

## CHAPTER 1: SPREADSHEET BASICS

### Text Problem Solutions

1. Suppose that at the beginning of October 2003 you purchased shares in Amazon.com (NASDAQ: AMZN). It is now five years later and you decide to evaluate your holdings to see if you have done well with this investment. This table below shows the market prices of AMZN.

AMZN Stock Prices	
Date	Price
2003	54.43
2004	34.13
2005	39.86
2006	38.09
2007	89.15
2008	69.58

- Enter the data, as shown, into a worksheet and format the table as shown.
- Create a formula to calculate your rate of return for each year. Format the results as percentages with two decimal places.
- Calculate the total return for the entire holding period. What is the compound average annual rate of return?

#### Worksheet:

	A	B	C
1	<b>AMZN Stock Prices</b>		
2		<b>Price</b>	<b>Return</b>
3	2003	54.43	
4	2004	34.13	-37.30%
5	2005	39.86	16.79%
6	2006	38.09	-4.44%
7	2007	89.15	134.05%
8	2008	69.58	-21.95%
9	Total Return		27.83%
10	Compound Annual Return		5.03%

#### Formulas:

	A	B	C
1	<b>AMZN Stock Prices</b>		
2		<b>Price</b>	<b>Return</b>
3	2003	54.43	
4	2004	34.13	=(B4-B3)/B3
5	2005	39.86	=(B5-B4)/B4
6	2006	38.09	=(B6-B5)/B5
7	2007	89.15	=(B7-B6)/B6
8	2008	69.58	=(B8-B7)/B7
9	Total Return		=(B8-B3)/B3
10	Compound Annual Return		=(B8/B3)^(1/5)-1

- Create a Line chart showing the stock price from October 2003 to October 2008. Make sure to title the chart and label the axes. Now, create an XY Scatter chart of the same data. What are the differences between these types of charts? Which type of chart is more appropriate for this data?



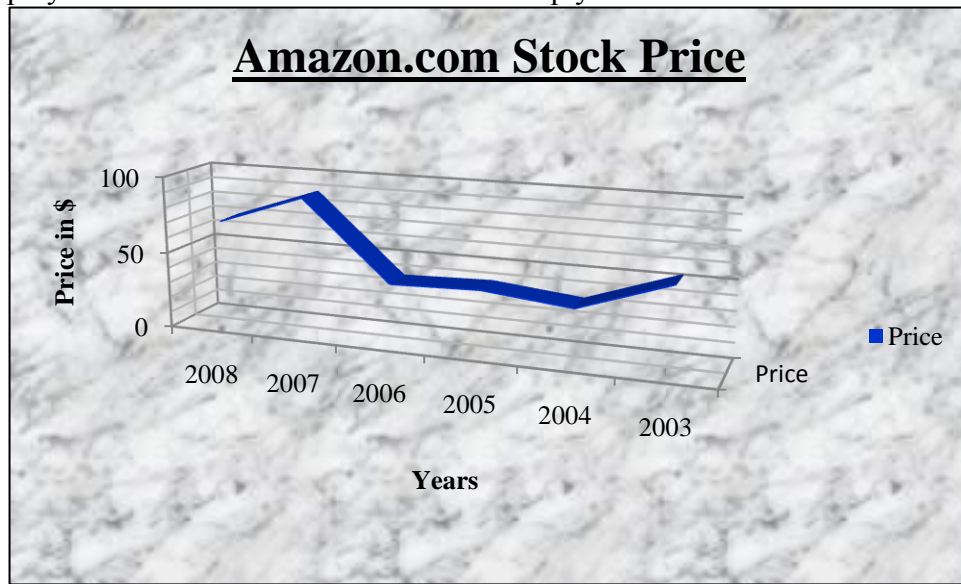
Answer: The two charts are created above. They appear to be very similar, but a close look will reveal a key difference. Notice that the data points on the line chart are aligned in the center of the X-axis label. In the XY chart they are aligned directly above the X-axis label.

The reason for this is that the label on the line chart is just that, a label. Excel doesn't treat it as a number and it might as well be text. Since the years are numbers, the XY Scatter chart is slightly more appropriate in this case. However, it doesn't matter too much here. In other cases, though, it can make a great deal of difference. One of the most common questions that I get is "Why doesn't my chart display properly?" In many cases the answer is that a Line chart was used

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when a Scatter chart was the correct choice. Remember, Line charts are for categorical data and Scatter charts are for showing relationships in numerical data.

e. Experiment with formatting possibilities of the chart. For example, you might try it to a 3-D Line chart and fill the plot area with a marble background. Is there any reason to use this type of chart to display this data? Do the “enhancements” help you to understand the data?



Answer: The above chart is a 3D Line chart that has been slightly rotated and had a marble background added. Note that the "eye candy" doesn't serve any practical purpose, and actually makes the data slightly more difficult to understand. This is an example of the type of chart that data visualization experts recommend against. Much better are the simple charts above.

2. In your position as research assistant to a portfolio manager, you need to analyze the profitability of the companies in the portfolio. Using the data for Exxon Mobil Corporation below:

Fiscal Year	2007	2006	2005	2004	2003
Total Revenue	390,328	365,467	358,955	291,252	237,054
Net Income	40,610	39,500	36,130	25,330	20,960

a. Calculate the net profit margin for each year.

b. Calculate the average annual growth rates for revenue and net income using the **GEOMEAN** function. Is net income growing more slowly or faster than total revenue? Is this a positive for your investment in the company?

Answer: Revenues are growing at a 13.28% compound annual rate compared to 17.98% for net income.

c. Calculate the average annual growth rate of total revenue using the **AVERAGE** function. Is this result more or less accurate than your result in the previous question? Why?

Worksheet:

	A	B	C	D	E	F
1	<b>Exxon Mobil Corporation</b>					
2		<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>
3	Sales	390,328	365,467	358,955	291,252	237,054
4	Net Income	40,610	39,500	36,130	25,330	20,960
5	Net Profit Margin	10.40%	10.81%	10.07%	8.70%	8.84%
6	Sales Growth	13.28%				
7	Net Income Growth	17.98%				
8	Change in Sales	1.07	1.02	1.23	1.23	
9	Sales Growth	13.28%				
10	Sales Growth (arithmetic)	13.68%				

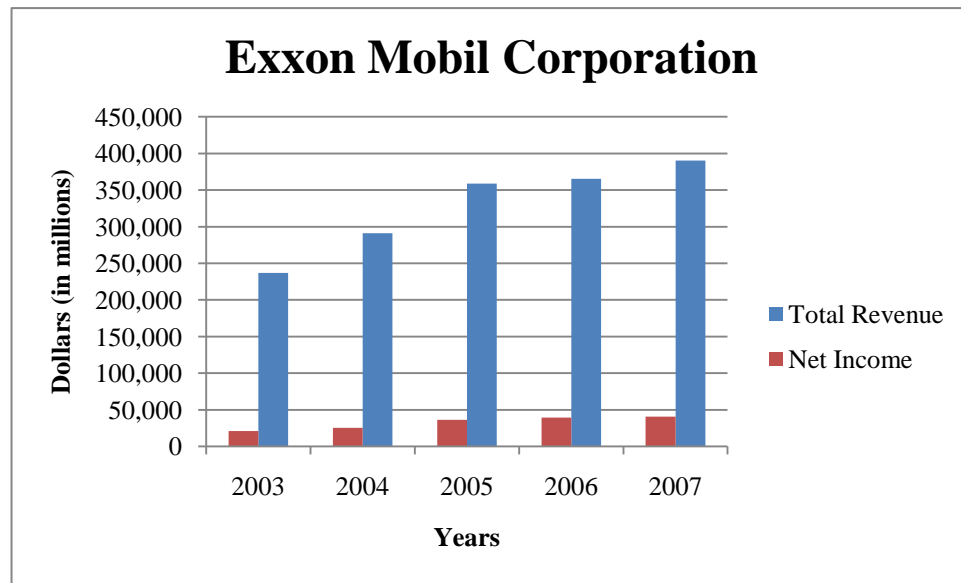
Formulas:

	A	B	C	D	E	F
1						
2		<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>
3	Sales	390328	365467	358955	291252	237054
4	Net Income	40610	39500	36130	25330	20960
5	Net Profit Margin	=B4/B3	=C4/C3	=D4/D3	=E4/E3	=F4/F3
6	Sales Growth	=(B3/F3)^(1/4)-1				
7	Net Income Growth	=(B4/F4)^(1/4)-1				
8	Change in Sales	=B3/C3	=C3/D3	=D3/E3	=E3/F3	
9	Sales Growth	=GEOMEAN(B8:E8)-1				
10	Sales Growth (arithmetic)	=AVERAGE(B8:E8)-1				

Answer: Using an arithmetic average, revenue growth is 13.68% per year. Whether or not that is more accurate depends on what you are trying to measure. The arithmetic average represents "typical" the growth in revenues in a year, whereas the geometric mean represents the compound average annual return.

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d. Create a Column chart of total revenue and net income. Be sure to change the chart so that the x-axis labels contain the year number, and format the axis so that 2007 is on far right side of the axis.



3. Repeat Problem 2 using the data below for the Qualcomm Inc. However, this time you should create a copy of your worksheet to use as a template. Replace the data for Exxon Mobil with that of Qualcomm.

Fiscal Year	2007	2006	2005	2004	2003
Total Revenue	8,871	7,526	5,673	4,880	3,847
Net Income	3,303	2,470	2,143	1,725	1,029

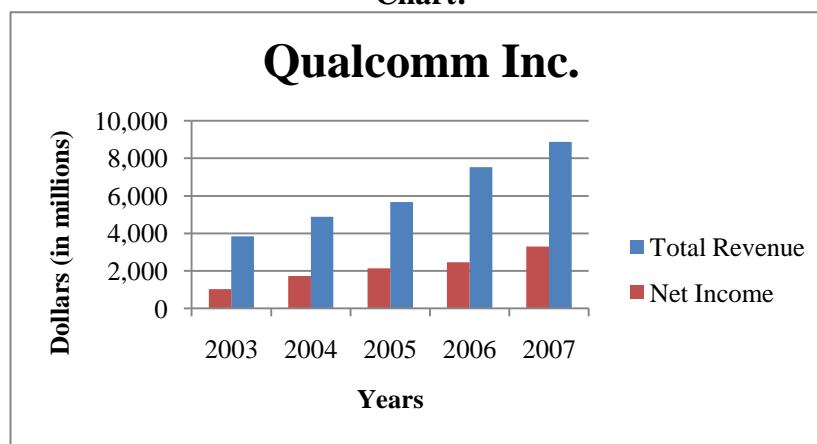
Worksheet:

	A	B	C	D	E	F
1	<b>Qualcomm Inc.</b>					
2		<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>
3	Sales	8,871	7,526	5,673	4,880	3,847
4	Net Income	3,303	2,470	2,143	1,725	1,029
5	Net Profit Margin	37.23%	32.82%	37.78%	35.35%	26.75%
6	Sales Growth	23.23%				
7	Net Income Growth	33.85%				
8	Change in Sales	1.18	1.33	1.16	1.27	
9	Sales Growth	23.23%				
10	Sales Growth (arithmetic)	23.41%				

**Formulas:**

	A	B	C	D	E	F
1	<b>Qualcomm Inc.</b>					
2		<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>
3	Sales	8871	7526	5673	4880	3847
4	Net Income	3303	2470	2143	1725	1029
5	Net Profit Margin	=B4/B3	=C4/C3	=D4/D3	=E4/E3	=F4/F3
6	Sales Growth	=(B3/F3)^(1/4)-1				
7	Net Income Growth	=(B4/F4)^(1/4)-1				
8	Change in Sales	=B3/C3	=C3/D3	=D3/E3	=E3/F3	
9	Sales Growth	=GEOMEAN(B8:E8)-1				
10	Sales Growth (arithmetic)	=AVERAGE(B8:E8)-1				

**Chart:**



a. Do you think that Qualcomm can maintain the current growth rates of sales and net income over the long run? Why or why not?

**Answer:** Qualcomm is in a very competitive business that requires frequent innovation. It seems unlikely that the firm can continue to grow revenues at a rate above 20% in the long run. Similarly, net income growth is unlikely to be maintained at this pace.

b. Which company was more profitable in 2007? Which was more profitable if you take a longer view? Would this affect your desire to invest in one company over the other?

**Answer:** In 2007, Qualcomm Inc. was more profitable than Exxon Mobil Corporation based on the net profit margin. Qualcomm has 37.23% of net profit margin while Exxon has 10.40%. Over the period 2003-2007, the arithmetic average net profit margin for Qualcomm is 33.99%, while the average net profit margin for Exxon is 9.76%. This average numbers may motivate potential investors to prefer Qualcomm Inc. over Exxon Mobil.

**CHAPTER 1: SPREADSHEET BASICS**

7

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4. Using the data for Paychex, Inc. (NASDAQ: PAYX) presented below:

<b>Fiscal Year</b>	<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>
Sales	\$2,066.32	\$1,886.96	\$1,674.60	\$1,445.14	\$1,294.35
EBIT	828.27	701.55	649.57	533.78	433.32
Total Net Income	576.15	515.45	464.91	368.85	302.95
Dividends per Share	1.20	0.79	0.61	0.51	0.47
Basic EPS from Total Operations	1.56	1.35	1.23	0.97	0.80
Total Assets	5,309.79	6,246.52	5,549.30	4,617.42	3,950.20
Accounts Payable	40.25	46.96	46.67	30.39	22.59
Total Liabilities	4,113.15	4,294.27	3,894.46	3,231.74	2,750.23
Retained Earnings	745.35	1,595.11	1,380.97	1,147.61	971.74
Net Cash from Operating Activities	724.67	631.23	569.23	466.62	389.00

a. Calculate the ratio of each year's data to the previous year for each of the above items for Paychex, Inc. For example: for year 2007, the ratio for sales is  $\$2,066.32/\$1,886.96 = 1.0951$ .

**Data**

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
<b>1</b>	<b>Paychex, Inc.</b>					
<b>2</b>	<b>Selected Financial Data</b>					
<b>3</b>	<b>For the Years 2004 to 2007</b>					
<b>4</b>	<b>Fiscal Year</b>	<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>
<b>5</b>	Sales	\$2,066.32	\$1,886.96	\$1,674.60	\$1,445.14	\$1,294.35
<b>6</b>	EBIT	828.27	701.55	649.57	533.78	433.32
<b>7</b>	Total Net Income	576.15	515.45	464.91	368.85	302.95
<b>8</b>	Dividends Paid per Share	1.20	0.79	0.61	0.51	0.47
<b>9</b>	Basic EPS from Total Operations	1.56	1.35	1.23	0.97	0.80
<b>10</b>	Total Assets	5,309.79	6,246.52	5,549.30	4,617.42	3,950.20
<b>11</b>	Accounts Payable	40.25	46.96	46.67	30.39	22.59
<b>12</b>	Total Liabilities	4,113.15	4,294.27	3,894.46	3,231.74	2,750.23
<b>13</b>	Retained Earnings	745.35	1,595.11	1,380.97	1,147.61	971.74
<b>14</b>	Net Cash from Operating Activities	724.67	631.23	569.23	466.62	389.00

**Worksheet:**

16	Paychex, Inc.				
17	Annual Growth Relatives				
18	For the Years 2004 to 2007				
19	Fiscal Year	2007	2006	2005	2004
20	Sales	109.51%	112.68%	115.88%	111.65%
21	EBIT	118.06%	108.00%	121.69%	123.18%
22	Total Net Income	111.78%	110.87%	126.04%	121.75%
23	Dividends Paid per Share	151.90%	129.51%	119.61%	108.51%
24	Basic EPS from Total Operations	115.56%	109.76%	126.80%	121.25%
25	Total Assets	85.00%	112.56%	120.18%	116.89%
26	Accounts Payable	85.71%	100.62%	153.57%	134.53%
27	Total Liabilities	95.78%	110.27%	120.51%	117.51%
28	Retained Earnings	46.73%	115.51%	120.33%	118.10%
29	Net Cash from Operating Activities	114.80%	110.89%	121.99%	119.95%

**Formulas:**

16	Paychex, Inc.				
17	Annual Growth Relatives				
18	For the Years 2004 to 2007				
19	Fiscal Year	2007	2006	2005	2004
20	Sales	=B5/C5	=C5/D5	=D5/E5	=E5/F5
21	EBIT	=B6/C6	=C6/D6	=D6/E6	=E6/F6
22	Total Net Income	=B7/C7	=C7/D7	=D7/E7	=E7/F7
23	Dividends Paid per Share	=B8/C8	=C8/D8	=D8/E8	=E8/F8
24	Basic EPS from Total Operations	=B9/C9	=C9/D9	=D9/E9	=E9/F9
25	Total Assets	=B10/C10	=C10/D10	=D10/E10	=E10/F10
26	Accounts Payable	=B11/C11	=C11/D11	=D11/E11	=E11/F11
27	Total Liabilities	=B12/C12	=C12/D12	=D12/E12	=E12/F12
28	Retained Earnings	=B13/C13	=C13/D13	=D13/E13	=E13/F13
29	Net Cash from Operating Activities	=B14/C14	=C14/D14	=D14/E14	=E14/F14

b. From your calculations in part a, calculate each year's rate of growth. Using the example in part a, the ratio is 1.0951, so the percentage growth in sales for 2007 is  $1.0951 - 1$  or 9.51%.



**Worksheet:**

31	<b>Paychex, Inc.</b>				
32	<b>Annual Growth Rates</b>				
33	<b>For the Years 2004 to 2007</b>				
34	<b>Fiscal Year</b>	<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>
35	Sales	9.51%	12.68%	15.88%	11.65%
36	EBIT	18.06%	8.00%	21.69%	23.18%
37	Total Net Income	11.78%	10.87%	26.04%	21.75%
38	Dividends Paid per Share	51.90%	29.51%	19.61%	8.51%
39	Basic EPS from Total Operations	15.56%	9.76%	26.80%	21.25%
40	Total Assets	-15.00%	12.56%	20.18%	16.89%
41	Accounts Payable	-14.29%	0.62%	53.57%	34.53%
42	Total Liabilities	-4.22%	10.27%	20.51%	17.51%
43	Retained Earnings	-53.27%	15.51%	20.33%	18.10%
44	Net Cash from Operating Activities	14.80%	10.89%	21.99%	19.95%

**Formulas:**

31	<b>Paychex, Inc.</b>				
32	<b>Annual Growth Rates</b>				
33	<b>For the Years 2004 to 2007</b>				
34	<b>Fiscal Year</b>	<b>2007</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>
35	Sales	=B5/C5-1	=C5/D5-1	=D5/E5-1	=E5/F5-1
36	EBIT	=B6/C6-1	=C6/D6-1	=D6/E6-1	=E6/F6-1
37	Total Net Income	=B7/C7-1	=C7/D7-1	=D7/E7-1	=E7/F7-1
38	Dividends Paid per Share	=B8/C8-1	=C8/D8-1	=D8/E8-1	=E8/F8-1
39	Basic EPS from Total Operations	=B9/C9-1	=C9/D9-1	=D9/E9-1	=E9/F9-1
40	Total Assets	=B10/C10-1	=C10/D10-1	=D10/E10-1	=E10/F10-1
41	Accounts Payable	=B11/C11-1	=C11/D11-1	=D11/E11-1	=E11/F11-1
42	Total Liabilities	=B12/C12-1	=C12/D12-1	=D12/E12-1	=E12/F12-1
43	Retained Earnings	=B13/C13-1	=C13/D13-1	=D13/E13-1	=E13/F13-1
44	Net Cash from Operating Activities	=B14/C14-1	=C14/D14-1	=D14/E14-1	=E14/F14-1

c. Calculate the average growth rate (using the AVERAGE function) of each of the above items using the results you calculated in part b. These averages are arithmetic averages.

d. Use the GEOMEAN function to estimate the compound annual average growth rate (CAGR) for each of the above items using the results that you calculated in part a. Be sure to subtract 1 from the result of the GEOMEAN function to arrive at a percent change. These averages are geometric averages.

e. Compare the results from part c (arithmetic averages using the AVERAGE function) to those for part d (geometric averages using the GEOMEAN function) for each item. Is it true that the arithmetic average growth rate is always greater than or equal to the geometric average (CAGR)?

Answer: The size of the differences is directly related to the variation in the distribution of growth rates across the years. The larger the variation, the larger the difference in the two types of averages, as can be seen by the standard deviations calculated below.

**Worksheet:**

46	<b>Paychex, Inc.</b>			
47	<b>Annual Growth Relatives</b>			
48	<b>For the Years 2004 to 2007</b>			
49	<b>Fiscal Year</b>	<b>Arithmetic</b>	<b>Geometric</b>	<b>Std Dev</b>
50	Sales	12.43%	12.41%	2.65%
51	EBIT	17.74%	17.58%	6.84%
52	Total Net Income	17.61%	17.43%	7.48%
53	Dividends Paid per Share	27.38%	26.41%	18.46%
54	Basic EPS from Total Operations	18.34%	18.17%	7.34%
55	Total Assets	8.66%	7.67%	16.08%
56	Accounts Payable	18.61%	15.53%	30.99%
57	Total Liabilities	11.02%	10.59%	11.03%
58	Retained Earnings	0.17%	-6.42%	35.68%
59	Net Cash from Operating Activities	16.91%	16.83%	5.02%

**Formulas:**

46			<b>Paychex, Inc.</b>		
47			<b>Annual Growth Relatives</b>		
48			<b>For the Years 2004 to 2007</b>		
49	<b>Fiscal Year</b>	<b>Arithmetic</b>	<b>Geometric</b>		<b>Std Dev</b>
50	Sales	=AVERAGE(B20:E20)	=GEOMEAN(B35:E35)		=STDEV(B20:E20)
51	EBIT	=AVERAGE(B21:E21)	=GEOMEAN(B36:E36)		=STDEV(B21:E21)
52	Total Net Income	=AVERAGE(B22:E22)	=GEOMEAN(B37:E37)		=STDEV(B22:E22)
53	Dividends Paid per Share	=AVERAGE(B23:E23)	=GEOMEAN(B38:E38)		=STDEV(B23:E23)
54	Basic EPS from Total Operations	=AVERAGE(B24:E24)	=GEOMEAN(B39:E39)		=STDEV(B24:E24)
55	Total Assets	=AVERAGE(B25:E25)	=GEOMEAN(B40:E40)		=STDEV(B25:E25)
56	Accounts Payable	=AVERAGE(B26:E26)	=GEOMEAN(B41:E41)		=STDEV(B26:E26)
57	Total Liabilities	=AVERAGE(B27:E27)	=GEOMEAN(B42:E42)		=STDEV(B27:E27)
58	Retained Earnings	=AVERAGE(B28:E28)	=GEOMEAN(B43:E43)		=STDEV(B28:E28)
59	Net Cash from Operating Activities	=AVERAGE(B29:E29)	=GEOMEAN(B44:E44)		=STDEV(B29:E29)

f. Contrast the results for the geometric averages to those for the arithmetic average for the variables listed below. What do you observe about the differences in the two growth estimates for Sales and Accounts Payable? What do you observe about the differences in the two estimates for Total Assets and Retained Earnings? Hint: Look at the results from part b (the individual yearly growth rates) for each variable to draw some conclusions about the variation between the arithmetic and geometric averages.

1. Sales
2. EBIT
3. Total Assets
4. Accounts Payable
5. Retained Earnings

Answer:

- a. Sales...not a large difference
- b. EBIT...not a large difference
- c. Total Assets...not a large difference
- d. Accounts Payable...relatively large difference
- e. Retained Earnings...huge difference

Internet Exercise

1. Choose your own company and repeat the analysis from Problem 3. You can get the data from MSN Money at <http://moneycentral.msn.com/investor/home.asp> To retrieve the data for your company, go to the Stocks area and enter the ticker symbol. Now choose Financial Results and then Statements from the menu on the left side of the screen. Display the annual income statement and copy the sales and net income data. Now enter the data into your template.