Hw 1.

1.1 i. $F_0 = 5050 \cdot e^{.035} = 5229$

Yes, there is an arbitrage opportunity

Short sell the gold at 5050 per ounce and invest at risk free rate.

Go long-forward at 5200 for 1 year

at T-1, the investment is 5229 per ounce, then buy gold at 5200 by forward contract and deliver gold

Profit is $29 per ounce

ii. Yes, there is arbitrage

borrow $5050 at 3.5%, buy gold for 5050,

short the forward contract at 5300

at T-1, deliver gold and receive 5300 and repay loan

Profit = $71

1.2. i. $\left(1 + \frac{.0325}{2}\right)^2 = 1.032764$

$r_{annual} = 3.2764\%$

ii. $\left(1 + \frac{r_q}{4}\right)^4 = 1.032764$

$1 + \frac{r_q}{4} = \sqrt[4]{1.032764} = 1.008087$

$\frac{r_q}{4} = .008087$

$r_q = .03235 = 3.235\%$

iii. $r_c = \ln(1.032764)$

$= 3.224\%$

1.3 $B = 10000\left(1 + \frac{.1715}{365}\right)^{30}$

$= 10000 \cdot 1.0004699^{30}$

$= \$10{,}142$

Interest charged: $142

1.4 1. $T=.5 \quad PV = 2.5e^{-.03 \cdot .5} = 2.463$

$T=1 \quad PV = 2.5e^{-.03 \cdot 1} = 2.426$

$T=1.5 \quad PV = 2.5e^{-.035 \cdot 1.5} = 2.373$

$T=2 \quad PV = 102.5e^{-.035 \cdot 2} = 95.585$

$P = 102.85$

2. $T=.5, 1 \quad PV = 3e^{-.03 \cdot .5} + 3e^{-.03 \cdot 1} = 5.89$

$T=1.5, 2 \quad PV = 3e^{-.035 \cdot 1.5} + 3e^{-.035 \cdot 2} = 5.55$

$T=2.5, 3, 3.5, 4, 4.5, 5 = 3e^{-.0425 \cdot 2.5} + 3e^{-.0425 \cdot 3} + 3e^{-.0425 \cdot 3.5} + 3e^{-.0425 \cdot 4} + 3e^{-.0425 \cdot 4.5} + 3e^{-.0425 \cdot 5} = 15.96$

$T = 5.5, \ldots, 10 = 84.64$

$P = 112.04$

3. 1. Using calculator $N=4, PV=-102.85, FV=100, pmt=2.5$

$I/Y = 1.756 \quad YTM = 3.51\%$

2. Using calculator $N=20, PV=-112.04, FV=100, pmt=$

$I/Y = 2.246 \quad YTM = 4.492\%$

1.5 i. $1m \cdot 1.175 = \$1,175,000$

with forward: $1{,}000{,}000 \cdot 1.150 = \$1,150{,}000$

Gain of $25,000 because appreciation was more than forward rate.

ii. $F_0 = X_0 e^{(r_{USD} - r_{EUR})T}$

$1.15 = 1.1 e^{(r_{USD} - r_{EUR}) \cdot .5}$

$\ln\left(\frac{1.15}{1.1}\right) = (r_{USD} - r_{EUR}) \cdot .5$

$.044452 = (r_{USD} - r_{EUR}) \cdot .5$

$.088904 = r_{USD} - r_{EUR} = 8.89\%$