through a rapid expansion over the past few years. The sudden jump in current liabilities in the last year is particularly disturbing and is indicative of the company suddenly being unable to pay its accounts payable, which have correspondingly ballooned. The purchaser elects to reduce the offer for the company because of the likely prospect of an additional cash infusion to bring its operations onto an even keel.

Cautions: This measurement can be misleading if a company's current assets are heavily weighted in favor of inventories, since this current asset can be difficult to liquidate in the short term. The presence of this problem can be revealed by using the inventory to working capital ratio or the inventory turnover ratio.

Table 5.6					
	2000	2001	2002		
Current assets	\$4,000,000	\$8,200,000	\$11,700,000		
Current liabilities	\$2,000,000	\$4,825,000	\$9,000,000		
Current ratio	2:1	1.7:1	1.3:1		

Current liabilities with required payment dates Total current liabilities \$148,000 Current liabilities with required payment dates \$197,000 Total current liabilities

75% Required current liabilities to total current liabilities ratio

Cautions: This ratio does not reveal a great deal of information if measured only for a single period, since there is no way to compare it to historical information. A better approach is to measure it on a trend line, or to compare it to the same period in the preceding year, when the liability proportion should have been about the same.

Also, the ratio does not reveal how much cash is actually needed for short-term payment requirements, so it should be supplemented with a short-term cash forecast sale.co.u that itemizes the precise cash flows to be expected over the measurement period.

WORKING CAPITAL TO DEBT RATIO

Description: The working capital to delta ft p is used to see if a company pay off its debt by liquidating its working capital. This measure is wed only in aid off at once, since the equilibrium of all working cases where debemat capital makes it in possible to run a busi coss and will likely lead to its dissolution.

Formula: Add up cash, a young receivable, and inventory, and subtract all accounts payable from the sum. Then divide total debt into the result. A variation is to use only short-term debt in the denominator, on the grounds that only this portion of the debt will come due for payment. The formula is:

Cash + Accounts receivable + Inventory – Accounts payable Debt

Example: The financial performance of the Open Sesame Door Company, makers of voice-activated door systems, has been so poor that it has violated all of its bank covenants. Because of the covenant violations, the bank has elected to call in its loan immediately. The bank vice president wants to see if the company can pay off the loan from its current resources and so examines the company's latest balance sheet and sees this information:

Balance Sheet Line Item	Amount
Cash	\$20,000
Accounts receivable	\$65,000
Inventory	\$110,000
Accounts payable	\$80,000
Debt	\$185,000

Ratio	Z-Score
Weighted return on total assets ratio	0.09
Weighted sales to total assets ratio	1.04
Weighted equity to debt ratio	0.41
Weighted working capital to total assets ratio	0.22
Weighted retained earnings to total assets ratio	0.19
Total Z-score	1.95

When these calculations are summarized, we arrive at the Z-score shown in Table 5.14.

With a low score of only 1.95, the Children's Furniture Factory should not be no business much longer.

Cautions: The results of this calculation are reliable only into e essert audulent financial reporting by a company that results in a with relation 2-score than we deretherwise be the case. Also, a sudden downt in it the economy, or some ther factor impacting profits, such as a price way can send a company scharcher condition spiraling downward on encircle of a high Z-score

9

pieces of equipment, some of which are old enough to have value as antiques (the equipment, not the staff). The company had income of \$230,000 in the last year. The CFO accumulates the following information about its fixed assets:

Total asset base	\$700,000
Band saws required for maximum capacity	4
Total band saws available	7
Average band saw cost	\$15,000
Belt sanders required for maximum capacity	3
Total belt sanders available	8
Average belt sander cost	\$8,000

By avoiding the opinions of the production staff and instead relying on a quantitative comparison of capacity levels and available equipment, the CFO has determined that there are three extra band saws and five extra belt sander. For a combined cost of \$85,000. With this information, the CFO calculates the verue on operating assets as:



37% Return on operating assets

Cautions: The specific assets included in the denominator can be subject to a great deal of interpretation, since managers realize that any assets not included in it will eventually become targets for elimination. Consequently, the list of assets used should be carefully reviewed, preferably with the industrial engineering staff, to ensure that each asset has a direct role in the production of revenue.

RETURN ON EQUITY PERCENTAGE

Description: This calculation is used by investors to determine the amount of return they are receiving from their capital investment in a company. This is a commonly used measure, but can be misleading, as discussed under the Cautions section.

Formulas: Divide net income by total equity. To obtain a better picture of the ability of a company to generate a return from operating activities only, the measure can be modified to be net income *from operations* divided by total equity. The basic formula is:

Cautions: There may be very good reasons for issuances of dividends that prevent the amount of equity from growing. For example, the Internal Revenue Service may have warned the company that it is retaining an excessive amount of equity and will be taxed on the excess amount unless it is distributed; also, the board of directors may have concluded that dividends in arrears must be paid out, stock must be bought back to shore up the market price of the stock, or a liquidating dividend is in order. In short, there may be good reasons for a moderate or negative equity growth rate.

EARNINGS PER SHARE

Description: This measure is the standard used to compare the financial results of publicly held companies. It is useful for shareholders to determine changes in earnings per share held over a period of time.

Formula: Subtract the dividends on preferred stock from net income a to divide the result by the combination of all outstanding common states are and all common stock equivalents. The amount of common stock equivalents is the but of all vested warrants and options as we had all convertible securities that have not yet been converted too common stock; this figure thus to be too high, since the holders or most common stock equivalent will frequently not exercise then thin to purchase common stock are terms for purchase of common stock equivalents are currently hence than the price at which they can be purchased on the open market, it is not very likely that they will be converted to common stock, and they can be safely excluded from the calculation. The formula is:

Net income - Dividends on preferred stock

Number of outstanding common shares + Common stock equivalents

Example: The controller of the Open Sesame Garage Door Company is calculating the earnings per share for the company, given the following information:

Net income	\$250,000
Preferred stock dividends	\$28,000
Shares of common stock	4,500,000
Number of vested options	125,000
Number of convertible bonds	20,000
Number of warrants	50,000

If the controller calculates earnings per share on a nondiluted basis, the formula will not include the options, convertible securities, or warrants shown. The formula will look like this:

 $\frac{\$250,000 - \$28,000}{4,500,000 \text{ shares}} = \frac{\$222,000}{4,500,000} = \frac{\$.049/\text{share}}{\$.049/\text{share}}$

If the options, convertible securities, and warrants *are* added to the calculation on a fully diluted basis, then the calculation is:

 $\frac{\$250,000 - \$28,000}{4,500,000 + 125,000 + 20,000 + 50,000} = \frac{\$222,000}{4,695,000} = \frac{\$222,000}{4,695,000} = \frac{\$0.47/\text{share}}{\$0.47/\text{share}}$ Cautions: Net income is a key component of this ratio. Although implane the of a company's overall operating condition, it can be skewed by no operating charges or credite, and it will also not reveal a company's such position. Consequently, it should be combined with a review of operating results, as well as a care like arrithment of all each aff of word outflows. Also, as noted in the Formula section, the amount or commensuot equivalents is frequently overstated, which tends to artificially reduce the amount of earnings per share.

PERCENTAGE CHANGE IN EARNINGS PER SHARE

Description: Earnings per share (EPS) is one of the most closely watched measures of corporate performance, so it makes sense for outside investment analysts, investors, and managers to regularly review the rate at which EPS changes from period to period. A company producing a lengthy string of gradual increases in EPS over many quarters is considered to be evidence of good management.

Formula: Divide the incremental change in EPS in the most recent reporting period by the EPS in the preceding period. It is possible that EPS will be modified by the management team in order to report a string of continuing increases (see the Cautions section); an alternative form of reporting is to base this measurement on cash flow per share, which is more difficult to alter. The formula is:

Incremental change in earnings per share Earnings per share from previous period **Formula:** The cost of capital is composed of the costs of debt, preferred stock, and common stock. The formula for the cost of capital is composed of separate calculations for all three of these items, which must then be combined to derive the total cost of capital on a weighted average basis. To derive the cost of debt, multiply the interest expense associated with the debt by the inverse of the tax rate percentage, and divide the result by the amount of debt outstanding. The amount of debt outstanding that is used in the denominator should include any transactional fees associated with the acquisition of the debt as well as any premiums or discounts on sale of the debt. These fees, premiums, or discounts should be gradually amortized over the life of the debt, so that the amount included in the denominator will decrease over time. The formula for the cost of debt is:

Interest expense \times (1 – Tax rate)

e.co.u Amount of debt - Debt acquisition fees + Premium on debt - Discount on debt

erred s

The cost of preferred stock is a simpler calculation since interes made on this form of funding are not tax-deductible. The three are of 336

nterstock requires a different type of calcuof the cost of cor lation. It is composed of the type soft eturn: a risk-free return, an average rate of return to be expected from a typical broad-based group of stocks, and a differential return based on the risk of the specific stock in comparison to the larger group of stocks. The risk-free rate of return is derived from the return on a U.S. government security. The average rate of return can be derived from any large cluster of stocks, such as Standard & Poor's 500 or the Dow Jones Industrials. The return related to risk is called a stock's *beta*; it is regularly calculated and published by several investment services for publicly held companies, such as Value Line. A beta value of less than one indicates a level of rate-of-return risk that is lower than average, while a beta greater than one would indicate an increasing degree of risk in the rate of return. Given these components, the formula for the cost of common stock is:

Risk-free return + (Beta × (Average stock return – Risk-free return))

Once all of these calculations have been made, they must be combined on a weighted average basis to derive the blended cost of capital for a company. This is accomplished by multiplying the cost of each item by the amount of outstanding funding associated with it:

Total debt funding \times Percentage cost = Dollar cost of debt Total preferred stock funding \times Percentage cost = Dollar cost of preferred stock

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\$32.87 Stock price (\$8,500,000 Net income/3,875,000 Shares outstanding = 15:1 Price/earnings

So far, the price/earnings ratio appears to compare favorably to the industry average. However, if the analyst excludes the extraordinary gain from net income, the earnings per share figure drops to \$1.61 per share. When incorporated into the price/earnings formula, this change increases the ratio to 20:1, which is higher than the industry average. Accordingly, the analyst considers the stock to be overpriced relative to the industry and refrains from recommending it to clients.

Cautions: If a stock tends to fluctuate widely over the short term, then it is difficult to arrive at an average common stock price that yields a valid price/earnings ratio. In such cases, it is better to calculate the price/earnings ratio with the most current common stock price as the numerator and view it on a trend line to monitor changes.

Another issue is that the net income figure can be significantly altered by the presence of large reserves or extraordinary items that skew operating reutes. In these cases, it is better to examine the underlying financial represented by the net income from operations, and use that number extremest end income figure in the measurement.

Yet another issue is that the active process based on common of factors besides net income, such a relevant bustly-wide drop in the active prospects, legal action against the outpany, well-publicized varianty chains, the presence of valuable parents and so on. These access are result in a stock price that is substantially different from what would other wisc be the case if only net income were the driving factor behind the stock price.

CAPITALIZATION RATE

Description: The capitalization rate is simply the reverse of the price/earnings ratio. It can be used in concert with the price/earnings ratio to see what the implied rate of return is on a company's stock, given the price at which its shares currently sell on the open market.

Formula: Divide earnings per share by the market price per share. The net income per share figure is typically used on a fully diluted basis, accounting for the impact of options, warrants, and conversions from debt that may increase the number of shares outstanding. If the capitalization rate measurement is being used to decide whether to purchase or sell stock, brokerage and other fees required to complete the transaction should be included in the calculation. The formula is:

Earnings per share Market price per share

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Example: An investor is interested in buying the stock of a high-tech company that specializes in the production of wireless Internet connections. This company's stock has experienced a considerable run-up in its stock over the past few months, and the investor is concerned that it may have gone too high to be a valid investment. Its earnings per share are \$2.18, and its stock price is \$159.14. This means that its capitalization rate is 1.4% (\$2.18 earnings per share, divided by \$159.14 stock price), which represents a return on investment of 1.4%. The investor therefore considers the stock to be too expensive and elects to wait for its price to drop before making an investment.

Cautions: As was the case for the price/earnings ratio, the capitalization rate can be skewed by the presence of extraordinary items that do not properly reflect the earnings stream from operations. If the proportion of extraordinary charges or income in the earnings per share figure is significant, then these should be stripped away, leaving earnings from operations in the numerator of the formula.

Variable cost per year = Processing fee of 1.00×120 employees $\times 26$ payrolls

- = Envelope stuffing fee of $.15 \times 120$ employees \times 26 payrolls
- = Direct deposit fee of $$.50 \times 120$ employees \times 26 payrolls
- = Garnishment fee of 2.50×10 employees $\times 26$ payrolls
- = \$5.148

Fixed cost per year = Minimum processing fee of $$50 \times 26$ payrolls

= Delivery fee of 10×26 payrolls

= 401(k) report charge of 12×12 months

= Sick time report charge of 10×12 months

= \$1.824

Total cost per year = \$6,972

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26 payrolls

= Direct deposit fee of $\$.65 \times 120$ employees \times 26 payrolls

= Garnishment fee of 3.50×10 employees $\times 26$ payrolls

= \$7.618

Fixed cost per year = Minimum processing fee of 15×26 payrolls

= Delivery fee of 0×26 payrolls = 401(k) report charge of $$5 \times 12$ months = Sick time report charge of $$5 \times 12$ months = \$510

Total cost per year = \$8,128

This analysis shows that the competitor's bid is \$1,156 higher than that of the existing service provider, primarily because the competitor charges higher peremployee fees (despite having lower fixed service costs). In this case, the variable + 0.46 Ending hours completed \times 3 audits = 1.38 Ending audits completed

+ Audits completed = 91.00

Number of equivalent audits completed = 93.23

93.23 Internal audits completed 109 Internal audits planned = 85.5% Internal audit efficiency

=

Cautions: This measurement focuses solely on the ability of the internal audit staff to complete their audits, not on their ability to discern any systemic problems tesale.co.u arising out of those audits. Consequently, the measurement must be supplemented by a qualitative review of the results of all completed audits.

BAD DEBT PERCENTALE

Description: A company shall ke rack not only of mount of bad debts incurred r, but also their trend in the specific reasons why each one becare was debt, the relationship between corporate credit policy and the nut of bad debts in a roo a diffeompany's bad debt experience in relation to the rest of the industry. All of these comparisons are needed in order to determine how bad debt levels are being controlled. The most basic of these measurements is the bad debt percentage, which compares the amount of bad debt incurred to either the total amount of credit sales or total outstanding accounts receivable.

Formula: Divide total bad debt dollars by the total amount of accounts receivable. The formula is:

> Total bad debt dollars recognized Total outstanding accounts receivable

The problem with using accounts receivable as the denominator for this calculation is that it only shows the relationship of bad debts to a small proportion of sales, which are represented by the accounts receivable balance. An alternative approach is to divide total bad debt dollars by total annualized credit sales; however, if this approach is used, then the numerator will only be comparable to the denominator if the bad debt figure is annualized, either by using the last 12 months of bad debts on a rolling basis, or by annualizing the amount of bad debts incurred over a shorter period. The formula is:

\$10,325 Applied on day of receipt Dollars of incoming cash = \$1,200 Cash + \$6,025 Checks +\$500 Wire + \$3,250 ACH

94% Application rate

If the wire transfer is excluded from the calculation, on the grounds that the accountant has no way of knowing how it should be applied, then the calculation changes to the following format:

\$10,325 Applied on day of receipt Dollars of incoming cash = 1,200 Cash + 6,025 Checks + 3,250 ACH

99% Application rate

Cautions: As just noted in Example, it may not be possible to apply cather the COV receivable records, because customers have not indicated which it is a state of the COV receivable records. paid with the cash. The amount of these funds must then better area in a holding account until the customers can be contacted about the problem. On the arc inds that a missing cash application is the cest men's fault, one can exclude the a noant of this unapplied cash from the mast ement. However, on Canalso include this cash in the measure on the grounds that his ville free the cash applications es live the problem with estomers in order to achieve the highest staff te ca mily pd sibl measurement res 🕩

COST OF CREDIT

Description: The cost of credit is used to determine the cost of not taking a discount offered by a supplier. It is used by the purchasing department as a negotiating tool so that a company can receive a net return on early payments to suppliers. It is also used extensively by the accounts payable staff to verify that the early payment terms offered by suppliers continue to be valid as the company's cost of capital changes. Further, the sales staff uses the calculation in its dealings with the purchasing staffs of other companies, who are also interested in obtaining better early payment discounts.

Formula: Determine the proportion of a full year to which the discount period applies. This is the number of days between the end of the early payment period and the date when the payment would normally be due at full price, divided into 360 days. This is the time period over which the discount rate earned by a company is applied. Next, subtract the offered discount percentage from 100%, and divide the result into the discount percentage. This is the effective interest rate that a company will be earning when it takes a supplier-offered discount. Finally, multiply the effective interest rate by the proportion of the full year to which the discount period applies. This yields the annualized cost of the credit being offered by a supplier through its early payment discount. The formula is:

Discount %/(100-Discount %) × (360/Full allowed payment days – Discount days)

Example: A supplier of the Newman Astronautics Company is offering early payment terms of 2/15 net 40, which is a discount of 2% if paid within 15 days, with regular payment due after 40 days. Newman's cost of capital is 14%. The accounts payable manager needs to decide if it is economically sensible to take advantage of the discount. The calculation is:



Cautions: Typically, the cost of credit is compared to a company's cost of capital, which is a blended rate composed of the cost of all corporate debt and equity. In reality, taking a discount tends to be an incremental decision related to the immediate cost of invested funds. For example, an accounts payable manager will draw down cash from a short-term cash supply, typically invested in a money market fund, to take advantage of an early payment discount. This means that the incremental investment trade-off is a few percent of interest earned in the money market fund, rather than the much higher cost of capital for the entire company.

EARNINGS RATE ON INVESTED FUNDS

Description: Most organizations have excess funds available that may be used eventually for working capital or asset purchase requirements, but which are unused at the moment. Others have considerable cash reserves that are being held for larger expenditures, such as acquisitions. In either case, these funds should be invested to derive some rate of return, which can include interest income or an increase in the market value of securities held. The earnings rate on invested funds is a good measurement for tracking the performance of this activity.

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Measurements for the Logistics Department

co.u he logistics function is composed of production scheduling, purchasing rials handling, and distribution. These areas are all central at Woth functioning of a company's production processes. A single of of these area n is is a prime area in which the severely impact or even halt production, and maintain a rigorous system of right rement tracking. The 16 measurements described in this chapter he intended to address the bpe onal aspects of logistics and should be reasured on a trend line to e re that management can spot of \mathfrak{P} then **w** ifficulties as The measurements discussed are:

Production Schedule Accuracy Economic Order Quantity Number of Orders to Place in a Period Economic Production Run Size Raw Material Inventory Turns Raw Material Content Finished Goods Inventory Turns **Obsolete Inventory Percentage** Percentage of Inventory > XX Days Old Percentage of Returnable Inventory Inventory Accuracy Percentage of Certified Suppliers Electronic Data Interchange Supplier Percentage

On-Time Parts Delivery Percentage Purchased Component Defect Rate Incoming Components Correct Quantity Percentage Percentage of Actual Payments Varying from Purchase Order Price Percentage of Purchase Orders Issued below Minimum Dollar Level Proportion of Corporate Credit Card Usage Percentage of Receipts Authorized by Purchase Orders Freight Audit Recovery Ratio Picking Accuracy for Assembled Products Average Time to Ship

next measurement) or its cost. These additional features can be measured alongside the on-time delivery percentage or melded into an overall rating score for each supplier.

PURCHASED COMPONENT DEFECT RATE

Description: The purchasing staff should be interested in the proportion of components purchased from outside suppliers that are defective. Any defect requires expensive time to document and return and may even interfere with the timely completion of the production schedule. Consequently, this is one of the most important measures of supplier performance. It should be measured both by supplier and by each component provided by each supplier, in case there are problems with only some portion of a supplier's total deliveries to a company. Also, it should be measured on a trend line, so that gradual increases can be easily spotted and dealt with.

Formula: Summarize all rejected components and civil these by the total number of components received. As just notably is measurement should at here to summarized by supplier, if not by specific component types delivered by individual suppliers. The formula s:



Example: The Tango Mural Company, manufacturer of flame-retardant Spanish tiles, has been having trouble with the receipt of chemicals from a key supplier. The company operates a lean inventory system that does not allow it to go for more than two days without inventory replenishment. Consequently, the rejection of chemicals from its orders has thrown it into an expedited ordering mode in recent months to keep its tile-baking facility operational. The purchasing staff accumulates the information in Table 11.7 to present to its chemical supplier.

The reject rate in month three has jumped drastically over that of the preceding two months, denoting some type of quality problems at the supplier. The purchasing manager decides to take this table into a meeting with the supplier, with the intention to demand immediate improvement in the rejection rate.

Table 11.7				
	Month 1	Month 2	Month 3	
Barrels ordered	512	431	602	
Barrels rejected	31	30	72	
Purchased component defect rate	6%	7%	12%	

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engineers in the boat design and testing groups appear to be somewhat less enamored with the concept. Therefore, the logistics manager schedules meetings with the managers of both departments to see what steps can be taken to increase the usage level.

Cautions: Though 100% usage of purchasing cards for all transactions below a specific dollar limit is a laudable goal for reducing purchasing labor costs, it is subject to abuse. For example, an employee can make multiple credit card purchases at a level just below the maximum limit to buy something that is much more expensive, which would normally have been subject to a great deal of purchasing scrutiny. Furthermore, purchasing cards can be used to make personal acquisitions, or to buy inappropriate items or services. All of these problems can be mitigated through internal audit reviews, limitations on the types of purchases allowed through corporate credit cards, and periodic maximum purchasing limits. However, all these controls should be put in place before a company can determine whether a high proportion of corporate credit card use has actually reflected its total purchasing costs.

PERCENTAGE OF RECEIPTS ADTHORIZED BY PURCHASE OTDERS

Description: On the most difficult tasks for the soleiving staff is to decide what the orders that are recarded with no accompanying purchase order. Since the orders are not at horized, and staff could simply reject them. However, they run the risk of rejecting some item that may have been bought on a priority basis and will cause undue trouble for the logistics manager when projects in other parts of the company are held up. Accordingly, these orders are frequently set to one side for a few hours or days, while the receiving staff tries to find out who ordered them. This can be a significant waste of receiving time, and it is worth measuring on a trend line to see if the problem is worsening.

Formula: The receiving department should maintain a receiving log, on each line of which is recorded the receipt of a single product within an order. Using the line items in the receiving log that correspond to the dates within the measurement period, summarize the number of receipt line items authorized by open purchase orders by the total number of receipt line items in the log. The formula is:

Receipt line items authorized by open purchase orders Total receipt line items

Example: The Hoboken Highlanders, makers of Scottish clothing for New Jersey residents (an admittedly small niche), has eliminated several of its purchasing controls to increase its level of purchasing efficiency. To counteract this deliberate weakening of controls, the logistics manager has insisted upon the use of purchase orders for 100% of all purchases made by the company. The primary

derive the net recovery rate experienced by the company as a result of the auditors' efforts. The basic formula is:

Total freight billings refund Total freight billings

Example: The Redfern Ski Company ships its super lightweight plastic skis to a variety of military and rescue organizations throughout the world, which depot them in remote locations for emergency rescue operations. Its per-unit freight bills sometimes exceed the cost of the skis being shipped, so the company regularly brings in freight auditors to ensure that the lowest possible freight charges are being paid. This year, the Robertson Auditing Company is reviewing billings for Redfern. It charges 35% for all refunds collected, which is higher than the 30% charged by last year's auditors, who achieved a 5% freight audit recovery rate, net of their fee. Of the \$1,250,000 of freight billings that Robertson reviews, it finds that 8.5% should be refunded to the company. The calculation of its freight ardit recovery ratio is:

Since Robertson achieved a higher recovery rate, net of their fee, than the previous year's auditors, Redfern may consider retaining this higher-performing audit firm for the following year.

% Recovery rate

Total freight billing

Previe

Cautions: Most organizations do not have a sufficient volume of freight bills to warrant using freight-auditing firms on a year-round basis (if they did, they would be justified in bringing the work in-house). If freight auditors are brought in too frequently, they may end up reviewing freight invoices that were already reviewed during the last audit. Picking over the same invoices in this manner will inevitably result in a decline in the freight audit recovery ratio, which is not the fault of the freight auditors, but rather of the company that scheduled them to begin work too soon.

PICKING ACCURACY FOR ASSEMBLED PRODUCTS

Description: When a company ships disassembled products to customers, it is important that the kits shipped out have exactly the correct number of the right

it is quite common for large custom-made products to require one or more days of work before a properly configured shipping container can be built for it. Measuring the average delivery time can determine if this constitutes a significant portion of the time period required to make a product and deliver it to the customer.

Formula: For each shipment in a sample group being reviewed, subtract the actual delivery date from the date when the order was sent to the shipping area. The delivery date can be taken from the shipping log or the bill of lading, while the date of movement to the shipping area can be taken either from production records (if products have just been produced) or from materials-handling records (if they have been taken from finished goods inventory). The formula is:

Delivery date - Date order was sent to shipping area

Example: The Magellanic Company, maker of custom sea-going rowboats for the fishing industry, typically spends several days constructing shipping container for each of its rowboats. The logistics manager wants to determine verticative standard time of two days is adhered to in all cases; other of each ager handling fee should be charged on certain types of boaten the manager derives the process the process in Table 11.13 from deliveries manager in the past month.

The logistics manager recess that boats longer than 13.5 in bis take an extra day to construct of the convestigation reveals that the is caused by the standard whole the of 13.5 incluse is no exceeded, requiring considerable extra time to lengthen. Accordingly, the rechager recommends a price increase for all boats over 13.5 incluse to account for this packaging problem.

Function: It may not be the fault of the shipping department if the average delivery time is extended because of a credit-related stoppage in shipping. This happens when the collections staff decides that a customer is not paying for existing invoices in a timely manner and requires the shipping staff to stop shipping products to the customer until overdue payments are received. If products related to these customers have already arrived in the shipping department, then they may sit there for weeks before payment is received, thereby increasing the size of the measurement. The problem can be avoided by having the shipping department immediately return these items to the warehouse for storage.

Table 11.13		
Order Number	Boat Dimensions (inches)	Average Delivery Time
307	5×12	2
318	6×15	3
312	6.5×15	3
310	5.5×14	2
315	6×13.5	2

Cautions: There can be a time delay between the point when a customer complaint is received and the date when the related product was shipped, so that the time period covering the numerator in the calculation is somewhat earlier than the time period covering the denominator. This can result in an inaccurate measurement if the volume of orders changes significantly from period to period. The problem can be mitigated by using larger time periods for the measurement, such as quarterly instead of monthly.

PERCENTAGE OF SALES THROUGH DISTRIBUTORS

Description: A company may use a number of sales channels to move its products to customers, such as direct retail, direct catalog, distributors, retail chains, and so on. Each channel should be measured to see where the bulk of company O.U business is being generated. The header for this measurement is the percentage of sales through distributors, but it can be easily modified to determine the poortion of sales through any sales channel. This measurement is lister in the loss is chapter instead of the sales chapter because the type of d ution channel has a profound impact on the cost structure of the logist ca epartment's shippin For example, sales to a distributor regenerally in bulk, which reduce reight costs, while sales directly to consumers require react high relackaging and delivery costs. Also, c con ei support is sometimes har a a by distributors, whereas al creek ire a company to hear leavis function itself. dieu

Formula: Divide the total dollars of sales to distributors by the total dollars of sales by the company. This measure can be used for any other sales channel, and can also be separated into sales by different product lines or geographic regions. The formula is:

Total dollars of sales to distributors Total dollars of sales

Example: The Shenandoah Golf Company manufactures titanium golf clubs. It began by selling through golf course pro shops in the Virginia area and has since used a variety of sales channels to increase its sales throughout North America. Lately, the sales and logistics department costs have become so large that the president decides to review all of the sales channels to see if some can be eliminated, thereby allowing the company to drop those employees who were dedicated to specific sales channels. The president collects the information shown in Table 11.16.

By splitting sales into sales channels and then taking the extra step of determining net margins on each channel, the president can see that the catalog sales channel should be eliminated, given its net losses. Also, sales to retail chains are not resulting in excessively high margins, though they are positive; this may be an area requiring additional review.

Table 11.16				
Sales Channel	Sales by Channel	Total Sales	Percent Sales by Channel	Margin After Support Costs
Catalog	\$450,000	\$15,595,000	3%	-15%
Distributors	\$3,800,000	\$15,595,000	24%	12%
Pro shops	\$6,250,000	\$15,595,000	40%	11%
Retail chains	\$5,095,000	\$15,595,000	33%	6%

Cautions: Though the measurement of sales volume by channel is important, it is even better if the accounting system can be designed to yield gross margins or (better yet) net margins by sales channel. This is usually difficult to achieve and requires some manual revision of the numbers stored in the general ledger. If this is done, a company sometimes finds that the net profits resulting from direct sales to customers are lower than if sales are made through intermediaries, such calise tributors, because of the many expenses involved with directs the theory of the gross margin associated with the various sales channels is interprotated into the calculation, then the reverse conclusion provide reacted, since this measure will only show the reduced prices that if the peak grant to distributors.

12

Measurements for the Production Department

Production measures are unique in that they involve very few finapeia i tots. Instead, most of the information from which they are derived Channed from other sources, such as tracking systems for units of the lactar, machinery atilization time, and scrap tracking. These excenses may not be as tight a corr (1) d as financial systems, so the data use (for these measurement should b) tested to ensure that it is of a cufficient quality to yield eccente information. The measurement elescribed in this chapter all the several categories: the utiliable of sorp production constraints, and known as bottleneck operations; overall productivity and effectments, and usage; and overhead expense utilization. The measurements discussed in this chapter include:

Constraint Productivity Constraint Rework Percentage Constraint Schedule Attainment Constraint Utilization Degree of Unbalance Throughput Effectiveness Break-Even Plant Capacity Manufacturing Effectiveness Productivity Index Unit Output per Direct Labor Hour Average Equipment Setup Time Unscheduled Machine Downtime Percentage Acceptable Product Completion Percentage Work-in-Process Turnover Scrap Percentage Warranty Claims Percentage Maintenance Expense to Fixed Assets Ratio Indirect Expense Index Reorder Point On-Time Delivery Ratio

CONSTRAINT PRODUCTIVITY

Description: An efficient management team wants to increase the productivity of its bottleneck operation, since increasing the amount of throughput at this location will enhance the company's overall ability to generate a larger profit. If the efficiency of some other operations were to be enhanced, the bottleneck would still exist, and so overall manufacturing output would not improve.

Formula: Divide the total number of units produced per hour by the number of hours worked at the bottleneck operation. If several different products are being continually run through the bottleneck operation, all requiring different processing times, then the measure should be separately calculated for each product so that productivity can be more precisely determined. The measurement should be tracked on resale.co.u a trend line in order to spot changes in the level of productivity. The formula is:

Number of units produced per hour Number of hours worked

Example: The Aboriginal Paintwork Company an of its hand three u ramic products through a kiln, thigh is the bottleneck in its single-shift peration. The plant manager wants to see if an ongoing effort to reduce setup, baking, and retrieval times tax related a greater degree of efficiency at this operation. The n metric precisinformation over a the emonth period that includes several compary holidays that is show m 6.1.

The table shows that the increased number of work days occurring during the three-month period has created the appearance of greater efficiency at the kiln, even though the actual level of productivity has gradually declined on a per-hour basis throughout the period.

Cautions: This measurement can yield misleading results if the mix of units produced carries a lower profit margin than some other mix that might require the production of fewer units, resulting in a high level of productivity to create a smaller profit than might otherwise be attained. Consequently, this measure should be used in conjunction with a review of the total gross margin being generated by the bottleneck operation.

Table 12.1			
	May	June	July
umber of units produced	6,400	6,552	6,688
mber of work days	20	21	22
mber of available hours	160	168	176
onstraint productivity	40/hr	39/hr	38/hr

CONSTRAINT REWORK PERCENTAGE

Description: A bottleneck operation limits the total amount of production work that can be completed by a manufacturing facility, so the volume of work passing through it must be maximized. This objective can be severely impinged upon when production rework must be passed through the bottleneck for refinishing work, since the bottleneck operation must duplicate previously completed work which infringes upon its ability to complete new work that would otherwise have created additional profits. Consequently, the production manager should closely track the amount of rework time at the bottleneck operation.

Formula: Divide the total rework hours used in a constraint operation by the total number of hours available at the constraint. For example, if a constraint operation Rework hours used in constraint operator Sale CO. Total hours of constraint can be used 24 hours a day, then this should be used in the denominator. The formula is:

Example: The Premium Wood work Company run, nea ly a of its furniture a ling operation, with hard production bottleneck. A products through a pet number of Sulving problems have been recognized downstream from this operatice, necessitating rework be realized s through the belt sander a second time. It is also possible to sand the flaws by hand, though this takes much more labor to complete. The belt-sanding operation runs 24 hours a day, 365 days a year. Should the constraint rework measurement be used in this situation, and if so, how should it be measured?

The measurement should be used, because the bottleneck belt sanding operation is operating at its absolute capacity with no room for rework tasks. If sanding flaws can be corrected by hand, then this option should be pursued instead of using any capacity in the bottleneck for the same task. The measurement should only include any rework that is actually run through the belt-sanding operation, since this reflects the production manager's inability to shift rework away from the bottleneck. For example, if three hours of rework were required for manual sanding and two hours for belt sanding in a 24-hour day, then only the two hours used for belt sanding should be divided by the 24 hours of available capacity to arrive at a constraint rework percentage of 2/24, or 8.3%.

Cautions: Rework that can be shifted to other machines than the bottleneck operation should be excluded from the calculation, but only if it is in fact shifted elsewhere. Also, this measurement is less valid in situations in which companies use their bottleneck operations for less than a 24-hour day, since they can simply schedule some overtime work to handle excess work requirements.

intensive activities requiring a variable labor rate with automated equipment requiring an additional fixed cost.

Formula: Multiply the current plant utilization level by the total amount of fixed costs currently incurred by the plant. Then divide into the result the net amount of sales minus all variable expenses. There may be varying points of view regarding which costs are listed in the denominator as variable, and which are listed in the numerator as fixed-no matter how the issue is settled, be sure to include all costs somewhere in the formula, with no exclusions (except for extraordinary costs). This formula can be used effectively for individual product lines within a facility. The formula is:

Current utilization level × Total fixed costs

Example: The Archly Investment Company is considering the purchase the COV Sinclair Aircraft Company. A key consideration is the ability earn money in an expanding private aircraft model. The director of Archip is keenly interested in the break-even plant empirity to see if there is much a sile potential, or if the break-even with a sonigh that the facility would be unable to turn a significant profit oven if the market increased considerably. The director finds that the field wis currently operating a 45% capacity, that its sales are \$20,925,000, and its fixed costs \$ 600,000, hs variable x n es are \$15,425,000. The calculation is:

> Current utilization level × Total fixed costs _ Sales - Variable expenses (40% Current capacity level) × (\$25,425,000 Fixed costs) _ (\$46,500,000 Sales) – (\$30,925,000 Variable expenses)

 $\frac{\$10,170,000}{\$15,575,000} =$

65% Plant break-even capacity

Given the 65% plant break-even capacity level, there appears to be room for additional profits if sales increase.

The Archly director would also like to determine the theoretical maximum amount of profits if capacity utilization were to reach 100%. The facility uses 40% of its capacity to generate \$46.5 million of sales; by dividing the 40% utilization figure into existing sales level, the director estimates that total sales at a 100% utilization level would be \$116,250,000. Also, the existing gross margin is 33% (based on sales of \$46.5 million, less variable costs of \$30.925 million, divided by sales). These figures allow the director to estimate total theoretical profits as shown in Table 12.3.

Example: The production manager of a kayak manufacturing plant is concerned about the manufacturing effectiveness of the facility's constraint operation, which is a blow-molding machine that creates the kayak shells. The operation runs during all three shifts, seven days a week, so there is no way to increase its total output without purchasing an additional blow molding machine. However, the manager suspects that some of the output of this equipment is not being shipped to customers. The manager compiles the following information:

Total hours of constraint usage/week	168 Hours
Hours used for production run setups	38 Hours
Hours used on shells that are scrapped	12 Hours

Based on this information, the manager finds that manufacturing effectiveness of the operation is only 70%, which is derived as:



director hires the most experienced setup engineers available, hoping to reduce the amount of setup hours required to switch over to new production jobs.

Cautions: There can be a significant time lag between the shipment of products to customers and the point at which constraint hours were consumed, especially if the constraint operation is early in the production process and many days are required before shipment occurs. If so, the measurement of constraint hours consumed will fall into one reporting period, while the measurement of throughput hours shipped may fall into another, making it difficult to compile the information needed for the measurement. To avoid this problem, manually measure the types of throughput hours consumed at the constraint operation, though this can be subject to error (especially if the person tracking the information is also the subject of the resulting measurement).

PRODUCTIVITY INDEX

Description: The productivity index can be used to measure a variety of activities within a production operation that lead to changes in the volume of units manufactured. For example, if the total amount of maintenance hours spent on a work cell is increased, there may be a resulting increase in the total number of

UNIT OUTPUT PER DIRECT LABOR HOUR

Description: This measurement is most useful in those increasingly rare situations where the primary form of value added to a product is direct labor. In most situations, direct labor composes only a small proportion of the value added, so there is only a poor causal relationship between the amount of unit output and the number of direct labor hours worked. However, where the proportion of hours worked is high, this measure can have some value.

Formula: Add together the total number of units completed during the production period and the total number of unit equivalents, less the total number of unit equivalents recorded at the end of the preceding reporting period. Then divide the result by the total number of direct labor hours in the reporting period. A *unit equivalent* is defined as that completed proportion of an incomplete unit of production on which work has been finished. For example, if a product is 40% complete, then it work has been finished. For example, if a product is 40% complete, then it to 0.20 unit equivalents. If another product were 20% complete, then it work has been for example, the two units would be the been determined. The formula is:

equivalents

Example: There are three major jobs running through the production shop of the Overhead Hoist Company. At the end of the preceding period, Job A was 30% complete, Job B was 49% complete, and Job C was 83% complete. When combined, this amounted to a unit equivalent of 1.62 units of production (30% + 49% + 83%). At the end of the current reporting period, Job C was completed and shipped. Job A was 85% complete, Job C was 98% complete, and Job D was 32% complete. The number of direct labor hours worked in the shop in the current period was 2,418. The calculation of unit output per direct labor hour is:

unit equivale

otal number

Total units completed + Total

 $\frac{\text{Total units completed + Total unit equivalents} - \frac{\text{Total carryforward unit equivalents}}{\text{Total number of direct labor hours}} = \frac{1 \text{ Unit completed + } (.85 + .98 + .32) \text{ Equivalent units} - \frac{(1.62 \text{ Carryforward units})}{2,418 \text{ Direct labor hours}} = \frac{1 \text{ Unit completed + } 2.15 \text{ Equivalent units} - \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{2,418 \text{ Direct labor hours}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforward units}}{2,418 \text{ Direct labor hours}} = \frac{1.62 \text{ Carryforw$

Table 12.8				
Month	Kick Plate Usage			
January	1,258			
February	542			
March	1,602			
April	770			
May	894			
June	1,195			
Average usage	1,044			
Average usage	1,044			

Example: The Open Sesame Door Company purchases large quantities of door kick plates from a brass supplier. The production manager's performance rating has suffered from the lack of this item in the past, since running out of it has brought production to a complete halt. The production manager needs are dere point that ensures that the company never runs out of kick plates gave. It is dereval information for the last six months of production is how are Table 12.8.

If the production manager simply orders the average mount of usage of 614 kick plates in each month, then there would be have been enough of the northand to meet production requirement in January, March and June, it avoid this problem, the manager meet at heaferty stock to the average usage figure. To ensure that procurie the average usage reader evaluation usage. In this case, the maximum usage was in March, when 1,602 kick plates were needed. The difference between the maximum of 1,602 and the average usage of 1,044 is 558, which becomes the safety stock. Thus far, it appears that the safety stock should be 1,602 units, which is also the maximum amount of usage that can be expected during the year.

However, the production manager does not wish to invest so heavily in raw materials. The average lead time for purchases of kick plates is five business days, or one-quarter of a month. With this information, the manager realizes that orders can be placed four times a month, thereby reducing the amount of kick plates kept on hand; also, she only needs one quarter of the safety stock. Accordingly, the manager modifies the calculation for the short lead time in the following manner:

 $\frac{(\text{Average usage per time period } \times \text{Lead time}) + \text{Safety stock}}{(1,044 \text{ Units of average usage} \times \frac{1}{4} \text{ Month lead time}) + (558 \text{ Units of safety stock} \times \frac{1}{4} \text{ Month lead time})}$

 $(1,044 \times \frac{1}{4}) + (558 \times \frac{1}{4}) = (261 + 140) =$

401 Unit reorder point

Cautions: This measurement is based solely on the concept of purchasing with historical usage information. The concept is fine as long as the amount of product manufactured is always the same. However, it will jeopardize the production

13

Measurements for the Sales and Marketing Department

The sales function is the engine that supplies the rest of Loos pany with enough revenue to create profitability and positive cach now. Since it is so created o overall operations and financial walt fit vits performance should be tracked with several types of catios und formulas. The mercures elected mould address not only the sales effectiveness of individual cales caff our also sales trends by produid blactor call market shore and the above of the company to retain existing custoners. The measurements press mercial this chapter are

Market Share Customer Turnover Browse to Buy Conversion Ratio Recency Direct Mail Effectiveness Ratio Inbound Telemarketing Retention Ratio Quote to Close Ratio Sales per Salesperson Sales Productivity Sales Effectiveness Sales Trend Percentage by Product Line Product Demand Elasticity Days of Backlog

MARKET SHARE

Description: Company managers may think that the company's sales volume is rising, and yet it may not be keeping pace with the overall sales increases within the market. This is a common occurrence in cases where market size is rapidly changing. Consequently, a periodic measurement of market share yields an approximate view of a company's sales performance in relation to the market as a whole.

Table 13.1				
	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Company sales	\$35,000,000	\$40,000,000	\$45,000,000	\$50,000,000
Market size	\$292,000,000	\$364,000,000	\$450,000,000	\$556,000,000
Market share	12%	11%	10%	9%

Formula: Summarize the dollar volume of all unit sales within a market, and divide it by the total dollar volume of industry shipments. This ratio may also be calculated based on unit volumes shipped, rather than dollars. The formula is:

Dollar volume of company shipments

Dollar volume of industry shipments

ale.co.u riencing exceed-**Example:** The Speedy Semiconductor Company has feed ingly rapid sales growth for the past few que n rs. its president wants opensity this rate of growth is consistent will the growth of its market of if the company is losing pace in comparison to its competitors. The marke hare data from the Semiconductor in the ry Trade Organization and Spredy's sales data for the same petied in stown in Table 12.1

The market share ratio mover at the bottom of the table should concern the president of Speedy, for the company's sales growth is not matching the overall size of the market. A reasonable follow-up question for the president would be to determine what other companies in the industry are gaining in market share, since these companies are essentially taking sales away from Speedy.

Cautions: A company can artificially increase its market share by stuffing sales into its distribution pipeline by offering special pricing arrangements to its distributors; this will artificially increase its market share until the next reporting period, when sales are likely to plunge below their earlier levels (since the distributors are still selling off their extra stocks from the last period), appearing to indicate a sudden reduction in market share. To avoid this problem, the market share calculation can be averaged over several reporting periods.

Another problem is that the dollar volume of industry shipments can be quite hard to compile and may be inaccurate even when this chore is completed.

CUSTOMER TURNOVER

Description: This measure is extremely useful for determining the impact of customer service on a company's customers. A very low turnover rate is important in situations where the cost of acquiring new customers is high.

using the card; the cost of the interest income lost through this concession is the cost of retaining the customer. Consequently, it is useful to also track the cost of the deals used to retain customers, and then compare this information to the retention rate to see if the customer retention effort is worthwhile.

QUOTE TO CLOSE RATIO

Description: The quote to close ratio is one of the most heavily used performance measures by the sales manager. This reveals which sales personnel have the best ability to close a deal once it has been quoted. Though this measures the effectiveness of only one step in the sales funnel, it is nonetheless an important one and can reveal considerable differences between the closing abilities of the various sales staff.

Formula: Divide the dollar value of orders received by the total amount of a Beter orders. An alternative is to compare the number of orders received for the number quoted, but is not recommended—the ratio can be to to slow dewed by a large number of small quotes. Also, given the intrilinate rangeh of time that curve it is sometimes wait before approvagian or lar, this measure nearly to be stread over several months in order to effect a reasonable comparison of quoted to received orders. The formula re

Dollar value of quoted orders

Example: The Geomorphics Software Company has had great difficulty in determining the sales effectiveness of its new sales staff. Its software is difficult for the sales staff to learn, and so requires a long time period before sales personnel can become effective sellers. The sales manager has hit upon the use of the quote to close ratio on a trend line to see if this is a better way to measure their effectiveness. Accordingly, the sales manager has compiled dollars quoted and orders received information for two new sales personnel, Mr. Brandy and Ms. Browne. Their sales results over a four month period are shown in Table 13.7.

Table 13.7				
	Jan	Feb	Mar	Apr
Brandy – Quotes	\$45,000	\$63,000	\$42,000	\$53,000
Brandy – Orders	\$6,750	\$12,600	\$10,080	\$14,840
Brandy – Quote to close ratio	15%	20%	24%	28%
Browne – Quotes	\$42,500	\$45,000	\$41,000	\$43,000
Browne – Orders	\$6,375	\$5,400	\$7,380	\$6,450
Browne - Quote to close ratio	15%	12%	18%	15%

(Total sales in cha

SALES TREND PERCENTAGE BY PRODUCT LINE

Description: The marketing and engineering departments need to know how the sales of each of a company's product lines are progressing, so that they can alter their marketing positioning, sales concepts, and product features in coordination with the perceived position of each product in its life cycle. For example, if sales are steady or dropping, then the engineering department should use this information to design a replacement or enhanced version of the existing product that will spur sales when introduced.

Formula: Subtract total sales dollars in the previous period from those in the current period, and divide the result by total sales in the previous period. This yields the percentage change in sales during the period. The measure can also be based on the number of units sold, but ignores the price point at which sales are made, and so yields less information. This measure is best used for an entire product line rather than for individual products, since there may be so many products are cessories within a product line, including many that are cannical tine of the formula is:

Example: The Nomicon office Searing Company has designed a deluxe office chair, the Flexomatic, that has seen skyrocketing sales for the last few years. However, competitors have brought out two comparable models, which will soon cut into the unit volume on sales of the Flexomatic. Consequently, the sales manager wants to keep close track of its sales trend to spot the point at which sales are trailing off. The relevant information for the past four months is shown in Table 13.11.

лvio

Fotal sales in

The sales trend percentage for the Flexomatic reveals a potential problem in the most recent month of April, where the rate of sales growth has dropped from the usual 50% rate to 33%. If this reduced sales trend were to continue much longer, the sales manager might consider dropping the Flexomatic price to become more competitive with the other models on the market.

Cautions: Changes in sales levels from period to period may be closely tied to promotional, seasonal, or pricing changes, and so must be reviewed with these is-

Table 13.11									
	January	February	March	April					
Sales	\$1,000,000	\$1,500,000	\$2,250,000	\$3,000,000					
Change in sales from previous period	—	\$500,000	\$750,000	\$750,000					
Sales trend percentage	—	50%	50%	33%					

sues in mind. To avoid this problem, a sales trend could be compared to the same trend calculation for the period in the previous year, along with a commentary on changes in marketing and engineering efforts in the interim that might have had an impact on sales.

PRODUCT DEMAND ELASTICITY

Description: This is useful for determining the ability of a company to maximize its profit on product sales by altering prices. However, as noted under the Cautions section, there are so many other variables impacting sales effectiveness besides price that this measurement's effectiveness is restricted.

Formula: Divide the percentage change in quantity of product sold by the perco.U centage change in price. The product demand is considered to be inelastic if the result of the measurement is greater than 100%, and elastic if it is less that D%. The formula is: of 336

ge in price

en selling an industrial-grade Example: The acuum Company h viet if come for a number of real Superior of \$250 per unit. After comparing this product to the competition die pian's marketing team believes that it can spend only \$25 to reposition the vacuum as a premium product with an aluminum casing. At a gross margin of 50%, this means that the product's price must increase by \$50, to \$300. In addition, due to its repositioning as a premium product, the marketing staff would like to increase its price further, to \$325. A marketing test at this price point reveals that the number of units sold declines from 5,000 to 4,000 as a result of the increased price. Is this product price elastic or inelastic? Use the preceding formula to find out:

Percentage change in q

Perfer

Percentage change in quantity Percentage change in price (5,000 Units – 4,000 Units) / 5,000 Units (\$325 - \$250) / \$250 $\frac{20\%}{30\%} =$ 67%

The measurement reveals that the suggested price increase will result in a smaller proportional drop in unit sales. Consequently, the new price point should be implemented.

FINANCIAL STATEMENT PROPORTIONAL ANALYSIS

Proportional analysis is simply converting all of the numbers in an income statement and balance sheet into percentages, so that they can be compared over time to see what differences arise. By conducting this analysis, one can see if there are trends in revenues, costs, assets, or liabilities that may require further analysis or investigation.

When using Excel to conduct a proportional analysis of a financial statement, one must first input the income statement for each period into the worksheet, so that the proportional analysis calculation will appear below it or on a separate worksheet. Exhibit 14.1, a simplified income statement has been entered in the cells at the top of the worksheet. For each line item in this top section, there is a formula entered in the replicated income statement at the bottom of the screen that divides each expense line item by the revenue figure, resulting in a percentage of sale.co.u sales for each item. For example, the materials cost proportion for the month of January is calculated with the following formula, which is entered in cell B15:

B5/B\$4

or multiple month Since the spreadsheet contains the income a tem sulting proportional analysis becomes year useful for finding on trend in me expenses being incurred over the course of the

	P File Edit Yiew Insert Format Tools Data Window Help									
-	A	B	C	D	E	F	G	Н	I	
1	Proportional Income States	ment Analy	rsis							
2										
3	Dollars	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
4	Revenue	1,200	1,250	1,300	1,250	1,350	1,400	1,450	1,400	
5	Materials Cost	550	575	595	565	605	610	635	620	
6	Direct Labor Cost	120	120	145	140	150	160	170	180	
7	Gross Margin	530	555	560	545	595	630	645	600	
8	Administrative Expenses	280	290	340	335	330	350	360	365	
9	Profit Before Taxes	2.50	265	220	210	265	280	285	235	
10	Taxes	100	106	88	84	106	112	114	94	
11	Net Profit	150	159	132	126	159	168	171	141	
12										
13	Proportions							-		
14	Revenue	100%	100%	100%	100%	100%	100%	100%	100%	
15	Materials Cost	46%	46%	46%	45%	45%	44%	44%	44%	
16	Direct Labor Cost	10%	10%	11%	11%	11%	11%	12%	13%	
17	Gross Margin	44%	44%	43%	44%	44%	45%	44%	43%	
18	Administrative Expenses	23%	23%	26%	27%	24%	25%	25%	26%	
19	Profit Before Taxes	21%	21%	17%	17%	20%	20%	20%	17%	
20	Taxes	8%	8%	7%	7%	8%	8%	8%	7%	
21	Net Profit	13%	13%	10%	10%	12%	12%	12%	10%	
22										
23										
24										
	Sheet1 / Sheet2 /	Sheet3 /			1					

Exhibit 14.1 Proportional Analysis of an Income Statement

	A	B	C	D	E	F	G	Н	I	-
1	Proportional Balance Sh	eet Analys	is	-	-		-			-
2		,								
3	Dollars	Jan	Feb	Mar	Aur	Mav	Jun	Jul	Aug	
4	Cash	152	138	72	31	17	0	0	0	
5	Accounts Receivable	375	400	410	415	425	435	442	440	-11
6	Inventory	400	398	396	394	392	390	388	378	
7	Fixed Assets	598	603	729	841	900	902	908	911	
8	Total Assets	1,525	1,539	1,607	1,681	1,734	1,727	1,738	1,729	
0	Accounts Payable	450	475	485	490	500	510	517	515	-11
11	Accrued Liabilities	83	83	83	81	81	81	80	80	
12	Debt	92	71	119	180	213	186	181	164	
3	Equity	900	910	920	930	940	950	960	970	
4	Total Liabilities	1,525	1,539	1,607	1,681	1,734	1,727	1,738	1,729	
16	Proportions									
17	Cash	10%	9%	4%	2%	1%	0%	0%	0%	
8	Accounts Receivable	25%	26%	26%	25%	25%	25%	25%	25%	
9	Inventory	26%	26%	25%	23%	23%	23%	22%	22%	
20	Fixed Assets	39%	39%	45%	50%	52%	52%	52%	3 14	2
21	Total Assets	100%	100%	100%	100%	100%	100%	diego	2 U 3	-
23	Accounts Payable	30%	31%	30%	29%	2 %	- 98	3070	30%	
24	Accrued Liabilities	5%	5%	5%	5%	6	370	5%	- 6	
25	Debt	6%	5%	7%	1. %	12.00	11%	10%	2 5	
26	Equity	59%	1 19%	57	55-0	54%	55%	55%		
27	Total Liabilities	100%	10 %		100%	1000	100 6	00%	100%	
8										•
	Sheet1 Sheet1	whe B								

with ratios located at the bottom that are derived from these two reports. By using this approach, one can quickly enter the summary-level financial information for the current reporting period and then see the related ratios appear at the bottom of the worksheet. In a few moments, he or she has access to a rough analysis of company operations. If there are entries for the financial results of previous months, then one can also see trend lines in ratio results that extend through to the current reporting period.

As an example of the types of ratio analysis one can use in a worksheet, we will use the income statement and balance sheet shown earlier, in Exhibits 14.1 and 14.2. A series of ratios are noted in Exhibit 14.3 that are derived from those statements.

In Exhibit 14.3, there are several tabs itemized at the bottom of the worksheet. Each one represents another spreadsheet that is clustered into the same workbook. The first tab, entitled IS, contains a spreadsheet version of the income statement. The second tab, entitled BS, contains a spreadsheet version of the balance sheet. The ratios shown in the exhibit are compiled by referencing the cell locations in these two spreadsheets and listing the result on the current Ratios spreadsheet.

The formulas behind the ratios in Exhibit 14.3 are not shown, so the same spreadsheet is laid out differently in Exhibit 14.4 to provide this information. In

:01

The first type of analysis is of *operating leverage*. Under this concept, we determine the extent to which a percentage change in sales results in a different percentage change in profits. For example, if all costs were totally variable, there would be a percentage change in profits that would exactly match the change in sales, which would result in an operating leverage ratio of 1:1. However, if the bulk of costs are fixed, and will therefore not change when there are changes in sales, then an increase in sales will result in a more rapid increase in profits. For example, if a 10% increase in sales results in a 20% increase in profits, then the operating leverage ratio is 2:1. This is a wonderful condition to have when sales are on the increase, since large profit jumps will occur. However, the inverse situation arises if sales decline, since fixed costs must still be paid even when sales drop, which results in inordinate profit decreases. Thus, a large operating leverage ratio is a two-edged sword that cuts deeply in a declining sales situation. To measure this, we can create a measurement for the degree of operating leverage, which is calculated by dividing the percentage change in profits (before interest and control taxes) by the percentage change in sales. The reason for excluding interest and control taxes are change in sales. costs is that we are only determining the amount of leverage base for operations, and neither of these expenses are related to opticat or s. I us heasure has been n n Ethelit 14.3, and is n w Ps added to the ratio analysis previously show an expanded format in Exhibit 416.

-	- YC _[] # _] 114_03.xls										
	r Eile Idit Yew Insert Format I is Patro views Help								- 5 2		
-	A		C	D	E	F	G	H	I		
1	Ratio Analysis										
2		Jan	Feb	Mar	Apr	May	Jun	Jul			
3	Balance Sheet Ratios:										
4	Quick Ratio	1.0	1.0	8.0	0.8	0.8	0.7	0.7			
5	Current Ratio	1.7	1.7	1.5	1.5	1.4	1.4	1.4			
б	Debt/Equity Ratio	0.1	0.1	0.1	0.2	0.2	0.2	0.2			
7											
8	Income Statement Ratios:										
9	Gross Margin	44%	44%	43%	44%	44%	45%	44%			
10	Return on Sales	13%	13%	10%	10%	12%	12%	12%			
11	Breakeven Point	\$634	\$653	\$789	\$768	\$749	\$778	\$809			
12											
13	Mixed Ratios:										
14	Fixed Asset Turnover	79%	81%	81%	74%	78%	81%	\$3%			
15	Inventory Turnover	20	21	22	21	23	24	25			
16	Receivables Tumover	38	38	38	36	38	39	39			
17	Return on Assets	10%	10%	8%	7%	9%	10%	10%			
18	Return on Equity	17%	17%	14%	14%	17%	18%	18%			
19											
20	Leverage Ratios:										
21	Operating Leverage		1.4	-4.2	1.2	33	1.5	0.5			
22	Financial Leverage		1.0	1.0	1.0	1.0	1.0	1.0			
23	Earnings per Share (1.000)	0.15	0.16	0.13	0.13	0.16	0.17	0.17			
24	• • • • • • • • • • • • • • • • • • • •										

Exhibit 14.6 Leverage Ratios

FORECASTING

One is sometimes called upon to make sales forecasts or verify those made by the sales and marketing departments. One of the better approaches for doing this is to extend the past history of sales volume forward into the periods being projected. Though this method of prediction is like trying to drive a car by looking in the rear view mirror, it is still one of the best tools available, as long as it is supplemented by detailed conversations with the sales staff to see what is really happening in the marketplace.

There are two formulas provided by Excel that result in forecast information. The first, and simplest, is the TREND command. This one superimposes a trend line on an existing set of time-sequenced data points to arrive at an expected sales level for a specified future period. To illustrate the command, we return once again to the income statement shown earlier in Exhibit 14.1. We will use a new worksheet within the same spreadsheet, called Trend, and reference in it all of the monthly sales figures from the previous income statement. This is show

In the worksheet in Exhibit 14.8, we already know all & e could points from January through August, and want to calculate a trend have that extends an additional month to give us a prediction for Secteral elesses. Accordingly in the table of months and historical sales frameworked in the Trend work Sector there is an additional cell next to the "August" seles period. In that cell we en while following formula: TRENO(844) 11,A4:A11,A12)

Though it looks complicated, this is a relatively simple command. The trend line is based on the data points contained in cells B4 through B11 for the date ranges contained in cells A4 through A11. The date for the period to be forecast is noted in cell A12. The formula generates a number that is the extension of the trend shown by the previous data elements and will deposit this number in the B12 cell. Another way to state the formula is to ignore the dates and just ask for the next number in sequence. The formula, based on the previous example, looks like this:

TREND(B4:B11, ,{9})

Under this variation, we are using the same set of data points, but ignoring the dates (hence the two commas in the formula with no data in between), and a number in brackets which represents the trend for the ninth number in the sequence of data elements. Since the original set of data only included eight data elements, this will be the next revenue figure after the last month of actual data. If the requested trend were for the month of December, the number in brackets would change to {12}, since this would represent the twelfth data point in the series.

In order to show this information in a graph, use the same series of steps noted for the graphs previously presented for Exhibit 14.7. However, to add a trend line overlay to the presented data, click on the completed graph, move the cursor to the the descriptions for all of the inputs to the equation are identical to those for the double-declining balance method.

• *Variable-declining balance depreciation*. This method is essentially the same as the double-declining balance method, but you can alter the depreciation rate, as well as convert over to straight-line depreciation at the point where accelerated depreciation results in a lower depreciation expense. The formula detail is VDB(Cost, Salvage, Life, Start Period, End Period, Depreciation Factor, Switch to Straight Line). The descriptions for the first three inputs to the equation are the same as those used for the double-declining balance method. The Start Period part of the equation specifies the beginning period for which you want to calculate depreciation. The End Period part of the equation specifies the ending period for which you want to calculate depreciation. The Depreciation factor part of the equation specifies the rate at which depreciation is calculated. For example, entering a "2" results in 200% double-declining depreciation, whereas entering a 1.5 results in 150% depreciation, which is a less rapid form of accelerated depreciation. Finally, the Switch to Strain 1 in e part of the equation allows you to enter TRUE to use deeling to be depreciation for all depreciation periods, or enter FLUI to have the formula atomatically switch to straight-line depres at on the point where straig results in a higher depreciation expe

0.U

It is evidential the talk of data inputted into an of mese depreciation formulas is nearly destical. Only the an leaving of mulas will alter the calculated depreciation expense.

The type of depreciation method used matters a great deal, for the most aggressive one, that depreciates the largest amount in the first few periods, will result in reduced taxes in the near term, which results in increased short-term cash flow. Since increased cash flow now is worth more than cash flow at the end of a project, an aggressive depreciation method will yield greater project cash flows.

COMPOUNDING ANALYSIS

One is sometimes called upon to calculate the result of a variety of payment or receipt scenarios that involve streams of cash flows over multiple periods. In this section, we review several of the most common ones, as well as how to use Excel formulas to create accurate answers for each scenario. They are:

Future value. If a company is investing money at a consistent rate for a fixed time period, one may want to know how much that investment stream will be worth at a specified future date. To determine the future value of such an investment stream, use the FV formula. The details of the formula are FV(Interest Rate, Number of Periods, Payment Amount). The Interest Rate component is the expected earnings rate on the investment. The Number of Periods component is the number of periods over which a fixed amount is being invested. The

Cash Flow Measurements Name Formula Cash flow from operations Income from operations + Noncash expenses -Noncash Sales Income from operations Net income + Noncash expenses - Noncash sales Net income Cash flow return on sales Net income + Noncash e.co.U expenses - Noncash sales Total sales Fixed charge coverage Expense coverage days from Preview Page 3 ash flow from ore Snort-term marketable securities + Accounts receivable Annual cash expenditures / 360 Cash flow coverage ratio Total debt payments + Dividend payments + Capital expenditures Net income + Noncash

Cash receipts to billed sales and progress payments

Cash to current assets ratio

Cash flow to fixed asset requirements

Net income + Noncash expenses – Noncash sales

Cash receipts

Billed sales + Billed progress payments

Cash + Short-term marketable securities

Current assets

Net income + Noncash expenses – Noncash sales

Budgeted fixed asset purchases

Cash flow to fixed asset requirements (*continued*)

Cash flow return on assets

Cash to working capital ratio

Net income + Noncash expenses – Noncash sales – Dividends – Principal payments

Budgeted fixed asset purchases

Net income + Noncash expenses – Noncash sales

Total assets

Cash + Short-term marketable securities

Current assets – Current liabilities

expenses - None

Increase in fixed a

Increa i

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Cash reinvestment ratio



Cash flow to debt ratio

Stock price to cash flow ratio

Dividend payout ratio

Cash + Short-term marketable securities

lividends

Current liabilities

Net income + Noncash expenses - Noncash sales

Debt + Lease obligations

Net income + Noncash expenses – Noncash sales

Total long-term debt payments for the period

(Stock price) × (Number of shares outstanding)

Earnings before interest, taxes, depreciation and amortization

Total dividend payments

Net income + Noncash expenses – Noncash sales Raw material inventory turns

Raw material content

Finished goods inventory turns

Obsolete inventory percentage

(Raw material dollars consumed/raw material inventory dollars on hand) \times 12

Raw material dollars sold
Sales

(Finished goods dollars consumed/finished goods inventory dollars on hand) × 12

Cost of inventory items with no recent usage

Total inventory

Total doll

co.u

Percentage of inventory > XX days old



Percentage of certified suppliers

EDI supplier percentage

On-time parts delivery percentage

Purchased component defect rate

Total dollars of inventory

Number of accurate test items

Total number of items sampled

Number of certified production suppliers

Total number of production suppliers

Number of suppliers with EDI linkages

Total number of suppliers

(Actual arrival date) – (Requested arrival date)

Number of rejected components

Total number of components received