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Teaching the Budgeting Process Using a Spreadsheet Template

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Abstract
The purpose of this article is to demonstrate how to use a template to teach the budgeting process and how to use the same template to do a sensitivity analysis once the budget process is completed. The template can be used as-is by non-accounting majors. They just have to fill in all of their assumptions by replacing the red numbers. The template can be locked so that students cannot modify the formulas by mistake. Just lock the worksheet and students will be able to only change the assumptions. Accounting majors are shown how to build their own template by using formulas. This requires a good understanding of Excel and of the budgeting process. Once the template is constructed, making modifications to the assumptions is very easy and students can see the results immediately.

Introduction
Most textbooks in accounting or in entrepreneurship use tables to explain what the budget is all about. The textbooks usually explain one equation at a time and students rapidly learn that creating a budget by hand is a very long process. In explaining a business plan, many entrepreneurship books have a special business plan appendix, but most of their examples are based on the acquisition of an existing company (Kuratko, 2009). By using Excel, many professors have reduced the amount of time spent doing calculations. However, most accounting professors continue to use Excel as a calculator and do not develop a spreadsheet that would allow a rapid analysis of “what if” situations. This paper demonstrates how to create a template that allows students to change one or many of their assumptions and see the impact on the budget immediately. Unlike most examples used in books, this template also incorporates income taxes.

This template was developed at the request of the organizers of the Connecticut Business Plan Competition: The Entrepreneurship Foundation. The competition started more than ten years ago. It involves mostly graduate students, and all colleges and universities in Connecticut can send teams to the competition. The biggest difficulty that students have had was doing a budgetary analysis. Most students were enrolled in an Entrepreneurship class and were not accounting majors. They understood the concept of a budget but were unable to do the analysis themselves. The Foundation features this template in their student guide (The Entrepreneurship Foundation, 2009).

After a long discussion with the Foundation, we decided that the template would have a section for assumptions, a cash budget, an income statement, and a balance sheet. The assumptions would allow students to input their data in on worksheet and then see the results immediately in
the budget. The current template has more sections. One section is used for the assumption, one for each budget, one for cash flows and one for each financial statement.

**Description of the Template**
The first screen students see is the Assumptions Sheet.

![Figure 1: Budget Assumptions](image)

The red numbers in Figure 1 are the assumptions that students must change for their new product. As shown in Figure 2, they also need some information about the beginning balance sheet, borrowing, minimum cash level, the tax rate, and the amount of quarterly income taxes payments.
For accounting students, the same template is used. Students are told to fill in the information from the example in the book that we are currently using for the graduate or undergraduate course (Garrison, Noreen, & Brewer, 2008) or (Hansen & Mowen, 2007).

**How to use a template to teach the budget process**

The first element of the budget process is to calculate revenues and cash inflows. Revenues are the product of quantity sold and the price per unit. Students are informed that there are many ways to determine the price and that once the price is set the quantities can be obtained from the marketing department. Students must also understand that the cash might not be received at the same time as the sale.

One can determine, using cells B4:B5 in Figure 1, that because the company has a market share of 10% of a total market of 1,000,000 units, it is selling 100,000 units. Because of an annual growth of 5%, the company is expecting sales of 105,000 next year. This number will be used with some calculations. However, this number is confusing for most non-accounting majors and the numbers are hidden. In the first quarter, the firm will have 10% of its sales which will be 10,000 units. The formula used in C8 is the following: =$B$4*$B$5*C7. This formula is copied to D8:F8.

Before moving to the next step, students should be told about lines 18, 25 and 29. Line 28 is calculated first. Total depreciation is calculated using the depreciation method used for income taxes (double declining balance with the half year rule). The net book value at the beginning of the year (E40 – E41) is depreciated at twice the depreciation rate (2/B27). The additions for the
quarter (C26) are depreciated at half that rate \((1/2 \times \frac{2}{B27} = B27)\). The formula is 
\[
=\left(\frac{(\$E40-\$E41) \times 2}{B27}\right)/4 + \frac{C26}{B27}.
\]
The depreciation is then allocated to manufacturing costs (line 18) or administrative cost (line 25) based on the percentage of use by manufacturing (B24).

The next step is to create the sales budget as shown in Figure:

![Figure 3: The Sales Budget](image)

First quarter unit sales in C3 are determined by referencing the assumed amount with the formula: =Assumptions!C8. This formula is copied for each quarter, and the quantity for the year is the sum of the four quarters. In C4, the formula for selling price per unit is =Assumptions!$B$3. Finally, the formula for total sales is: =C3*C4.

From this table, the cash inflows can be calculated. As assumed in cell B9, seventy percent (70%) of first quarter sales will be collected in the first quarter \((\$250,000 \times 70\%)\). The accounts receivable from the previous quarter will also be received in the first quarter. At the end of the fourth quarter, 30% of the sales of that quarter are still receivable. The information is summarized in the next table:

![Figure 4: Cash Collections](image)

Cell C8 is calculated as = Assumptions!F32. It represents the amount of accounts receivable at the beginning of the year, this would be the first amount received. Cell C9 is calculated by multiplying the amount of sales for the first quarter by the percentage of cash receipts the same quarter. The formula is =C5*Assumptions!$B$9. The remaining amount not received the same quarter will be received the following quarter. The formula in D10 is =C5 – C9.

The next step is to look at the manufacturing process. The number of units to manufacture must be calculated. Because units must be fabricated before they are sold, we also have to calculate how many units are needed as a “buffer.” This is usually a percentage of the sales of the next quarter. The necessary information is in B10:B19, as shown in Figure:
In the first quarter, the company needs not only to manufacture the 10,000 units, but also needs a buffer of 25% on the second quarter sales (30,000 x 25%), which means they need to manufacture a total of 17,500 units. Figure shows the production budget. The budgeted sales come from line 3. The desired ending inventory is calculated with the following formula: =Sales!$D$3*Assumptions!$B$10. This means that is the percentage specified in B10 (Figure 1) multiplied by the sales of next quarter. The beginning inventory in C6 is the amount in cell C34 in Figure 2, the number of units in the beginning inventory for the year. For all other quarters, the beginning inventory in a quarter is the ending inventory in the previous quarter.

Students are told that the security buffer for the fourth quarter was calculated as 2,625, which is 25% of 10,500 units. Students must remember that because growth was 5%, sales for the first quarter of next year would be 10,000 plus 5%, for a total of 10,500 units. Since this will be the required production for the first quarter of year 2, the company needs 25% of this amount at the end of quarter 4 of year 1. Students should notice that the ending inventory for the year (H4) is not the sum of quarterly ending inventory but the ending inventory at the end of the fourth quarter (F4). Similarly, the beginning inventory for the year (H6) is the beginning inventory for the first quarter (C6).

The first element of the manufacturing cost is the cost of raw materials. Since 15 pounds are needed for each unit, we would need 17,500 units at 15 pounds each for a total of 262,500 pounds of raw materials. However, raw materials have to be purchased in advance and a security
“buffer” is also needed. In this case, it represents 20% of the purchase of the next quarter. Students are told to be careful about beginning and ending inventories. After the quantities have been determined, the cost is calculated by multiplying the pounds by the cost per pounds. The results are as follows:

The calculations for the materials budget are summarized in Figure 8:

Because the cash outflow for each semester is only 80% (as specified in Assumption B14) of the purchases of the quarter, outflows need to be calculated in the following table.
Students should be told to notice that the formulas used here are very similar to the formulas used in for the cash inflows (see Figure 9).

The other elements of the manufacturing process are easier to determine than the direct materials cost because neither direct labor nor overhead need a buffer. Unlike raw materials, you cannot buy labor in advance and store it to be used later. The calculations for direct labor and overhead are straightforward and are shown in Figure 3. Students are also reminded that because depreciation is not a cash outflow, it has to be taken out of the expenses to determine the cash outflows.

The numbers in Figure 3 were calculated using the formulas shown in:
The next step in the budget process is to add the selling and administrative expenses.

For this step, students must remember that variable selling costs are per unit sold, not per unit manufactured. The other selling and administrative costs are a fixed determined amount per quarter and are easy to calculate. Again, we have to add back depreciation to determine the cash outflow.

As shown in Figure 4, the variable costs are calculated while the fixed costs are just taken from the assumption section.
Creating the Cash Budget

Now is the time to calculate the Cash Budget (see the Financials worksheet). The first element is to look at the beginning balance of the cash and add the cash inflows from the sales budget. The beginning cash plus cash receipts is the total available.

The next step is to look at all of the cash disbursements from purchases, the direct labor budget, the overhead budget and the selling and administrative budget. Two more disbursements are also taken into account: equipment purchases and dividends (see C26:F27 in Figure 1). These are added to the disbursements. We also add one more line for interest that we will need to calculate.
The difference between the total available and the total disbursements will determine the excess (or deficit) of cash in row 18. As can be seen below, all numbers used here come from numbers calculated in the Budget section of the template.

We now need to determine the amount to borrow and when it will be reimbursed. Two important assumptions are made here: Borrowing is always done on the first day of a quarter and repayment is always made on the last day of a quarter. Additionally, we make another assumption about the amount borrowed and how to round it up. Finally an assumption is made about the tax rate and the quarterly payments made throughout the year.

In the example above, we have a deficit of $213,000 and since we need a minimum of $40,000 (B51) in cash, we must borrow $253,000, which is a multiple of $1,000 (B52). The amount is calculated the following way:

\[ =IF(B18<Assumptions!$B$54,ROUNDUP(-B18+Assumptions!$B$54,-3),0) \]

This means that if the excess or deficit of cash is less than the amount specified in the assumptions, you round up the sum of the deficit cash plus the desired amount. The roundup is to the third number to the left of the decimal, which means rounded up to the next thousand.

This amount will appear on the line labeled Borrowings, as follows (C21):
Accrued interest is next calculated in B23 using the formula \(=B20 \times \text{Assumptions!B55}/4\).

The interest is thus calculated as $22,138 which will be paid the first day of the next quarter to avoid compound interest. This was indicated as line 15 of the disbursement of the next quarter (C15). Students are also told to note that Cash at the end of the first quarter (B28) will be the cash at the beginning of the second quarter (C4 in Figure 14).

The last step of the budget process is to prepare financial statements. The manufacturing cost and the income statement use revenues and expenses, not the inflows or outflows of cash. This is the Manufacturing Costs Statement shown in Figure:

![The Manufacturing Cost Statement](image-url)
The Manufacturing Costs Statement is just to determine how much it cost to produce the goods manufactured (or finished) during the year.

The Income Statement is shown next.

![Figure 18
The Income Statement](image)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Company XYZ</strong></td>
<td><strong>Income Statement and Retained Earnings</strong></td>
<td><strong>For Year X</strong></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sales</td>
<td>$2,500,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cost of Goods Sold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Beginning inventory</td>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Plus Manufacturing Costs</td>
<td>1,404,794</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Less Ending Inventory</td>
<td>(29,794)</td>
<td>1,375,000</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Gross margin</td>
<td>1,125,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Selling and Administrative Expenses</td>
<td>504,050</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Net Income before interest</td>
<td>620,950</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Interest Expense</td>
<td>82,950</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Net Income before taxes</td>
<td>538,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Taxes</td>
<td>188,300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Net Income</td>
<td>349,700</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Plus Retained Earnings at Beginning</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Less Dividends</td>
<td>(32,000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Retained Earnings at the End</td>
<td>$317,700</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In order to determine the Cost of Goods Sold, in the next statement, we need to add the beginning inventory of finished goods plus the manufacturing cost and subtract the ending inventory of finished goods. The balance sheet is prepared next.
The total of the Assets is equal to the total of Liabilities and Stockholders’ Equity. Students can use the financial statements to do a ratio analysis or any other form of financial analysis. There is an amount to pay for income taxes because the amount paid each quarter ($30,000 as per line 16 in Figure 14), were not enough to cover the real income tax expense ($188,300 as per D14 in Figure 18) shown in the income statement. Explaining the process and doing the whole budget usually takes about three hours. The last Spreadsheet is the formal cash flows statement shown in Figure 20.
How to use the template to do a scenario analysis.
Imagine that your sales force told you that if you reduce the price by $1 you could increase market share by 2%. Should you do it? It could take another 3 hours to answer if done by hand. This is when the spreadsheet is especially useful. Change the two assumptions and see the results immediately. Go to the Assumption sheet and change B3 from $25 to $24. Also change B5 from 10% to 12% and see the results in the Financials Sheet.
Net Income is now $425,409 an improvement from the situation before. Note that every number of the income statement was recalculated automatically.

![Figure 22: The New Income Statement](image)

Also, since your financials are all there, you could calculate the impact on your ratios. You immediately get the results of any change in your assumptions. Any number in red can be changed and you will see the results immediately.

**Conclusion**

By using a template with an assumptions sheet, you can very rapidly see the impact of a decision. This is very useful for both accountants and non-accountants. The advantage of a template is that the user does not have to know how to calculate all of the elements of the budget and can concentrate on the results.

Accounting majors should be shown step-by-step how they can construct such a template for their own needs. They are told that it is important to write the formulas correctly and to make a reference to a cell address (B3) instead of just using the amount $25.

Students are also told that the approach used here is more realistic than the approach used in many books by looking at the total market and a specific market share for their business instead of just using quantities as most accounting books do. The depreciation method used is also the
same method used by the IRS. Most books just use an amount for depreciation instead of calculating the expense as we would usually do for a corporation.

It takes a lot more time to build the template but once it is built, people will save hundreds of hours every time they have to do a budget and every time they have to answer a simple question such as what happens if my raw materials cost is increased by 10%. With a flexible budget process, it is very easy to see the impact of some changes in a few key strokes instead of taking another three hours to recalculate everything.

References


