Portfolio Case Study

The Situation - Your individual client (Mr. Slade) has been very successful in his business dealings, and has accumulated $1 million in cash and investments. Previously Mr. Slade has invested these funds rather haphazardly, in a potpourri of investments without much strategy or thought. Presented below is a summary of his funds as they are currently invested:

<table>
<thead>
<tr>
<th>Investment Type</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>275,000</td>
</tr>
<tr>
<td>Speculative Stocks</td>
<td>400,000</td>
</tr>
<tr>
<td>Mutual Funds</td>
<td>325,000</td>
</tr>
</tbody>
</table>

In speaking with Mr. Slade, with your help he determines that he would like to spread his investments around in a variety of investments in an effort to diversify his portfolio. Together, you come up with the following criteria for Mr. Slade’s investment strategy:

1. Mr. Slade wants to spread his investments around, including blue chip stocks, growth stocks, speculation stocks, cash, real estate and mutual funds.
2. Mr. Slade needs between $100,000 and $150,000 in liquid cash.
3. Mr. Slade wants to carry about 25% to 35% of the portfolio in blue chip stocks.
4. Mr. Slade would like to no more than 20% of the portfolio invested in speculative stocks.
5. Mr. Slade wants no more than 20% of his investments in mutual funds.

The next step in this process is to estimate the expected return on investment (ROI) for each of investments. Some of these numbers are easy to come by and some are a little more difficult. For example, it is known that the checking account pays 2.2% interest, and of course there is no growth. Mr. Slade’s speculative stock investments have grown at an average of 12%, with no dividend payments while his mutual funds have grown 7% per year. A little research reveals that blue chip stocks grow on average 6.0% per year, and pay about 4% in dividends annually, and growth stocks grow at
about 8% per year. The real estate market has shown steady growth of 12% per year, but there is an annual cost of about 3.5% for taxes, insurance and maintenance.

Mr. Slade wants you to help him figure out which portfolio mix maximizes his earnings, while obeying his stated constraints. Thereafter, Mr. Slade wants you to set up a organized approach for tracking these investments in the future.

The Big Picture - Your Goals Are:

Install the Solver tool in Excel.

Use Solver to calculate the best mix of investments that also obeys Mr. Slade’s stated investment goals and criteria.

Set up an Excel worksheet that organizes and tracks these investments.

Create web queries that will import stock prices and mutual fund information directly into Excel.

This Case Study Covers the following Excel Features and Concepts:

- **Add-ins**
- **Web Query Parameters**
- **Solver Overview**
- **Editing Web Queries**
- **Solver Worksheet**
- **Refreshing Web Queries**
- **Solver Constraints**
- **Subtotaling**
- **Solver Targets**
- **Outlining**
- **Solver Reporting**
- **Tables**
- **Portfolio Design**
- **PivotTables**
- **Web Queries**
- **Format Gallery**

Steps:

To use the Solver Add-in, you need to load it first. To do this, Click the Microsoft Office Button, and then click Excel Options. Click Add-Ins, and then in the Manage box, select Excel Add-ins. Click Go. In the Add-Ins available box, select the Solver Add-in check box, and then click OK. After you load the Solver Add-in, the Solver command is available in the Analysis group on the Data tab.

1. Set up the “Investment Mix” worksheet, starting with the row and column labels shown below.
2. Enter the percentage returns for each investment, including earnings and growth rate. Note that the earnings rate for real estate is a negative number because the owner must pay money annually for taxes, insurance and maintenance.

3. Enter an amount of funds for each investment, the total of which sums to the $1 million that Mr. Slade owns. It does not matter which amounts you enter here; these are the amounts that will eventually be adjusted by Solver. (For example, you could enter $1 for the first five investments and $999,995 for the last investment if you wanted to.)

4. Enter formulas to calculate the percentage of each investment as a percentage to the total investments. This is best accomplished by typing in the top formula, applying absolute references to the denominator, and double clicking the fill handle to copy the formula down.
Enter the remaining formulas to complete the schedule. These formulas are straight forward and they are best accomplished by typing the formula once, applying the proper absolute column reference to the “Amount of Investment” cell reference, and then copying this formula down and across. The final column simply sums the earnings and growth to derive a total return on investment.

5. Presented below is an auditing view of this schedule with all data and formulas displayed so that you can check your work. This computation represents the Solver Problem which Solver will solve.

6. Now that your investment schedule is complete, you are ready to use solver to determine the optimum investment mix that yields the top return, yet obeys Mr. Slade’s stated investment objectives. Launch the Solver tool from the Data menu’s Analysis chunk.
7. Enter the Constraints into the solver Parameters dialog box one at a time. For example, the amount of cash is to be at least $100,000 and at most $150,000. These constraints are expressed as $F$8 $\geq$ 100000 and $F$8 $\leq$ 150000.

8. Further, in order to make solver work, you must add two additional constraints as follows. A constraint that tells solver the total amount of available funds must also be added by instructing Solver that total funds are $1,000,000. Another constraint that indicates that no investment shall be less than $0.00 must also be added, otherwise solver will try to maximize earnings by suggesting negative investment amounts. (Sure, this sounds crazy, but Solver is not a thinking intelligent being, its just a calculation.)

9. Complete the Solver by referencing the cells to be changed and the cell to be maximized in the solution. The cells to be changed are the 6 cells containing the amounts to be invested in each type of investment, as shown in the dotted line box below.

10. The cell to be maximized is the total amount of return on investment, or the total of the “Projected Total” column.
11. With all constraints, changing cells, and maximized cell properly referenced, you are now ready to produce the solution by pressing the Solve button. This action will adjust the portfolio mix schedule to provide those top results which obey the stated investment objectives.

12. As you can see by the serene above, solver has adjusted the portfolio investment mix to show that total earnings of $90,950 can be achieved by maximizing the investments in blue chip stocks, avoiding growth stocks, placing the minimum amount of $100,000 in checking, etc. After producing this report, Mr. Slade may decide that additional constraints are needed, and if so, the numbers can be massaged accordingly.

13. Solver now offers a variety of options for reporting the results. The report can be saved as a scenario. Thereafter, Solver will produce various reports to help you understand the results. The first of these reports is the Answers Report shown to the right.
14. The Sensitivity and Limit Reports provide details into how the final answers were derived.

15. Now that the Portfolio Investment Mix and Solver worksheets have both been created, they can be rerun as frequently as desired in just a few seconds. For example, assume that the checking account interest rate changes, blue chip returns fall, and Mr. Slade’s objectives change. This is no problem as you can open the worksheets and make these adjustments in only a few seconds. Specifically, assume that Mr. Slade decides that at least 10% of the investments should be invested in Mutual funds. Simply add this new constraint to Solver and recomputed the results.
As market conditions change, the Investment Mix Schedule assumptions can be updated and Solver can be re-run to produce new results. Thereafter, Mr. Slade needs only to track investments and move them around as the amounts grow to match his desired investment goals.

16. The next step is to assist Mr. Slade in selecting investments from each category, and then creating a worksheet to track those investments. While the selection of each individual investment is complex, strategic and personal (and hence beyond the scope of this case study), let us assume that Mr. Slade has decided upon the following specific investments:

<table>
<thead>
<tr>
<th>Category</th>
<th>Symbol</th>
<th>Company Name</th>
<th>Initial Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Chip Stocks</td>
<td>MSFT</td>
<td>Microsoft</td>
<td>50,000</td>
</tr>
<tr>
<td>Blue Chip Stocks</td>
<td>T</td>
<td>AT&amp;T Inc.</td>
<td>50,000</td>
</tr>
<tr>
<td>Blue Chip Stocks</td>
<td>DOW</td>
<td>Dow Chemical</td>
<td>50,000</td>
</tr>
<tr>
<td>Blue Chip Stocks</td>
<td>DD</td>
<td>Du Pont</td>
<td>50,000</td>
</tr>
<tr>
<td>Blue Chip Stocks</td>
<td>UPS</td>
<td>UPS</td>
<td>50,000</td>
</tr>
<tr>
<td>Blue Chip Stocks</td>
<td>XOM</td>
<td>Exxon Mobil</td>
<td>50,000</td>
</tr>
<tr>
<td>Blue Chip Stocks</td>
<td>KO</td>
<td>Coca Cola</td>
<td>50,000</td>
</tr>
<tr>
<td>Speculation Stocks</td>
<td>GOOG</td>
<td>Google</td>
<td>50,000</td>
</tr>
<tr>
<td>Speculation Stocks</td>
<td>ORCL</td>
<td>Oracle</td>
<td>50,000</td>
</tr>
<tr>
<td>Speculation Stocks</td>
<td>IN</td>
<td>Intermec</td>
<td>50,000</td>
</tr>
<tr>
<td>Speculation Stocks</td>
<td>MRK</td>
<td>Merck</td>
<td>50,000</td>
</tr>
<tr>
<td>Checking Account</td>
<td></td>
<td></td>
<td>100,000</td>
</tr>
<tr>
<td>Real Estate</td>
<td></td>
<td>Undeveloped Land</td>
<td>70,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Townhome</td>
<td>180,000</td>
</tr>
<tr>
<td>Mutual Fund</td>
<td>FFIDX</td>
<td>Fidelity Fund</td>
<td>50,000</td>
</tr>
<tr>
<td>Mutual Fund</td>
<td>EDSIX</td>
<td>Evergreen Disciplined Value Fund</td>
<td>25,000</td>
</tr>
<tr>
<td>Mutual Fund</td>
<td>AFATX</td>
<td>Alfa SS Star Science &amp; Technology</td>
<td>25,000</td>
</tr>
</tbody>
</table>

17. Set up an initial Portfolio that list these investments and the initial amounts that Mr. Slade has decided to place in each investment. Include a column for share price and the total number of shares as shown below.
18. On a separate sheet, insert a Web Query to retrieve these stock and mutual fund prices using the ticker symbols provided. To do this, select “Existing Connections from the Data Ribbon’s “Get External Data” Chunk, and select “Stock Quotes”. Enter the ticker symbols in the “Enter Parameter Value” dialog box shown below. Be sure to check the checkbox titled “Use this value/reference for future refreshes”.

19. This action will cause Excel to reach out to a stock portfolio database on the Internet and create the following summary report:
20. Return to the Portfolio and insert formulas to pull stock price data from the web query into the Portfolio as shown below.

![Table](image)

21. Add formulas in the shares column by dividing the amount of each investment by the share price in order to determine the appropriate number of shares of each investment Mr. Slade should purchase to meet his investment goals. Be sure to use the round function and round to the nearest tenth.

![Table](image)

22. Once Mr. Slade has made all of the necessary investments, recreate the portfolio on a new sheet, and make the necessary adjustments to reflect the actual results of these transactions. Due to the requirements of purchasing blocks of shares, Mr. Slade will not be able to purchase the exact number of shares indicated above at the exact same price indicated above. Therefore there will be slight discrepancies. Once those transactions are completed, Mr. Slade will need a worksheet that documents the beginning point in which Mr. Slade begins to track his investments. For example, the resulting Portfolio might look like this:

![Table](image)
23. Once created, the portfolio can be updated at any time by pressing the “Refresh Data” button. As an example, just moments after completing this portfolio, Mr. Slade’s investments had grown by $1,651, as shown below. Of course changes in the real estate holdings and checking account balance will need to be input manually on a periodic basis such as every 6 months or each year.

24. Next, practice converting this data to both a table, and a PivotTable. Therefore select the top cell referencing the share price, and press F2 and then F$ to toggle on the absolute references. Use the down arrow and repeat this until all share formulas have an absolute reference. Copy the Portfolio to a new sheet, and again to yet another new sheet.

25. Select one of the portfolio examples and apply Subtotals to the Portfolio using the “Subtotal” tool from the Data Ribbon’s “Outline” Chunk. This action will automatically subtotal the Portfolio by category as shown below.
26. Convert the portfolio to a table using the “Table” tool from the Insert Ribbon’s “Tables” Chunk. This will automatically apply formatting and drop down filters to the Portfolio. You change the formatting using the gallery or by applying new formats to individual rows or columns.

![Table](image1)

27. Next click the “Outline” selection number 2 to display the collapsed version of the data, displaying subtotals and grand totals only.

![Outline](image2)

28. Now select the second copy of the Portfolio, and with your cursor positioned on any cell in the table, select the “PivotTable” tool from the Insert Ribbon’s PivotTable Chunk. This action will produce a new Sheet with a Blank Pivot Pallet displayed as shown below.

![PivotTable](image3)
29. In the Pivot Table Field List dialog box, check the “Category”, “Company Name” and “Total” column. Next drag the Category field from the Row Labels box and drop it in the Column labels box. The resulting pivot report should appear as follows:

30. Finish by formatting the table with a “Dark” design from the “Format as Table” tool on the Home Ribbon’s Styles chunk. Also apply comma formatting.
In conclusion, you have assisted Mr. Slade in planning an investment strategy which diversifies his holdings, yet maximizes earnings. Additionally, you have created a worksheet that tracks these investments. As all of the factors change, Mr. Slade can easily determine which monies, if any, need to be moved around to maintain his desired diversity. For example, assume that Mr. Slade makes an additional $200,000 in 2007, and his checking account increases accordingly. He need only insert the new checking account balance into solver, along with any other known adjustments such as changes in earnings, and rerun solver to obtain a new mix, which can be compared to the current investment mix to determine which investments need to be adjusted.