

Explanation of the Model Formulation and Output:

The given code formulates a linear programming problem using the Gurobipy optimizer to maximize the profit subject to certain constraints.

There are four decision variables:

my_var1: represents the quantity of 1st product that is produced and sold.

my_var2: represents the quantity of 2nd product that is produced and sold.

my_var3: represents the quantity of 3rd product that is produced and sold.

my_var4: represents the quantity of 4th product that is produced and sold.

The objective function of the model is used to maximize the profit. The profit is computed as the difference between the total revenue and the total cost.

code:

```
my_obj = 5*my_var1 + 985*my_var2 - 475*my_var3 - 0.9*my_var4
```

There are seven constraints in the model:

my_budget_constraint represents the budget constraint. The total cost of producing and selling the products must not exceed £20,000. This is given by the inequality:

code:

```
20*my_var1 + 1000*my_var2 - 15*my_var3 + 0.9*my_var4 <= 20000
```

my_min_profit_constraint_1, my_min_profit_constraint_2, and my_min_profit_constraint_3: represent the minimum profit constraints for three different scenarios. These constraints require that the profit in each of the three scenarios must be at least £2,000. These are given by the inequalities:

code:

```
5*my_var1 + 985*my_var2 - 475*my_var3 - 0.9*my_var4 >= 2000
5*my_var1 + 595*my_var2 + 285*my_var3 - 0.9*my_var4 >= 2000
5*my_var1 + 175*my_var2 + 695*my_var3 - 0.9*my_var4 >= 2000
```

my_min_profit_constraint_1_mod, my_min_profit_constraint_2_mod, and my_min_profit_constraint_3_mod: represent modified minimum profit constraints for three different scenarios. These constraints are the same as the previous constraints, but they are added to ensure that there is at least one scenario in which the profit is at least £2,000. These are given by the inequalities:

code:

```
5*my_var1 + 985*my_var2 - 475*my_var3 - 0.9*my_var4 >= 2000
5*my_var1 + 595*my_var2 + 285*my_var3 - 0.9*my_var4 >= 2000
5*my_var1 + 175*my_var2 + 695*my_var3 - 0.9*my_var4 >= 2000
```

The Gurobipy optimizer is used to solve the linear programming problem formulated by the code. After the solver has completed the optimization process, the optimal solution and objective value are printed.

Output Interpretation:

The optimal objective value is £19,700. The optimal values of the decision variables are my_var1 = 0.0, my_var2 = 20.0, my_var3 = 0.0, and my_var4 = 0.0. The values show that the company should invest £20,000 in the 1st scenario 1 to maximize profit, and no investment is needed in the 2nd and 3rd scenarios. The company earns a profit of £19,700 by following this investment strategy.