**Occupy Wall Street Optimizer: Executive Summary**

**Problem Summary**

Occupy Wall Street (OWS) faces several difficulties when it comes to occupying venues throughout New York City and gaining publicity. Most notably, the organization faces two major challenges:

1. Randomness in their cash inflows and outflows
   * Donations come in randomly
   * Expenses for bail and legal fees are random, based on both the amount of the expense and the number of people needing those services
   * Food costs are random to a degree
2. Costs of occupying different locations
   * Parks, Subways, Office Buildings and Schools are have different costs associated with the supplies necessary to put on effective protests
   * The relative “value” of each occupied site differs based on the composition of the crowds (e.g., office buildings have more members of the 1% than a school would)

In order to address each problem, we assembled a two-step model. We first used Crystal Ball in order to determine probabilistically the funding available for the weekly occupying of sites throughout New York City. We then used a Simplex Model to determine how OWS could use these funds to generate the most exposure while staying within their projected budget.

**Crystal Ball Simulation**

Using historical donation figures, we determined the average donation amount that OWS received during its first two weeks. After finding the average donation, we used a Maximum Extreme distribution for the amount of each donation, a donation which allows for extremely unlikely outliers on the high end (typically used for natural disasters such as flooding or earthquakes). Using figures provided by OWS, we also assumed that on average, the number of donations per day can be described by a normal distribution, employing the central limit theorem to determine that the average number of donations across more than 60 days would approximate the normal distribution.

We then assumed a cost structure for each of the various expenses that OWS faces on a day-to-day basis: food, legal expenses, and bail money. Currently, OWS, provides these three services to its occupiers. Based on information available in the media, we made additional assumptions, which are highlighted in the screenshot below:

***Crystal Ball Simulation***



**Solver Model Formulation**

Using the output of the Crystal Ball Simulation, we then added the weekly budget as a constraint for the number of troops that OWS could send into the field. We determined that the goal of the model would be to optimize publicity while respecting certain constraints on the number of venues available for occupation.

* *Objective*: Maximize Publicity
* *Decision Variables:* Number of venues to occupy of each type
  + *Available venues:* *Office Buildings, Schools, Parks, Subway Stations*
* *Subject to the Following Constraints*:
  + Weekly budget = $30,000
    - Must cover the cost of basic occupying supplies
  + Maximum number of venues by type
    - Parks: 20 / Subways: 50 / Office Buildings: 10 / Schools: 5
  + Maximum number of rhythmically-inclined drummers: 500
  + Staffing requirements for a venue to count as “occupied”
  + Non-negativity for each venue

The Excel screenshot below depicts the model formulation:

***Solver Formulation***



Based on the Solver Model, we determined that OWS should occupy the following numbers of venues:

* Parks: 10
* Subways: 3
* Office Buildings: 10
* Schools: 5

The above combination would maximize publicity for the cause while respecting all constraints. Interestingly, a sensitivity analysis informed us that the budget was not the binding constraint—the number of venues was actually the limiting factor in the model. This means that OWS should expand their consideration set and focus on finding viable locations rather than increasing funding.

**Conclusion**

While there is a great deal of ambiguity in the facts and figures associated with OWS, this model attempts to apply quantitative rigor to a highly qualitative situation. We believe that this case highlights the difficulty that managers face when analyzing problems that do not have clear inputs (or outputs). Ultimately, this type of analysis can help inform managerial decisions, even if the exact figures are not utilized. We additionally hoped to demonstrate how a problem without an obvious quantitative component can be simplified to figures that can be input into an Excel model.