Strategic Finance Decision-Making and Optimization Solutions

1. Executive Summary

This project aims to solve two optimization problems related to financial decision-making. The first problem involves short-term financing for the company, where the objective is to maximize the total amount of cash available by determining the optimal borrowing amounts between two financing instruments. The second problem focuses on currency arbitrage trading, aiming to identify opportunities to buy and sell currencies to generate profit within certain constraints. We will formulate the problems into linear programming (LP) models and adopt Julia JuMP solver to find the optimal solutions for each problem.

2. Business Objective

The primary objective of this project is to provide optimal financial solutions for the company to make strategic decisions in short-term financing and currency arbitrage trading, ultimately maximizing cash flow and profitability.

3. Data Source

We utilized the company's net cash flow for each month and the corresponding monthly interest rates for different financing methods to solve the short-term financing problem. For the currency arbitrage trading problem, we made use of the table of bid/ask quotes for four major currency pairs at a given date/time to perform the analysis.

Please refer to the Data Source file for detailed description of our data and constraints.

4. Approach

For both financial decision problems, we will formulate a linear programming (LP) model to determine the optimal solutions. For the short-term financing problem, we aim to determine the optimal borrowing amounts between the two financing instruments so that the total cash available in December 2013 will be maximized. On the other hand, we try to identify opportunities for buying and selling currencies to maximize profit within specified constraints for the currency arbitrage trading problem.

5. Insights and Conclusions

Based on our analyses, we concluded the optimal financing and currency trading methods to maximize the cash flow and profitability for the company.

Insights for Short-term Financing Problem

The optimal borrowing amounts between bonds and credit each month that maximized the total amount of cash available in December 2013 are determined as below (in thousands of dollars):

Row	Month	Credit	Bonds
	String	Float64	Float64
1	Jul	100.0	150.0
2	Aug	100.0	50.5
3	Sep	0.0	102.3
4	Oct	100.0	0.0
5	Nov	1.76	0.0
6	Dec	0.0	0.0

The optimal amount of cash in December 2013 is around US$294,402.86. Meanwhile, the solution provides a strategic plan for optimizing the total amount of cash available in December 2013 through borrowing between credit and bonds over a six-month period.

Insights for Currency Arbitrage Problem

The buy/sell quantities among currencies that maximized the arbitrage amount are determined as following (rounded to the 2nd decimal point):

TO / FROM	USD	EUR	JPY	GBP
USD	0	0	2,750,699,649.29	0
EUR	20,620,299.95	0	0	0
JPY	0	23,684,343.46	0	0
GBP	0	0	0	0

The optimal arbitrage amount is $10,000. The results indicates that the optimal trade executions involve cyclically leveraging available funds to buy and sell currencies (from USD to EUR to JPY, then back to USD) to maximize the arbitrage profit.

6. Recommendations

Based on our insights, we provided several recommendations to reach our intended goal in maximizing cash flow and profitability for the company:

1) Adopt a dynamic cash management approach by leveraging borrowing options to navigate through periods of negative cash flows while minimizing borrowing costs during periods of positive cash flows.
2) In currency arbitrage trading, exploit opportunities to buy and sell currencies in a cyclical manner to maximize profit within specified constraints.

7. Limitations

For the currency arbitrage problem, we assumed no transaction costs in trading. However, real-world currency exchange typically incurs high transaction fees. Thus, further incorporation of fees and other costs into the optimization problem is necessary for practical applications in real-world scenarios.