Homework #1

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1.1

$S_0 = 5050, r = 3.5\%, T = 1$

Fair Foward: $F^* = S_0 e^{rT} = 5050 e^{0.035} = 5229.88$

i) $F = 5200$

Time 0: short gold, invest S_0, long foward

Time 1: Investment = $S_0 e^{rT}$, Buy gold via foward & return it

$\Pi = S_0 e^{rT} - F = 5229.88 - 5200 = \boxed{29.88}$

ii) $F = 5300$

Time 0: Borrow S_0 buy gold, short foward

Time 1: Deliver gold and repay loan

$\Pi = F - S_0 e^{r1} = 5300 - 5229.88 = \boxed{70.12}$

1.2

nominal $j = 3.25\%$ with semi annual compounding.

$G = (1 + j/2)^2 = (1.016251)^2 = 1.032764062 5$

i Annual compounding: $r_{ann} = G - 1 = \boxed{3.2764\%}$

ii Quarterly compounding: $j_4 = 4(G^{1/4} - 1) = \boxed{3.2369\%}$

iii Countinuos compounding: $r_c = \ln(G) = \boxed{3.2239\%}$

1.3 APR = 17.15%

Daily rate: $r_d = (1 + APR)^{1/365} - 1 = (1.1715)^{1/365} - 1 = 0.000433751 5$

Balance after 30 days: $B_{30} = 10000(1 + r_d)^{30} = 10000(1.0004337515)^{30}$

$B_{30} = \boxed{10,130.95}$

1.4

Discount factor: $DF(t) = e^{-R(t)t}$

Bond B1 (5% coupon, 2y): $B_1 = \sum CF(t) e^{-R(t)t} = \boxed{102.83}$

Yield solves:

$$102.83 = \sum \frac{CF(t)}{(1 + y/2)^{2t}}$$

$y_1 = \boxed{3.5214\%}$

Bond B2 (6% coupon, 10y): $B_2 = \sum CF(t) e^{-R(t)t} = \boxed{111.84}$

Yield solves:

$$111.84 = \sum \frac{CF(t)}{(1 + y/2)^{2t}}$$

$\boxed{y_2 = 4.5152\%}$

1.5

$N = 1,000,000$

unhedged cost: $1,000,000(1.175) = 1,175,000$

hedged cost:

$$100,000,000(1.150) = 1,150,000$$

Gain = 25,000

Interest rate differential (covered interest parity):

$$r_{USD} - r_{EUR} = \frac{1}{0.5} \ln\left(\frac{1.150}{1.100}\right)$$

$$r_{USD} - r_{EUR} = 8.8904\%$$