# Team Brogram: Stackelberg Plan

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## 0.1 Design

### 0.1.1 Overview

1. On game initialisation, parse *CSV* and perform batch regression to find follower's reaction function, $R_F(x)$.
2. For the first day, find global maxima of $J_L[]$ to obtain price to submit.
3. On proceeding to a new day, take previous follower's price and perform recursive regression to efficiently update approximation of $R(x)$.
4. Again, find maxima of updated $R(x)$ and submit price. Repeat for each new day.

## 0.2 Schedule

This section describes each task in more detail.

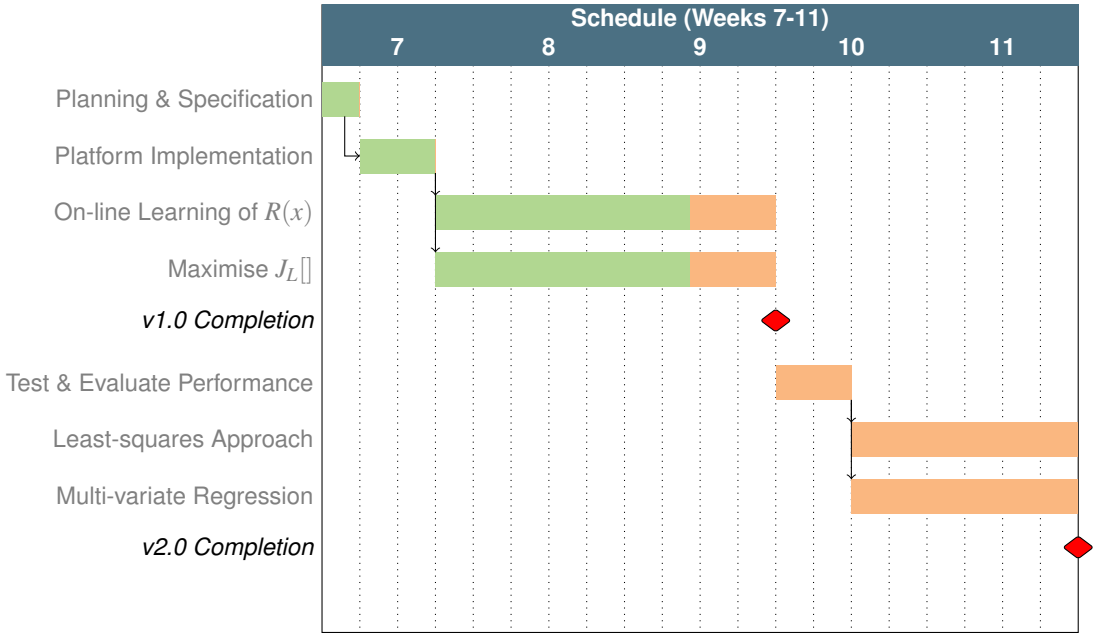
### 0.2.1 Tasks

We have broken development down into the following key deliverables:

1. Learning the reaction function (*Sam* & *Danyal*)
    - Currently assuming the follower's reaction function is linear, so simply representing the function as two variables, $a$ and $b$, from $R(x) = a + bx$.
    - We then parse CSV data files to obtain historical data on follower responses
    - After, we perform linear regression via least-squares on this data to to find values for $a$ and $b$.
    - Regression performed using formula from Xiao-Jun's fourth lecture, slide 20.
    - Our next task is to find the global maxima of the function.
2. Online Learning (*Sam* & *Danyal*)
    - Weight least square w/ a forgetting factor to produce an updated estimator.
    - Use recursive least square approach to find coefficients.
3. Finding the global maxima (*Freddy*)
    - Having estimated the follower's reaction function, $R(x)$, we will then calculate our optimal strategy by maximising the (leader's) payoff function, $J_L[]$.

### 0.2.2 Gantt Chart

The Gantt chart below shows how the development will progress over the coming weeks.




Milestones/deliverables are marked by a **red** diamond.