**Project 1: What-if Analysis**

**CSIS 140: Introduction to Information Systems and Internet Technologies**

**Spring 2014**

**Objectives:** Improve the problem solving skills using what-if analysis.

**Description:** *What-if analysis* enables one to experiment with different variables or assumptions so that one can observe and compare how the changes affect the related outcome. A *variable* is an input value that can change to other values to affect the results of a situation.

**Problem to solve:**

You need a new car. After doing some preliminary research on prices, you developed a spreadsheet to help to calculate your monthly payment (use the PMT function), total mount to repay a car loan, and the total amount of interest you will pay. You want a car that costs $25,000 including taxes, title, and other fees. You plan to take $5000 out of your savings account for a down payment. You are currently investigating automobile loan interest rates at various banks and credit unions. You realize that you need to find a less expensive car and/or change your down payment. Although you can change input values to see the comparisons at the same time. In addition, you want to look at your annual monthly budget to review the impact of purchasing a new car on your income and expenses.

Class work:

1. A *one-variable table* is a structured range that contains different values for one variable to compare how these values affect one or more calculated results. For example, you can use a one-variable table to compare monthly payments on a car. Your first step is to decide which one variable to manipulate (in this case – the interest rate). Then you need to specify the substitution values. A *substitution value* is a value that replaces the original input value of the variable in a data table. After you enter the substitution values in either a column or a row, you need to add one or more formulas that relate mathematically to the variable for which you are using substitution values. It is important that you enter the substitution values and formula references in the correct locations. This sets the left and top boundaries of the soon-to-be completed data table. To complete the one-variable data table use the Data Table tool (Data tab, Data Tools group, What-If Analysis).

Format the data table to look like the one-variable data table in the ‘*problems 1 and 2.pdf* ‘file. Build the 3D chart *Monthly Payment by Cost/APR* with 3 series ($20,000, $25,000 and $30,000) using the Two-Variable Data Table.

1. A *two-variable data table* is a structured range that contains the different values for two variables to compare how these different values affect the results for one calculated value. Create a two-variable data table to check how the monthly payments depend on the APR and the down payment.

Format the data table to look like the two-variable data table in the ‘*problems 1 and 2.pdf* ‘file.

1. *Goal Seek* is a tool that enables you to specify a desired result from a formula, without knowing what input value achieves that goal. Goal Seek works backward to identify the exact value for a variable to reach the goal. Unlike variable data tables, Goal Seek uses the original worksheet data to change an input instead of displaying various combinations in a separate table. Goal Seek manipulates only one variable and one result; it does not produce a list of values to compare.

Given the current interest rate with a five-year loan and your planned down payment, you want to identify the most that you can afford on a car to keep your monthly payment at $300 (the answer for the car cost should be $21,091.81. Scroll the *’problems 3 and 4.pdf’* file).

1. You may want to compare several variables and their combined effects on multiple calculations. This type of analysis involves identifying and setting up *scenarios*, which are detailed sets of values that represent different possible solutions. Business managers often create a best-case scenario, worst-case scenario, and most likely scenario to compare outcomes. *Scenario Manager* is a what-if analysis tool that enables you to define and manage up to 32 scenarios to compare their effects on calculated results. The Scenario Manager dialog box enables you to create, edit, and delete scenarios. A *scenario summary report* is an organized structured table of scenarios, their input values, and their respective results.

Use the Scenario Manager to create the scenario summary report like in the *’problems 3 and 4.pdf’* file.

1. *Solver* is an add-in application that searches for the best or optimum solution to a problem by manipulating the values for several variables within restrictions that you impose. You must load the Solver add-in before you can use it. When you load Solver, Excel displays Solver in the Analysis group on the Data tab. The *objective cell* specifies the cell that contains a formula that produces a value that you want to optimize (that is, maximize, minimize, or set to a value) by manipulating values of one or more variables. The formula in the objective cell relates directly or indirectly to the changing cells and constraints. The *changing variable cells* are the cells containing variables whose values change within the constraints until the objective cell reaches its optimum value. The changing variable cells typically contain values, not formulas, but these cells have a mathematical relationship to the formula in the objective. The *constraints* specify the restrictions or limitations imposed on a spreadsheet model as Solver determines the optimum value for the objective cell.

Although using Goal Seek and Scenario Manager were helpful in further analyzing your car purchase, you want to ensure the spreadsheet model imposes constraints on the solution. Therefore, you will continue your analysis by using Solver. Before using Solver, you want to reset the variables to their original values. After entering the original variable values again, you will specify the monthly payment cell as the objective cell (with the value of 300), and the cost of car, down payment, APR, and number of years for the loan as the changing variable cells. You need to define the constraints: $20,000 to $30,000 cost, $5,000 to $7,500 down payment, 4% to 6% APR, and 4 to 6 year loan. In addition, you need to set an integer constraint for the years so the Solver does not produce a fractional year. Create the Answer Report similar to the report in the ‘*problem 5.png’* file.

Homework:

Find answers to the following questions:

* Reset the variables to their original values. What is the monthly payment if the down payment is $6,000?
* Reset the variables to their original values. What is the down payment if the monthly payment is $250?
* Reset the variables to their original values. What is the min monthly payment, related APR and the down payment (save the Answer Report)?

**Scoring Rubrics**

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| **#** | **Feature** | **Score (%)** |
| **1** | Class work (One-Variable Table, Two-Variable Table, 3D Chart, Goal Seek, Scenario Manager, Solver) | 60 |
| **2** | Homework (correct answers) | 40 |
|  |  | 100 |

**Note. Any inconsistency with the provided page images, any non-working feature or any wrong answer will result in -10%.**