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Assignment 1

The goal of this assignment is to address the following for the Baldwin Enterprises problem of minimizing transaction costs from foreign exchange transaction fees.

1. Create a model for this problem and solve it.
2. What is the optimal trading plan?
3. What is the optimal transaction cost (in equivalent USD)?
4. Suppose another executive thinks that holding \$250,000 USD in each currency is excessive and wants to lower the amount to \$50,000 USD in each currency. Does this help to lower the transaction cost? Why or why not?
5. Suppose the exchange rate for converting USD to GBP increased from 0.6409 to 0.6414. What happens to the optimal solution in this case?

1. I used Python to compute the buy and sell transactions combinations of currency in order to achieve the balance goals of \$8M of EUR, \$54M of JPY, while maintaining a constraint of a minimum of \$250K in USD value for every single currency on hand, and then \$50K minimum, and then changed the exchanged rate for GBP to USD by increasing the rate slightly. The goal is to reduce transaction costs (ending value less beginning value). I started off by creating all of my variables (beginning balances, rates, and constraint variables). I also created the LP variables which are the exchange transactions, or buy/sell amounts. I then created variables for the ending balance calculations, for which all are used in the LP model. Essentially your ending balance is the starting balance, plus any buy exchanges, and any sell exchanges. I put the LP model into a function that I can re-use for each scenario by computing the optimal transactions, transaction costs, and the ending balances.
2. For the optimal trading plan for 250K minimum - In this case we should sell 2,945,103 of USD by buying 3M of the EUR equivalent. We then sell 839,775 by buying the JPY equivalent. We also sell 9,327,999 HKD by buying the USD equivalent. We finally buy 131,333,180 of JPY by selling the HKD equivalent. This results in 250K of USD, 8M of EUR, 160K in GBP, 2.3M of HKD, and finally 54M of JPY.
3. The optimal transaction cost is \$27,866 in USD, which is calculated as the change in our beginning balance in USD to our ending balance in USD after transacting our currency. This is because after we convert our USD to a currency, and sell the currency back to USD, the actual dollar value drops to .99~ for GBP to USD as an example because this drop in price represents the cost to complete the exchange.

4. After lowering the minimum balance in USD to \$50,000 the transaction fee remains nearly unchanged. This is because \$250K in minimum balance requirements is already suggested to be the optimal solution, therefore a reduced minimum balance constraint will have no impact. However, when we increase the constraint by requiring a higher minimum balance to \$300K for example, the transaction fees will now be higher or considered infeasible since there is now less opportunity for improvement and iterations the program can go through in order to reduce the fees.
5. When we increase the exchange rate for GBP from .6409 to .6414, our transaction fees would expect to reduce only if we were to transact in GBP/USD, which means we've made a foreign currency exchange gain or profit, however in this case there is no change since we did not utilize GBP to USD. In this case, USD has risen in value compared to the GBP, our USD's purchasing power has increased.