**APPENDIX O (SELECTED QUESTIONS FROM OLD EXAMS)**

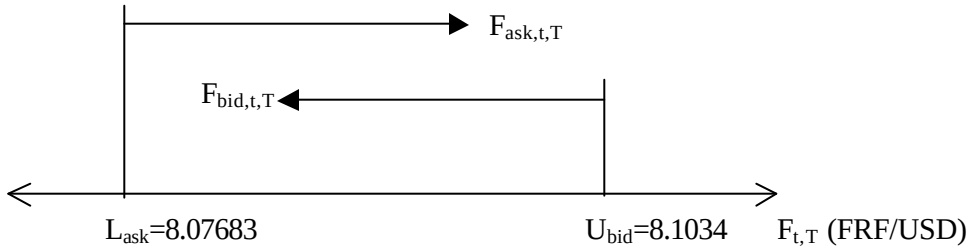
## Midterm 1

M1.I Short questions (10 points each)

1. (CHAPTER LN III). Bank A gives the following quotes: FRF/USD=8.0000-25. The Euro one-year interest rates for the FRF, $i_{FRF}$, and for the USD, $i_{USD}$, are 10(1/4)-(3/4) and 8(1/8)-(1/4). What is a possible quotation for the 180-day year FRF/USD forward exchange rate?

ANSWER:
Determination of bounds: we need to calculate the bounds for the forward rate, $U_{bid}$ and $L_{ask}$.

$U_{bid} = S_{ask,t}[(1+i_{ask,d}xT/360)/(1+i_{bid,f}xT/360)] = 8.0025$ FRF/USD [1.05375/1.040625] = 8.1034 FRF/USD.
$L_{ask} = S_{bid,t}[(1+i_{bid,d}xT/360)/(1+i_{ask,f}xT/360)] = 8.0000$ FRF/USD [1.05125/1.04125] = 8.07683 FRF/USD.




**Possible quote**: $F_{t,180}$=8.0910-8.0975 FRF/USD.

2. (CHAPTER LN IV). You have 278 monthly observations for the MSCI Australian Index. The first six autocorrelation coefficients are: $\rho_1$=.14, $\rho_2$=.11, $\rho_3$=.06, $\rho_4$=.03, $\rho_5$=-.02 and $\rho_6$=.05. The Q(6) statistics is equal to 11.34 ($\chi^2_6$=12.59 at the 5% level).
(A) Test if there any sample autocorrelation different than zero.
(B) Test if the first autocorrelations are jointly significantly different than zero.
(C) Looking at the size of the $\chi$'s and your tests, do you have evidence that the Australian Index has autocorrelation?

(A) SE=1/$\sqrt{278}$ = .06
$t_1$ = .14/.06 = 2.33 > 2; $t_4$ = .03/.06 = 0.50 < 2
$t_2$ = .11/.06 = 1.82 > 2; $t_5$ = .02/.06 = 0.30 < 2
$t_3$ = .06/.06 = 1.00 < 2; $t_6$ = .05/.06 = 0.82 < 2
$\Rightarrow$ Only first order autocorrelation is significantly different from zero.

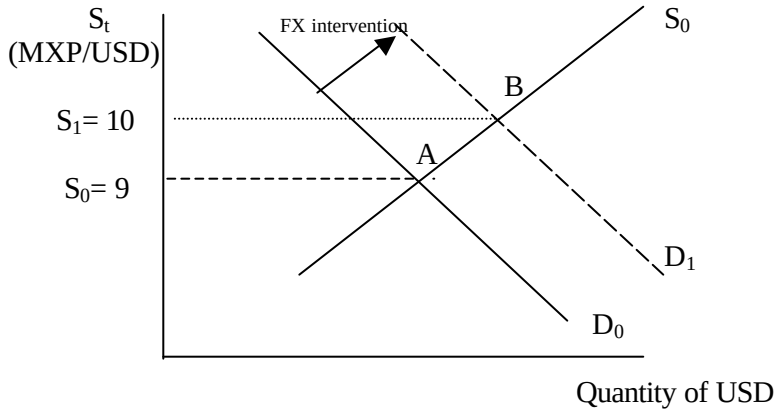
(B) Q(6)=11.34 < $\chi^2_{6,.05}$ = 12.58 $\Rightarrow$ cannot reject joint insignificance at the 5% level
(C) The first six autocorrelations are jointly equal to zero. The only significant autocorrelation is the first one; however, it is small. Overall, we cannot conclude that the Australian Index shows significant evidence of autocorrelation.

3. (CHAPTER LN II). Mexico has a floating exchange rate system. The Mexican peso (MXP) is appreciating against the USD. The Central Bank of Mexico decides to intervene to stop the appreciation of the MXP. The Central Bank of Mexico does not want to affect local interest rates. With the help of a graph, describe what the Central Bank authorities can do.

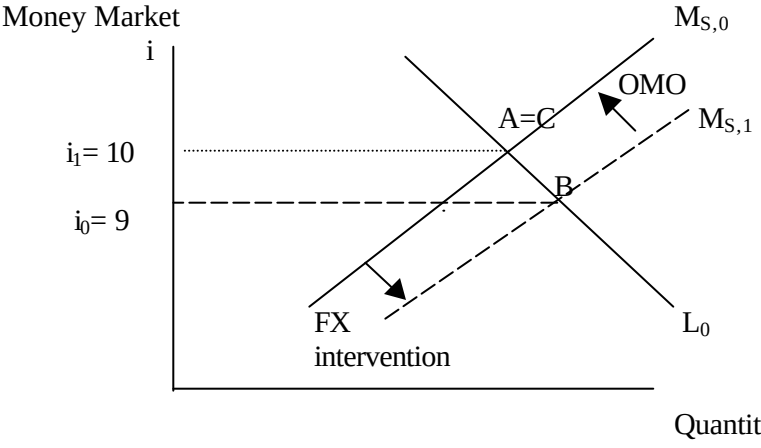
ANSWER:

| | |
|---|---|
| Original Situation: | Point A ($S_0$= 9 USD/MXP and $i_0$=10%) |
| CB intervention in FX market (buy USD-sell MXP): | Point B ($S_1$= 10 USD/MXP and $i_0$=9%) |
| Sterilization intervention (OMO:buy MXP-sell Letes) | Point C ($S_1$= 10 USD/MXP and $i_0$=10%) |

FX Market




Money Market




The Central Bank of Mexico uses an OMO to stop the appreciation of the MXP against the USD. The OMO consists of selling Letes (Mexican Short-term Treasury bonds) and receiving MXP, thereby, reducing domestic credit (money supply goes back to $M_{S,0}$). The OMO brings the Money Market back to A(=C), where the interest rate is $i_0$.

4. (CHAPTER LN I). Kramerica Bank gives the following quotes: $S_t$ = .6102-.6110 USD/CHF, and $S_t$= 1.6170-1.6190 USD/GBP. In addition, Kramerica Bank quotes $S_{bid}$= 2.6575 CHF/GBP. Is arbitrage possible? If so, design a triangular strategy to take advantage of Kramerica's quotes.

ANSWER:
(i) Calculate the CHF/GBP cross-rates.
$S_{bid,JPY/GBP} = S_{bid,JPY/USD} x S_{bid,USD/GBP}$=[(1/.6110) CHF/USD]x[(1.6170) USD/GBP]= 2.6465 CHF/GBP.
$S_{ask,JPY/GBP}=S_{ask,JPY/USD} x S_{ask,USD/GBP}$ = [(1/.6102) CHF/USD]x[(1.6190) USD/GBP] = 2.6532 CHF/GBP.

(ii) Kramerica's bid quote for the CHF/GBP is too high (overvaluation of the GBP against the CHF).
(1) Borrow CHF 1, exchange it for USD .6102. Exchange the USD .6102 for GBP .3769. Sell GBP and buy CHF using $S_{bid}$=2.6575 CHF/GBP. We get CHF 2.6575 x .3769 = CHF 1.00162.

5.- (CHAPTER LN III). Suppose you are given the following data:
$S_t$ = 110 JPY/USD
$i_{JPY,1\text{-}yr}$ = 2%
$i_{USD,1\text{-}yr}$ = 6%
$F_{t,1\text{-}yr}$ = 108 JPY/USD.

(A) Is arbitrage possible? (Hint: Calculate the IRPT forward rate).
(B) If IRPT does not hold, design a covered arbitrage strategy. Calculate the arbitrageur's profits.
(C) Briefly discuss, the capital flows observed in Japan if the above prices persist.

ANSWER:
(A) $F_{t,1\text{-}yr} = S_t (1 + i_d) /(1 + i_f)$ = 110 JPY/USD x (1 + .02)/(1 + .06) = 105.84 JPY/USD ($\neq$108 JPY/USD)
$\Rightarrow$ YES, arbitrage is possible.

(B) The forward USD is overvalued ($F_{t,1\text{-}yr}$ = 108 > $F^{IRPT}_{t,1\text{-}yr}$ =105.84). Therefore, a covered arbitrage strategy should involve selling the USD forward.
Steps:
(1) Borrow JPY 1 at 2% for 1 year.
(2) Convert to USD at 110 JPY/USD.
(3) Deposit in USD at 6% for 1 year
(4) Sell USD forward at 108 JPY/USD.

In one year, we'll observe the following cash flows.
We'll receive (in JPY) = (USD 1/110) x 1.06 x 108 JPY/USD = JPY 1.0407
We'll pay (in JPY) = JPY 1 x 1.02 = JPY 1.02
Profits = JPY 1.0407 – JPY 1.02 = JPY .0207 (2.07%)

(C) Japan observes: p = (108 - 110)/110 = -.01818 and $i_{JPY} - i_{USD}$ = .02 - .06 = -.04. Since p > $i_{JPY} - i_{USD}$, capital flies from Japan to the U.S. For example, Japanese investors will sell Japanese government bonds. The proceeds of these sales will be invested in U.S. assets ($\Rightarrow$ not an equilibrium situation).

6.- (CHAPTERS LN I-VIII).You are a Swiss Investor and only care about Swiss Franc returns. You follow a multi-country CAPM approach. Design an investment for the following scenarios (you want to invest in the markets mentioned):
a.- you're bullish on the Japanese yen (JPY), but unsure of the Japanese economy.
b.- you're bullish on the Madrid Stock Exchange, but unsure about the peseta (the Spanish currency).
c.- you're bullish on the computer industry and on the DEM, but you forecast a bear market in Germany.
d.- you forecast a bigger than usual trade deficit in the U.S. and a strong U.S. stock market.
e.- you forecast interest rates in France are going to decrease, but the French economy is in a recession.

ANSWER:
a) Low $\beta$ JPYs stocks
b) High $\beta$ Spanish stocks (and hedge FX exposure)
c) Low $\beta$ computer industry (no hedge FX exposure)
d) Exchange rate USD/CHF $\uparrow$. Then, hedge USD exposure. High $\beta$ stocks in the US
e) Exchange rate FRF/CHF $\uparrow$. It might jump start the stagnant French economy: Buy high $\beta$ French stocks, but hedge FX exposure

7.- (CHAPTER LN VII). Mr. Splinter, a U.S. delta hedger, wants to hedge DEM 10 million for a year. He decides to buy put options with a strike price of 80 at a premium of 2.55 cents per DEM. The delta, $\delta$, of this contract is (-1.2), with a gamma of 0.15. The spot rate is USD .7890 per DEM. On the PSE one contract covers DEM 62,500 (a contract includes 62,500 DEM puts).
a) Determine the number of number of contracts Mr. Splinter should buy.
b) Two months later the spot rate was .7990 USD/DEM. What is the delta at this spot rate? How many contracts should Mr. Splinter buy/sell to maintain a perfect hedge?

ANSWER:
(a) DEM 10,000,000 to hedge.
N = number of contracts = -10,000,000/[-1.2 x 62,500] = 133.33 $\approx$ 133 contracts

(b) $\delta_{new} = \delta + 1 \times \gamma = -1.20 + .15 = -1.05$
$N_{new} = -10,000,000/[-1.05 \times 62,500] = 152.38 \approx 152$ contracts.

Mr. Splinter needs to buy 19 contracts, to add to his 133 contracts.

8. (CHAPTER LN III). It is March 1999. You read in the Economists that a Big Mac in London sells for GBP 1.90, while in New York it sells for USD 2.43. The exchange rate is 1.61 USD/GBP.
(A) According to purchasing power parity (PPP), what should be the USD/GBP exchange rate?
(B) If you believe in PPP, what kind of signal (buy, hold, sell) have you generated?
(C) Based on the real exchange rate, which country is more competitive? Briefly, discuss the implications of your findings.

ANSWER:
(A) $S^{PPP}_t$ = USD 2.43/GBP 1.90 = 1.28 USD/GBP.
(B) According to PPP, the GBP is overvalued (25.88%). Therefore, PPP has generated a sell GBP signal.
(C) $R_t = S_t P_f / P_d$ = [1.61 USD/GBP x GBP 1.90]/[USD 2.43] = 1.2588 ($\Rightarrow$ $R_t$ is different from one!).

The U.K. is less competitive than the U.S. since its (Big Mac) prices are higher than U.S. prices, after taking into account the nominal exchange rate. Over time, we expect the GBP to depreciate against the USD.

9. (CHAPTER V). You work for Valdano Co. Valdano Co. is a U.S. hedge fund that has a long position in Swiss bonds, valued at USD 50,000,000. They use a GARCH(1,1) model to forecast the monthly volatility of the USD/CHF exchange rate. Valdano Co. uses monthly observations, measured in percentage changes, to estimate the GARCH model. Valdano Co. obtains the following estimates for the variance parameters: $\alpha_0$ = .003, $\alpha_1$ = .150, and ß$_1$ = .930. The estimate for this month's (August) conditional variance is $\sigma^2_{AUG}$ = 0.002. At the end of August, the exchange rate is $S_{AUG}$ = .7050 USD/CHF, while Valdano had a forecast $S^F_{AUG}$ = .6900 USD/CHF. The exchange rate in July was $S_{JUL}$ = .6850 USD/CHF

(A) Valdano Co. asks you to forecast the variance next month (September).

ANSWER:
$s^F_{AUG}$ = (.6900 - .6850)/.6850 = 0.0073
$s_{AUG}$ = (.7050 - .6850)/.6850 = 0.0292
$\varepsilon_{SEP} = (s_{AUG} - s^F_{AUG})$ = 0.0292 – 0.0073 = 0.0219
$\sigma^2_{SEP}$ = 0.003 + 0.150 $(0.0219)^2$ + 0.930 (0.002) = 0.004932

That is, the volatility forecast for September is $\sigma_{SEP}$ = 7.023%.

(B) Now, Valdano Co. wants to calculate the September's VAR of its exposure to changes in the USD/CHF exchange rate. Valdano uses a 95% confidence interval for VAR calculations. What is the interpretation of your VAR estimate.

ANSWER:
VAR (mean) = $W_0 \alpha \sigma \sqrt{\Delta t}$. = USD 50,000,000 x 1.65 x 0.07023 x 1 = USD 5,793,975.00
That is, the maximum one-month loss of this portfolio is USD 5,793,975.00.
Note: $\sigma$, the volatility, is monthly. Given that the estimated VAR (mean) is also monthly (September), $\Delta t$=1.

10. (CHAPTER LN VIII). Chambers Corporation will receive DEM 1,000,000 in 180 days. It considers using (1) a forward hedge, (2) an option hedge, or (3) no hedge. Its analysts develop the following information, which can be used to assess the alternative solutions:

- Spot rate of mark as of today = .65 USD/DEM
- 180-day forward rate of mark as of today = .67 USD/DEM
- Interest rates are as follows:
  - 180-day deposit rate: 5.5% in Germany, and 6.0% in the U.S.
  - 180-day borrowing rate: 6.0% in Germany, and 7.0% in the U.S.
- A DEM call option: expires in 180 days, exercise price of .68 USD/DEM, and a premium of USD .02.
- A DEM put option: expires in 180 days, exercise price of .70 USD/DEM, and a premium of USD .03.
- Chambers Corporation forecasted the future spot rate in 180 days as follows:

| Possible Outcomes | Probability |
|---|---|
| .63 USD/DEM | 20% |
| .66 USD/DEM | 60% |
| .74 USD/DEM | 20% |

Which strategy would you recommend to Chambers Corporation? Why?
ANSWER:
(1) **Forward Hedge**: Sell DEM 180 days forward.
USD to be received in 180 days = DEM 1,000,000 x .67 USD/DEM = USD 670,000.

(2) **Call Option**: Purchase put options. Exercise price = .70 USD/DEM; premium = USD .03

| Possible $S_{t+180}$ | Premium per Unit for Option | Exercise? (X=USD .70) | Total USD Received per Unit | Total USD Amount (DEM 1,00,000) | Probability |
|---|---|---|---|---|---|
| USD .63 | USD .03 | YES | USD .66910 | USD 669,100 | 20% |
| USD .66 | USD .03 | YES | USD .66910 | USD 669,100 | 60% |
| USD .74 | USD .03 | NO | USD .70910 | USD 709,100 | 20% |

E[USD to be received in 180 days] = USD 677,100

(3) **Remain Unhedged**: Purchase CHF 100,000 in the spot market 180 days from now.

| Future Spot Rate in 180 Days | Total Amount (USD 1,000,000) | Probability |
|---|---|---|
| USD .63 | USD 630,000 | 20% |
| USD .66 | USD 660,000 | 60% |
| USD .74 | USD 740,000 | 20% |

E[USD to be received in 180 days] = USD 670,000
**Recommendation**: Use put options, but a risk-lover might consider the no-hedge strategy.

11.- (CHAPTER LN VIII). Mr. Pitman is the owner of a small publishing company in New York that specializes in distributing books to Europe. Mr. Pitman monthly revenue is EUR 250,000 a month. Mr. Pitman wants to set up a USD/EUR naive hedge that would ensure his ability to make affordable purchases in the U.S., should the EUR collapse. In particular, he is very worried about a potential depreciation of the EUR against the USD in December. Mr. Pitman wants flexibility, so he decides to use American option contracts. Mr. Pitman's broker charges a flat fee of USD 15 and the exchange charges USD 1.50 per contract.

A. Specify what type of options should Mr. Pitman use (calls or puts).
B. How many standardized PHLX contracts should Mr. Pittman buy?
C. Using the information given in the WSJ clip, construct:
    i) at the money/in-the-money December hedge.
    ii) out-of-the money December hedge.
    iii) a collar.

(Specify strike prices and costs.) Briefly discuss the advantages and disadvantages of each strategy. Which one would you recommend to Mr. Pitman? (Why?)

ANSWER:
(A) Mr. Pitman should use puts (right to sell EUR)
(B) Number of contracts = EUR 250,000/[62,500/contract] = 4 contracts.
(C) •At-the-money (X=1.06 USD/EUR, premium=USD .0283)

Cost:

| | |
|---|---|
| a. premium USD .0283 per EUR | USD 7,075 (=USD 0.0283 x 250,000) |
| b. broker fee USD 15 + USD 1.50 per contract | USD 21 |

Advantage: sets a floor close to today's $S_t$ (1.0554 USD/EUR). The floor is set at USD 265,000.
Disadvantage: cost = USD 7,096.

• Out-of-the-money (X=1.04 USD/EUR, premium=USD .0170)

Cost:

| | |
|---|---|
| a. premium USD .0283 per EUR | USD 4,250 (=USD .0170 x 250,000) |
| b. broker fee USD 15 + USD 1.50 per contract | USD 21 |

Advantage: cost = USD 4271 (a cheaper alternative than the in-the-money/at-the money option)
Disadvantage: sets a lower floor = USD 260,000

• Collar: buy one put (X=1.04 USD/EUR, premium=USD .0170) and sell one call (X=108 USD/EUR, premium=USD 0.0056)

Cost:

| | |
|---|---|
| a. premium USD .0283 per EUR (paid) | USD 4,250 |
| a. premium USD .0056 per EUR (received) | (USD 1,400) |
| b. broker fee USD 15 + USD 1.50 per contract | USD 42 |

Advantage: cost = USD 2,892 (the cheapest!)
Disadvantage: sets a lower floor = USD 260,000 and also sets a cap = USD 270,000.

**Recommendation**: The collar looks attractive, from a price perspective. It's a cheap insurance alternative.

· **Information from the WSJ**

**PHILADELPHIA OPTIONS**
Friday, September 10, 1999

| | | Calls | | Puts | |
|---|---|---|---|---|---|
| | | Vol. | Last | Vol. | Last |
| **Euro** | | | | | **105.54** |
| **62,500 Euro-cents per unit.** | | | | | |
| 102 | Oct | ... | 0.01 | 3 | 0.38 |
| 102 | Dec | ... | 0.01 | 5 | 0.49 |
| 104 | Sep | 3 | 0.74 | 90 | 0.15 |
| 104 | Oct | 7 | 1.70 | ... | ... |
| 104 | Dec | 3 | 2.19 | 25 | 1.70 |
| 106 | Dec | 8 | 1.85 | 12 | 2.83 |
| 108 | Oct | 75 | 0.43 | ... | 0.01 |
| 108 | Dec | 17 | 0.56 | 3 | 3.68 |
| 112 | Dec | 2 | 0.08 | 1 | 7.81 |
| **Australian Dollar** | | | | | **65.37** |
| **50,000 Australian Dollars-cents per unit.** | | | | | |
| 64 | Oct | ... | 0.01 | 20 | 0.31 |
| 65 | Sep | 20 | 0.30 | ... | ... |
| 66 | Oct | 30 | 0.42 | ... | 0.01 |
| **British Pound** | | | | | **163.52** |
| **31,250 British Pounds-European Style.** | | | | | |
| 161 | Sep | 32 | 0.82 | ... | ... |
| 162 | Oct | 32 | 1.54 | ... | 0.01 |
| **31,250 British Pounds-cents per unit.** | | | | | |
| 159 | Oct | ... | ... | 4 | 0.63 |
| 161 | Sep | 4 | 0.94 | ... | 0.01 |

12. (CHAPTER LN VIII). Laker Airway, a British air carrier, pioneered a railroad-like system called Skytrain. The idea was to fill all the seats at the same consistently low price, with no-frills service. As with other start-up companies, Laker Airways was heavily laden with debt. Between 1979 and 1982, Laker took on an enormous amount of new debt to purchase the ten aircraft needed to service the transatlantic routes from Gatwick Airport (U.K.). The debt came in three major segments:
(1) Mitsui Bank of Japan extended a loan of USD 59 million at 8.5% for 20 years.
(2) The Export-Import Bank of the U.S. in conjunction with other banks extended a loan of USD 228 million at an average interest rate of 7.5% over nine years.
(3) Midland Bank (U.K.) led a syndicate of European banks in extending a loan of USD 131 million. The British government extended a subsidy to Laker Airway by agreeing to pay any interest above a fixed level. Therefore, Laker Airways interest rate was fixed at 9%.

During the early 1980s, the GBP was apreciating against the USD. However, by the end of 1981, the USD reversed this trend and started to appreciate against the GBP. Laker Airways' 1981 revenues were GBP 30 million and USD 15 million. Laker Airway's cost, excluding interest payments, were GBP 15 million and USD 5 million. The exchange rate in 1981 was 1.81 USD/GBP.

(A) Assume no revenue or cost growth in 1982. How would a 10% depreciation of the GBP affect the 1982 annual cash flows of Laker Airways? (Hint: compare the cash flows of 1981 and 1982.)

ANSWER:

| | Year 1981 (1.81 USD/USD) | | Year 1982 (1.629 USD/GBP) | |
|---|---|---|---|---|
| Sales | GBP 30 M | | GBP 30 M | |
| | USD 15 M | | GBP 15 M | |
| | | GBP 38.25 M | | GBP 39.21 M |
| Cost | GBP 15 M | | GBP 15 M | |
| | USD 5M | | USD 5 M | |
| | | GBP 17.76 M | | GBP 18.07 M |
| Gross profit | | GBP 20.52 M | | GBP 21.14 M |
| Interest expense | | | | |
| Mitsui Bank | GBP 2.77 M (USD 59 M at 8.5%) | | GBP 3.08 M | |
| Ex-Im Bank | GBP 9.45 M (USD 228 M at 7.5%) | | GBP 10.50 M | |
| Midland Bank | GBP 6.51 M (USD 131 M at 9%) | | GBP 7.24 M | |
| EBT | | GBP 1.8 M | | GBP 0.32 M |

$\Rightarrow$ A 10% depreciation of GBP reduced cash flows!

(B) Laker Airways went into bankruptcy in 1982. Discuss two solutions you might have attempted to save Laker Airways.

ANSWER:
See Chapter LN VIII.

13. (CHAPTER LN XVII). You are a U.S. investor, whose U.S. portfolio tracks the U.S. market perfectly. You are considering investing in the following foreign stock markets:

| Market | Return (%) | SD | ß$_{WORLD}$ |
|---|---|---|---|
| Mexico | .16 | 2.10 | .62 |
| U.K. | .09 | 1.05 | .84 |
| Hong Kong | .14 | 1.50 | .49 |
| U.S. | .10 | 1.11 | 1.03 |
| WORLD | .12 | 1.01 | 1.00 |
| $R_F$ | .05 | | |

$R_F$ is the U.S. one-year Treasury Bill rate, that is, the risk free rate. ß$_{WORLD}$ is the beta of the foreign market with the World Index.

(A) Based on a risk-adjusted performance measure (RVOL and RVAR), rank the performance of the four markets.

ANSWER:

| | RVAR | RVOL |
|---|---|---|
| Mexico | .05236 | .1774 |
| UK | .0381 | .0476 |
| HK | .06 | .1837 |
| US | .045 | .05 |

(B) Assume you add to your U.S. portfolio, which tracks the U.S. market, all markets with a higher RVOL than the U.S. RVOL. You give a weight of 10% to each foreign market in your expanded portfolio. What is the risk of your expanded portfolio? Is the risk of your expanded portfolio lower than before?

ANSWER:

Add Mexico and Hong Kong.

$\beta_p = \Sigma_i \omega_i \beta_i = .80 \times (1.00) + .10 \times (0.62) + .10 \times (0.49) = .935$ (lower $\beta$!)

M1.II Long question (20 points)

1. (CHAPTER LN VI) You are a U.S. investor. You have an investment of CHF 5 million in Swiss government bonds. You want to hedge CHF 5 million for six months, using monthly forward contracts. You estimate the following model for exchange rates:

$\Delta S_t = S_t - S_{t-1} = a_s + b_s \Delta S_{t-1} + \varepsilon_{st}$.
$\Delta F_t = F_t - F_{t-1} = a_F + b_F \Delta F_{t-1} + \varepsilon_{Ft}$.

Each element in the covariance matrix is parameterized as follows:
$\sigma^2_{s,t} = \alpha_{s0} + \alpha_{S1}\, e^2_{s,t-1} + ß_{S1}\, \sigma^2_{s,t-1}$
$\sigma^2_{F,t} = \alpha_{F0} + \alpha_{S1}\, e^2_{f,t-1} + ß_{S1}\, \sigma^2_{f,t-1}$
$\rho = \sigma_{sf,t} / \{\sigma_{f,t}\, \sigma_{s,t}\}^{1/2}$.

Suppose you estimated the above system and you got the following estimates:
$a_s$=.005; $b_s$=.35; $a_f$=.009; $b_f$=.45;
$\alpha_{s0}$=.20; $\alpha_{s1}$=.15; $ß_{s1}$=.80;$\alpha_{f0}$=.30; $\alpha_{f1}$=.20; $ß_{f1}$=.75; $\rho$=.75.

You are given the following data: spot and 30-day forward rates (USD/CHF) for the months of August, September, October, and November.
$S_{Aug}$=.952; $S_{Sep}$=.940; $S_{Oct}$=.934; $S_{Nov}$=.925;
$F_{Aug}$=.947; $F_{Sep}$=.940; $F_{Oct}$=.936; $F_{Nov}$=.924;
$\sigma^2_{s,Oct}$=.430; $\sigma^2_{f,Oct}$=.410.

At the end of October, you constructed your hedge ratio ($h_{Nov} = -\sigma_{sf,t=Nov}/\sigma^2_{f,t=Nov}$).

(A) Now, at the end of November, you are required to construct your hedge ratio for December, that is you want $h_{Dec}$.

ANSWER:

| | $\Delta S_t$ | $\varepsilon_{S,t}$ | $\sigma^2_{S,t}$ | $\Delta F_t$ | $\varepsilon_{F,t}$ | $\sigma^2_{F,t}$ | $\sigma_{SF,t}$ | $h_t$ |
|---|---|---|---|---|---|---|---|---|
| September | -.012 | .----. | .----. | -.007 | .-----. | .-----. | .----. | .----. |
| October | -.006 | -.0068 | .430 | .004 | -.00985 | .410 | .3267 | -.7681 |
| November | -.009 | -.0119 | .5440 | -.012 | -.01920 | .6075 | .4263 | -.7097 |
| December | ... | ... | .6352 | | | .7557 | .5196 | -.6876 |

That is, the hedge ratio for December is -.6876.

(B) Interpret the hedge ratio for December, $h_{Dec}$.

ANSWER:
For each CHF long, we need to have CHF .69 short.

(C) The CHF/USD forward contract size is CHF 125,000.

(i) Do you need to buy or sell forward contracts?

(ii) How many contracts do you need to hedge your position?

ANSWER:

(i) Underlying position: Long CHF 5,000,000. $\Rightarrow$ sell forward CHF contracts

(ii) Number of contracts = CHF 5,000,000 x (-.69)/CHF 125,000 = -27.6 contracts $\approx$ 28 contracts.

2. (CHAPTER LN V). You are given the following quarterly CPI series in the U.S. and in Germany. from 1993:4 to 1994:4. The DEM/USD in 1994:1 is equal to 1.6600. Your job is to do quarterly forecasts of DEM/USD exchange rate for the period 1994:2 1994:4, using Relative PPP.

| | CPI | |
|---|---|---|
| Date | Germany | U.S. |
| 1993:4 | .590 | .356 |
| 1994:1 | .593 | .360 |
| 1994:2 | .595 | .368 |
| 1994:3 | .599 | .371 |
| 1994:4 | .601 | .375 |

(A) use the naive forecasting approach, that is, today's inflation is the best predictor for tomorrow's inflation.

ANSWER
Naïve model: $S^F_{t+1} = S^F_t\ (1+I_{GER})/(1+I_{USA})$

| Date | $I_{GER}$ | $I_{USA}$ | $S^F$ |
|---|---|---|---|
| 94:1 | 0.508 | 1.124 | 1.6600 |
| 94:2 | 0.337 | 2.222 | 1.6499 |
| 94:3 | 0.672 | 0.815 | 1.6194 |
| 94:4 | 0.334 | 1.078 | 1.6172 |

(B) Your firm uses the following forecasting regression model to forecast inflation rates. Use a regression analysis.

$I_{GER,t} = .0088 + .94\ I_{GER,t-1} + \varepsilon_t.$
$I_{US,t} = .0106 + .97\ I_{US,t-1} + \varepsilon_t.$

ANSWER
Naïve model: $S^F_{t+1} = S^F_t\ (1+I^F_{GER})/(1+I^F_{USA})$

| Date | $I^F_{GER}$ | $I^F_{USA}$ | $S^F$ |
|---|---|---|---|
| 94:2 | 1.3580 | 2.1499 | 1.6472 |
| 94:3 | 1.1970 | 3.2156 | 1.6149 |
| 94:4 | 1.5119 | 1.8508 | 1.6095 |

3. (CHAPTER V). You work in Hong Kong for a local investment bank. You have available quarterly interest rate series in the U.S., $CPI_{USD}$, and in Hong Kong, $CPI_{HKD}$, from 2001:4 to 2002:3. You also have available GDP indexes (GDP) for the U.S. and Hong Kong. The HKD/USD in 2002:1 was equal to 7.400.Your job is to do quarterly forecasts of the HKD/USD exchange rate for the period 2002:2-2001:4, using the following model:

$S_{t+1}/S_t = 1 + .5\ (i_{d,t+1} - i_{f,t+1}) + .5\ (y_{f,t+1} - y_{d,t+1})$.

This model is a mixture of IFE and the monetary approach. You have the following data:

| Date | $GDP_{HKD}$ | $GDP_{USD}$ | Forecast ($S^F$) | Actual $S_t$ | $i_{HKD}$-$i_{USD}$ |
|---|---|---|---|---|---|
| 2001:4 | 2160 | 3150 | 7.155 | 7.155 | .0150 |
| 2002:1 | 2330 | 3220 | 7.400 | 7.400 | .0205 |
| 2002:2 | 2490 | 3370 | | 7.450 | .0180 |
| 2002:3 | 2620 | 3410 | | 7.500 | .0240 |
| 2002:4 | | | | 7.600 | |

To forecast income growth rates your firm uses the following regression model:
$y_{HKD,t} = .004 + .85\ y_{HKD,t-1} + \varepsilon_{HKD,t}$.
$y_{USD,t} = .003 + .90\ y_{USD,t-1} + \varepsilon_{USD,t}$.

To forecast interest rates (i) your firm uses a naive approach, i.e, today's interest rate is the best predictor for tomorrow's interest rate.

(A) Your job is to do quarterly forecasts of HKD/USD exchange rate for the period 2002:2-2002:4.
(B) Use the forward rate to forecast the HKD/USD exchange rate for the period 2002:2-2002:4.
(C) Use the random walk to forecast the HKD/USD exchange rate for the period 2002:2-2002:4.
(D) Compare your forecasts from (A), (B) and (C). (Hint: calculate MAE for each model)
(E) Suppose your firm is long USD 100,000,000. According to your forecasts in (A) and (B), would you hedge this exposure?

ANSWER:
(A) Use ad-hoc model to forecast $S_t$. First, you need to forecast $y_{t+1}$($y^F_{t+1}$).
$y^F_{HKD,2002:2} = .004 + .85$ x. $0.0787 = 0.0709$
$y^F_{USD,2002:2} = .003 + .90$ x. $0.0222 = 0.0230$
$S^F_{t+1} = S^F_t\ [1 + .5\ (i_{d,t} - i_{f,t}) + .5\ (y^F_{f,t+1} - y^F_{d,t+1})] = 7.4$ x $[1+.5x(.205)+.5x(.0230-.0709)] = 7.2986$
$\varepsilon_{2002:2} = S^F_{2002:2} - S_{2002:2} = 7.2986 - 7.4500 = -01514$

| Date | $y^F_{HKD}$ | $y^F_{USD}$ | Forecast ($S^F$) | Actual $S_t$ | Forecast Error |
|---|---|---|---|---|---|
| 2002:2 | .0709 | .0230 | 7.2986 | 7.450 | -0.1514 |
| 2002:3 | .0624 | .0449 | 7.3007 | 7.500 | -0.1993 |
| 2002:4 | .0484 | .0137 | 7.2616 | 7.600 | -0.3384 |

(B) Use IRP to calculate forward rates.
$S^F_{t+1} = F_{t,90} = S_t [1 + (i_{d,t} - i_{f,t})x90/360] = 7.4$ HKD/USD x [1+(.205)x90/360] = 7.4379 HKD/USD
$\varepsilon_{2002:2} = S^F_{2002:2} - S_{2002:2} = 7.4379 - 7.4500 = -0121$

| Date | Forecast ($S^F$) | Actual $S_t$ | Forecast Error |
|---|---|---|---|
| 2002:2 | 7.4379 | 7.450 | -0.0121 |
| 2002:3 | 7.4835 | 7.500 | -0.0165 |
| 2002:4 | 7.5450 | 7.600 | -0.0550 |

(C) $S^F_{t+1} = S_t = 7.400$ HKD/USD.
$\varepsilon_{2002:2} = S^F_{2002:2} - S_{2002:2} = 7.400 - 7.4500 = -0050$

| Date | Forecast ($S^F$) | Actual $S_t$ | Forecast Error |
|---|---|---|---|
| 2002:2 | 7.400 | 7.450 | -0.0500 |
| 2002:3 | 7.450 | 7.500 | -0.0500 |
| 2002:4 | 7.500 | 7.600 | -0.1000 |

(D) MAE (Ad-hoc) = 0.2297
MAE (FR) = 0.0278
MAE (RW) = 0.0667

The forward rate model is the best forecasting model, according to the mean absolute error measure.

(F) According to A, the firm should hedge since an appreciation of the HKD against the USD is forecasted. According to B, the firm should hedge since a depreciation of the HKD against the USD is forecasted.