The Baldwin Enterprise holds five (5) different currencies and requires a trading plan that will increase its Euro and Yen holdings to 8 million and 54 million respectively. Additionally, the company must maintain a USD value of at least $250,000 in each of the remaining currencies. They require a plan that minimizes transaction costs while meeting these predetermined conditions. To achieve this goal, a linear programming model was created using Pulp (Python). To reduce the number of total transactions, six (6) decision variables were identified as the amount of currency (USD, GBP, HKD) to be converted to EUR and JPY. Decision Variables:

X1 = Quantity of USD converted to EUR
X2 = Quantity of GBP converted to EUR
X3 = Quantity of HKD converted to EUR
X4 = Quantity of USD converted to JPY
X5 = Quantity of GBP converted to JPY
X6 = Quantity of HKD converted to JPY

The provided exchange rates were utilized to determine the transaction costs associated with each of the six (6) decision variables. Transaction Costs:

C1 = 0.00947446
C2 = 0.01917605
C3 = 0.00176192
C4 = 0.0006235
C5 = 0.001162
C6 = 0.0063871

These variables combined provide the necessary objective function for the linear optimization of the problem. Objective Function:

C1*X1 + C2*X2+ C3*X3+ C4*X4+ C5*X5 + C6*X6

The constraints were then obtained from the companies predetermined requirements. In order to be certain that a minimum holding of $250,000 USD in each currency is maintained, all constraints are converted to USD using the necessary transaction rates. Transaction Rates:

R1 = 1.5593 (GBP to USD)
R2 = 0.12812 (HKD to USD)
R3 = 0.00843 (JPY to USD)
R4 = 0.9724 (EUR to USD)

Constraints:

2,000,000 - (X1+X4) ≥ 250000 (USD holdings)

1000000*R1 - (X2+X5) ≥ 250000 (GBP holdings)

3000000*R2 - (X3+X6) ≥ 250000 (HKD holdings)

30,000,000*R3 + (X1+X2+X3) ≥ 54,000,000 *R3 (JPY holdings)

5,000,000* R4 + (X4+X5+X6) ≥ 8,000,000* R4 (EUR holdings)

Solving for our model provided an optimal trading plan with a minimized transaction cost of $3364.624 USD. The model recommends the following:

Quantity USD $67,960 converted to EUR (approximate transaction cost: $643.88)

Quantity HKD $134,360 converted to EUR (approximate transaction cost: $236.73)

Quantity USD $1,682,040 converted to JPY (approximate transaction cost: $1048.75)

Quantity GBP $1,235,160 converted to JPY (approximate transaction cost: $1435.26)

In the event that executives of the company opt to lower their minimum holdings of $250,000 USD equivalent to only $50,000 USD, it would be easy to assess this change via the created model. According to the model, a minimum of $50,000 USD equivalent holdings would reduce the total transaction costs to $2696.18. Additionally, it would drastically change the previous trading plan and reduce the overall number of transactions. This likely occurs because the decrease in minimum holdings effectively broadens the feasible region for our optimal solution. The model is subsequently able to find an optimal solution that reduces the number of transactions and associated costs.

If the exchange rate for converting USD to GBP were to increase from 0.6409 to 0.6414, the model and optimal solution should remain relatively unaffected. This is because USD to GBP conversion is not relevant to the model. However, this change would likely impact the conversion of GBP to USD in the constraints. This change would mostly likely reduce the ask price of 1 GBP by a fraction of a cent when exchanged for with USD. The optimal solution would thus remain the same.