EC 362 Fall 2000 Exercise 1

September 23, 2000

Chapter 1

SQ 1. Hedging reduces risk exposure, while speculation increases it. For a hedger to take a position in derivative markets, someone must be willing to take the other side of the bet.

SQ 2. The bank has written (or sold) the forward contract, committing to deliver GBP at a price of $1.6247/GBP. At the delivery date, that price is lower than the spot price of GBP, so the bank loses $(1.6247 - 1.65)$ per GBP, or $253,000 on the contract.

SQ 5. You have written a forward contract, so you are short a forward position in the stock index. If you buy a call and sell a put on the market index, with strike price equal to the forward price and maturity at the delivery date, you will have constructed a long synthetic stock position. With the appropriate magnitude, the options position will exactly offset the risk from the forward position.

Q 4. At time T, the options portfolio will be worth $(S_T - K)$, no matter whether that amount is positive or negative. This is the same payoff as that of a long position in a forward contract with the delivery price equal to K and maturity at the options expiration date.

Q 6. The discount rates (i_d), simple interest rates (i_s), discretely compounded interest rates (i_c) and continuously compounded interest rates (r) for these bonds are:

T	$i_d(T)$	$i_s(T)$	$i_c(T)$	$r(T)$
30	0.009952	0.009960	0.01	0.009956
60	0.019771	0.019835	0.02	0.019803
90	0.029451	0.029667	0.03	0.029559
120	0.038844	0.039603	0.04	0.039221

We may note that for any tenor $i_s(T) > i_d(T)$ and $i_c(T) > r(T)$.

Chapter 2

Q 2. The June contract pays $k\left(S_T - f_0\right)$, while the September contract pays $-k\left(S_T - f_1\right)$, where $k = 10$ million DM. Thus the net payoff is independent of S_T, depending only on the two delivery prices: $k\left(f_1 - f_0\right)$. In September, the June contract (which was worth zero when it was written) is now worth an amount related to the change in the forward price of the DM between June and September. You will not realise $k\left(f_1 - f_0\right)$ until June 1995, though, so that amount (the eventual profit on the portfolio of forward positions) will only be worth $k\left(f_1 - f_0\right) B\left(t_1, T\right)$ in September 1994, where t_1 refers to that date.

Q 3.

a. The forward price $F\left(0, 90\right) = S\left(1 + i_s \frac{T}{365}\right) = 65\left(1 + 0.045\frac{90}{365}\right) = \$65.72.$ A contract to deliver at this forward price has value zero at the time it is written.

b. If the forward price is set at \$60, the contract is worth $\frac{65-60}{1+0.045\frac{90}{365}} = \$5.66.$ For the seller to commit to a price of \$60 (rather than \$65.72) for delivery in three months' time, they will charge \$5.66 today. The present value arises because they can invest \$5.66 for three months and end up with \$5.72, which is the amount needed to fund the delivery at \$60 at time T.

Q 5.

The price of the domestic bond is $B\left(0, 3\right) = 1.0101^{-1}$ while the price of the foreign bond is $B_f\left(0, 3\right) = 1.0113^{-1}$. The forward rate is

$$
\begin{aligned}
F\left(0, 3\right) &= S_0 \frac{B_f\left(0, 3\right)}{B\left(0, 3\right)} \\
&= 0.5685 \frac{1.0101}{1.0113} \\
&= 0.5678
\end{aligned}
$$

A committment to sell DM at \$0.54 (rather than \$0.5678) would sell for $1MM\left[0.5678 - 0.54\right] B\left(0, 3\right) = \$27.547.20$. Note that calculation of this exact amount requires that you compute the forward rate to 8 digit precision, rather than the 4 shown above.