1.1

i) Short sell the forward.

Get $S_0 = 5050$

Invest it to get 3.5% which will grow to $5050e^{0.035}$ in 1 year

$\rightarrow$ 5229.88

buy back the gold so profit is:

$5229.88 - 5200$

$= \$29.88$

ii) Long the forward

Borrow $5050 at 3.5%

and buy 1 ounce at $5050

$\rightarrow$ $5050e^{0.035}$ $\rightarrow$ 5229.88

At t Maturity, receive $5300

$5300 - 5229.88 = \$70.12$

1.2

(i) $\left(1 + \frac{0.0325}{2}\right)^2 = 1 + x$

$x = 0.03276 \rightarrow 3.276\%$ annual

(ii) $\left(1 + \frac{0.0325}{2}\right)^2 = \left(1 + \frac{x}{4}\right)^4$

$r = 0.032369$ → 3.2369 quarterly compound

(iii)

$1.032764 = e^{r}$

$\ln(1.032764) = e^{r}$

$r = 3.2259\ \%$

1.3 $B_{30} = 10,000\left(1 + \frac{0.1715}{365}\right)^{30}$

$$\$_{30} = 10{,}000 \times 1.0141358 = 10141.94$$

1.4

1) $\$_1 = 2.5e^{-0.03(0.5)} + 2.5e^{-0.03(1.0)} + 2.5e^{-0.035(1.5)} + 102.5e^{-0.035(2.0)}$

$$\$_1 = 102.8314$$

2) $\$_2 = \sum_{k=1}^{4} 3e^{-R(t_k)t_k} + 103e^{-R(10)(10)}$

where $t_k = 0.5k$

$$\$_2 = 116.8428$$

3) $B_{mkt} = \sum_i CF_i e^{-yT_i}$

i)

$$102.8314 = 2.5e^{-y(0.5)} + 2.5e^{-y(1.0)} + 2.5e^{-y(1.5)} + 102.5e^{-y(2.0)}$$

$$y_1 = 0.034908$$

ii) $$111.8428 = \sum_{n=1}^{4} 3e^{-y(0.5n)} + 103e^{-y(0)}$$

$$y_2 = 0.044650$$

$$y_2 = 4.4650\%$$

1.5

(i) Payoff $= (S_T - F_0) \times$ Notional EUR

$S_T - F_0 = 1.175 - 1.150$

$= 0.025$

Payoff $= 0.025 \times 1\,000\,000$

$= 25\,000$

$1\,175\,000 - 1\,150\,000 = 25,000$

(ii)

$$F_0 = S_0 \times \frac{1 + r_{USD,T}}{1 + r_{EUR,T}}$$

$$\frac{1 + r_{USD,T}}{1 + r_{EUR,T}} = \frac{F_0}{S_0}$$

$$\frac{F_0}{S_0} = \frac{1.150}{1.100} = 1.0455$$