Case 1

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import pandas as pd
import numpy as np
SMALL = 0.00001

zcb = pd.read_excel('/Users/huanyu/Desktop/FixedIncome/hw1/zcb.xlsx')
cb = pd.read_excel('/Users/huanyu/Desktop/FixedIncome/hw1/cb.xlsx')
cb = pd.merge(cb,zcb,how='left',on='Maturity')
#cb.Maturity.duplicated()
selected_maturity = np.sort(np.concatenate(  \
(cb[cb.Maturity.duplicated()].index, \
cb[cb.Maturity.duplicated()].index - 1)))
cb = cb.loc[selected_maturity,:]
result = list()
for i in range(0,len(cb),2):
    x = 1
    y = -cb.iloc[i,1] * x / cb.iloc[i+1,1]
    z = -y - x
    synthetic_price = x * cb.iloc[i,2] + y * cb.iloc[i+1,2]
    zcb_price = z * cb.iloc[i,3]
    initial_cost = synthetic_price + zcb_price
    if (abs(initial_cost) > SMALL):
        if initial_cost > 0:
            result.append([-x,cb.iloc[i,1], -y,cb.iloc[i+1,1], -z, cb.iloc[i, 0],initial_cost])
        else:
            result.append([x,cb.iloc[i,1], y,cb.iloc[i+1,1], z, cb.iloc[i, 0],initial_cost])
result_df = pd.DataFrame({'Coupon Bond A':[x[0] for x in result],'Coupon A':[x[1] for x in result],'Cou
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library(reticulate)
library(knitr)
kable(py$result_df)
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Coupon Bond A	Coupon A	Coupon Bond B	Coupon B	Zero Coupon Bond	Maturity	Arbitrage Profit
-1	1.625	0.2131148	7.625	0.7868852	2022-11-15	0.2959016
-1	2.000	0.2807018	7.125	0.7192982	2023-02-15	0.4489254
-1	2.500	0.4000000	6.250	0.6000000	2023-08-15	0.2603750
-1	2.250	0.3000000	7.500	0.7000000	2024-11-15	0.6671250