**Data**

Set of PO types

Set of assignments

Set of carriers

Set of lanes

Number of POs of type

FEU for PO of type

Cost of sending a PO with assignment

Minimum quantity commitment for carrier

Target quantity for carrier on lane

Days from now that assignment is expected to be completed

Set of possible assignments for

Set of assignments that use carrier

Set of POs that can go on assignment

Set of POs that are being sent on lane

Penalty cost for missing for a carrier

Penalty cost for missing for a carrier on lane

Daily inventory cost for a PO

**Variables**

Number of POs of type assigned to

Dummy variable corresponding to the penalty for missing for carrier

Dummy variable corresponding to the penalty for missing for carrier on lane

**Formulation**

**Overview**

This is a [linear programming](https://en.wikipedia.org/wiki/Linear_programming) optimization model that considers origin dwell time, minimum quantity commitments for each carrier, target percentages for each lane, and transit time. The model does not consider volume allocation (MQC and target percentages) as hard constraints, instead the target volume allocations are “preferred” by the model. Meaning the model will attempt to hit the percentages as close as possible, but it allows itself a small amount of leeway if it can cut costs.

This is the objective function of the model:

The objective function has four components, which allows it to consider four different criteria when the model makes its allocation. The model will have to be “tuned” to allow it to make tradeoffs between costs and preferred allocations:

The above component takes into account overall cost of the allocation

This component takes into account the MQC for each carrier

This component takes into account the target allocation percentage for each carrier on each lane

This component takes into account how long each route takes – that is, it attempts to minimize transit time

The rest of the model is just equations that ensure that the objective function is mathematically correct.