

APPENDIX O (SELECTED QUESTIONS FROM OLD EXAMS)

Midterm 1

M1.I Short questions (14 points each)

1. (CHAPTER LN III). Bank A gives the following quotes: BOB/USD=8.0000-25. The Euro one-year interest rates for the BOB, i_{BOB} , and for the USD, i_{USD} , are $10(1/4)-(3/4)$ and $8(1/8)-(1/4)$.

A. What is a possible quotation for the 180-day year BOB/USD forward exchange rate? (BOB= Bolivian peso.)

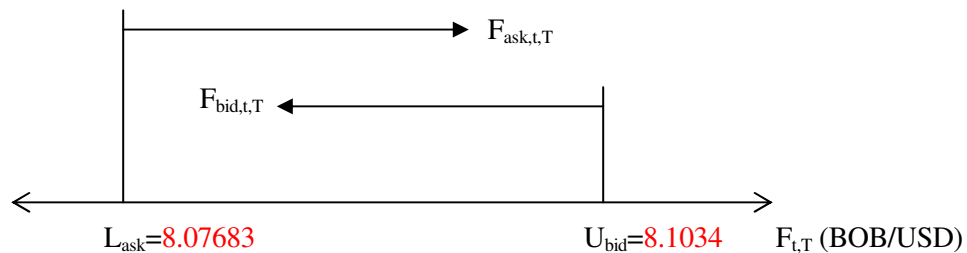
B. Chivas Bank quotes $F_{t,180}^{CB}=8.132-8.15$ BOB/USD. Is arbitrage possible? If so, design a covered arbitrage strategy to take advantage of Chivas Bank's quote.

ANSWER:

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

$$U_{bid} = S_{ask,t}[(1+i_{ask,d} \times T/360)/(1+i_{bid,f} \times T/360)] = 8.0025 \text{ BOB/USD } [1.05375/1.040625] = \mathbf{8.1034 \text{ BOB/USD.}}$$

$$L_{ask} = S_{bid,t}[(1+i_{bid,d} \times T/360)/(1+i_{ask,f} \times T/360)] = 8.0000 \text{ BOB/USD } [1.05125/1.04125] = \mathbf{8.07683 \text{ BOB/USD.}}$$



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

(B) $F_{t,180}^{CB}=8.132-8.15$ BOB/USD violates the U_{bid} bound

=> Arbitrage is possible.

Covered arbitrage strategy:

1. Borrow BOB 1 at $i_{ask,BOB}=10.75\%$ for 180 days.
2. Convert BOB 1 to USD at $S_{t,bid}=8.0025$ BOB/MXP
3. Deposit USD 9.8766 at $i_{bid,USD}=2.25\%$ for 180 days.
4. Sell the USD forward at $F_{t-180,bid}^{TB} = 8.132$ BOB/USD.

2. (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 $i_0 = 10\%$)

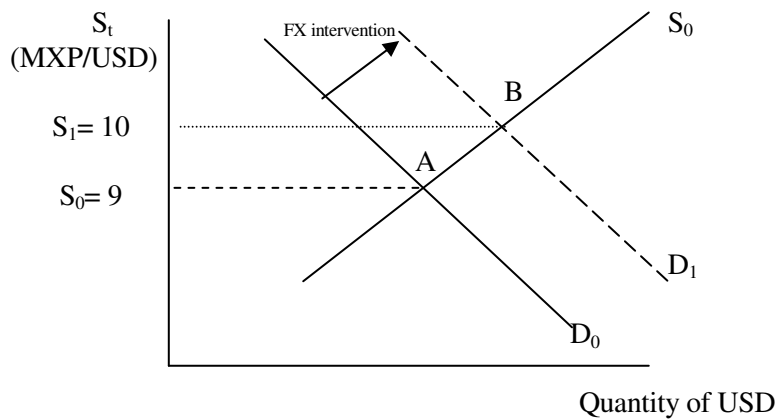
CB intervention in FX market (buy USD-sell MXP):

Point B ($S_1 = 10$ USD/MXP and $i_0 = 9\%$)

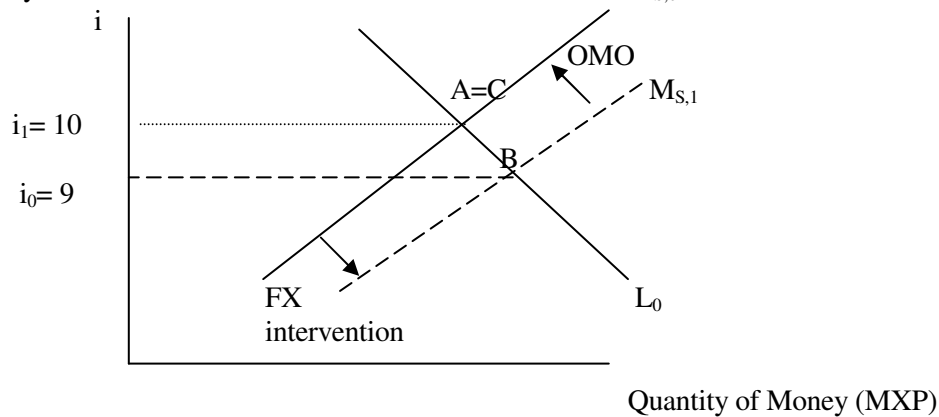
Sterilization intervention (OMO: buy MXP-sell Letes)

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 .

3. (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.

$$S_{bid,JPY/GBP} = S_{bid,JPY/USD} \times S_{bid,USD/GBP} = [(1/.6110) \text{ CHF/USD}] \times [(1.6170) \text{ USD/GBP}] = 2.6465 \text{ CHF/GBP.}$$

$$S_{ask,JPY/GBP} = S_{ask,JPY/USD} \times S_{ask,USD/GBP} = [(1/.6102) \text{ CHF/USD}] \times [(1.6190) \text{ USD/GBP}] = 2.6532 \text{ CHF/GBP.}$$

(ii) Kramerica's bid quote for the CHF/GBP is too high (overvaluation of the GBP against the CHF).

(1) Borrow CHF 1; (2) exchange it for USD .6102; (3) exchange the USD .6102 for GBP .3769; (4) sell GBP and buy CHF using $S_{bid} = 2.6575$ CHF/GBP. \Rightarrow we get CHF $2.6575 \times .3769 = \text{CHF } 1.00162$.

4. (CHAPTER LN III). Suppose you are given the following data:

$$S_t = 110 \text{ JPY/USD}$$

$$i_{JPY,1-yr} = 2\%$$

$$i_{USD,1-yr} = 6\%$$

$$F_{t,1-yr} = 108 \text{ JPY/USD.}$$

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

(B) The forward USD is overvalued ($F_{t,1-yr} = 108 > F_{t,1-yr}^{IRPT} = 105.84$). 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.

$$\text{We'll receive (in JPY)} = (\text{USD } 1/110) \times 1.06 \times 108 \text{ JPY/USD} = \text{JPY } 1.0407$$

$$\text{We'll pay (in JPY)} = \text{JPY } 1 \times 1.02 = \text{JPY } 1.02$$

$$\text{Profits} = \text{JPY } 1.0407 - \text{JPY } 1.02 = \mathbf{\text{JPY } .0207} \quad (2.07\%)$$

(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).

5.- (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 Bolivia are going to decrease, but the Bolivian economy is in a recession.

ANSWER:

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

6. (CHAPTER LN VII). Mr. Splinter, a U.S. delta hedger, wants to hedge CHF 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 CHF. The delta, δ , of this contract is (-1.2), with a gamma of 0.15. The spot rate is USD .7890 per CHF. Suppose that the PHLX option contract covers CHF 62,500 (a contract includes 62,500 CHF puts).

- a) Determine the number of number of contracts Mr. Splinter should buy.
- b) Two months later the spot rate was .7990 USD/CHF. What is the delta at this spot rate? How many contracts should Mr. Splinter buy/sell to maintain a perfect hedge?

ANSWER:

(a) CHF 10,000,000 to hedge.

$$N = \text{number of contracts} = -10,000,000 / [-1.2 \times 62,500] = 133.33 \approx 133 \text{ contracts}$$

(b) $\delta_{\text{new}} = \delta + 1 \times \gamma = -1.20 + .15 = -1.05$

$$N_{\text{new}} = -10,000,000 / [-1.05 \times 62,500] = 152.38 \approx 152 \text{ contracts.}$$

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

7. (CHAPTER LN III). It is March 1999. You read in the Economist 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) $S_t^{PPP} = \text{USD } 2.43 / \text{GBP } 1.90 = \mathbf{1.28 \text{ USD/GBP}}$.

(B) According to PPP, the GBP is overvalued (25.88%). Therefore, PPP has generated a *sell* GBP signal.

(C) $R_t = S_t P_f / P_d = [1.61 \text{ USD/GBP} \times \text{GBP } 1.90] / [\text{USD } 2.43] = \mathbf{1.2588}$ ($\Rightarrow R_t$ 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.

8. (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 $\beta_1 = .930$. The estimate for this month's (August) conditional variance is $\sigma_{AUG}^2 = 0.002$. At the end of August, the exchange rate is $S_{AUG} = .7050$ USD/CHF, while Valdano had a forecast $S_{AUG}^F = .6900$ 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:

$$S_{AUG}^F = (.6900 - .6850) / .6850 = 0.0073$$

$$s_{AUG} = (.7050 - .6850) / .6850 = 0.0292$$

$$\epsilon_{SEP} = (s_{AUG} - S_{AUG}^F) = 0.0292 - 0.0073 = 0.0219$$

$$\sigma_{SEP}^2 = 0.003 + 0.150 (0.0219)^2 + 0.930 (0.002) = 0.004932$$

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

(B) Now, Valdano 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. Briefly explain VAR estimate.

ANSWER:

$$\text{VAR (mean)} = W_0 \alpha \sigma \sqrt{\Delta t} = \text{USD } 50\text{M} \times 1.65 \times 0.07023 \times 1 = \mathbf{\text{USD } 5,793,975.00}$$

That is, the maximum one-month loss of this portfolio is **USD 5.794M** \Rightarrow In this 95% C.I., the worst case scenario for Valdano's Swiss bond position: $\text{USD } 50\text{M} - \text{USD } 5.794\text{M} = \mathbf{\text{USD } 44.206\text{M}}$.

Note: σ , the volatility, is monthly. Given that the estimated VAR (mean) is also monthly (September), $\Delta t = 1$.

9. (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.

10. (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 = $\text{EUR } 250,000 / [62,500/\text{contract}] = 4$ 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 .0170 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		

11. (CHAPTER LN VIII). It is March 3, 2011. Malone, a U.S. company, exports baseball equipment to Taiwan. Malone expects to receive a payment of TWD 50 million in August 1, 2011 (TWD=Taiwanese Dollar). Malone decides to hedge this exposure using an August forward contract, which expires on August 1, 2011. The 3-month, 4-month and 5-month Taiwanese interest rates are 3.5%, 3.7% and 4%, while the 3-month, 4-month and 5-month U.S. interest rates are 1%, 1.1% and 1.3%, respectively. On March 3, the spot exchange rate is 29.78 TWD/USD and the August 1 forward trades at 30.12 TWD/USD.

(A) Use the information given in the attached Excel output (based on 10 years of monthly changes) to calculate:

- i) The VAR associated with Malone's open position (use a 97.5% C.I.).
- ii) The worst case scenario for Malone.

(B) Calculate the amount to be received on August 1, using a forward hedge.

(C) Calculate the amount to be received on August 1, using a money market hedge.

(D) Assume the payment is made on July 11, 2011. On July 11, the spot exchange rate is 30.51 TWD/USD, the Taiwanese short-term interest rate is 3.85% and the U.S. short-term interest rate is 1.5%. Calculate the value of the August 1 forward contract on July 11, 2011. (Use IRP to calculate the forward rate.)

(E) (Continuation of question D) Calculate the hedger's profits (losses).

(F) Was the August 1 forward a perfect hedge? List all the factors that make the hedge imperfect.

• **DATA**

The information below is based on monthly percentage changes from 2001:1 to 2010:12.

1-mo % change TWD/USD	
Mean	-0.077%
Standard Error	0.1329%
Median	-0.029%
Mode	.....
Standard Deviation	1.4495%
Sample Variance	2.1
Kurtosis	0.561619
Skewness	-0.26282
Range	8.2225
Minimum	-4.365%
Maximum	3.8576%
Sum	-9.202
Count	119

ANSWER:

Note: Data is in terms of TWD/USD, but question is in terms of USD –i.e, USD=DC!

A. Transaction Exposure (TE): TWE 50 M x (1/29.78 TWD/USD) = **USD 1.67898 M**

Note: The monthly mean (TWD/USD) is -.0077 => The monthly mean (USD/TWD) is .0075

$$T = 5\text{-mo} \quad 5\text{-mo mean} = .0077 * 5 = .0385 \text{ (3.85\%)} \\ 5\text{-mo SD} = .014495 * \sqrt{5} = .0324 \text{ (3.24\%)}$$

(i) **VaR(97.5%)** = USD 1.67898 M * [1 + (.0385 - 1.96 * .0324)] = **USD 1.637 M**

(ii) The method used to approximate 5-mo mean returns cannot be used for extremes. Given the information, we need to make assumptions. Let's assume the worst case 1-mo scenario (-.038576) also applies in 5-mo. Then,

Worst case scenario = USD 1.67898 M * (1 - .038576) = **USD 1.614 M**

B. Amount to be received = TWD 50M x 1/(30.12 TWD/USD) = **USD 1.66003 M**

C. Check lectures notes. But, note that MMH is a replication of IRP. Then,

$$F_{t,150} = 1 / (29.78 \text{ TWD/USD}) \times (1 + .013 \times 5/12) / (1 + .04 \times 5/12) = .03321 \text{ USD/TWD}$$

=> Amount to be received = TWD 50M x .3321 USD/TWD = **USD 1.6605 M**

D. $F_{\text{July 11, Aug 1}} = 30.51 \text{ TWD/USD} \times (1 + .0385 \times 20/360) / (1 + .015 \times 20/360) = 30.549 \text{ TWD/USD}$

Value of forward contract = $\frac{F_{\text{July 11, Aug 1}} - F_{\text{Mar 3, Aug 1}}}{[1 + i_{\text{USD}} \times (T/360)]} = \frac{(1/30.549 - 1/30.12)}{[1 + .015 \times (20/360)]} = \text{USD } -0.00046584728$

E. Total value of Forward position (HP) = 50M * USD -0.00046584728 = USD -0.023292364

=> Total Amount to be received = TWD 50M x (1/30.51 TWD/USD) - USD 0.0233M
= **USD 1.61551 M**

F. No! Basis changed from (30.12 - 29.78) = 0.34 to (30.549 - 30.51) = 0.039

12. (CHAPTER LN VIII). Mr. Boyd is the owner of a chain of pubs in Boston that sells Australian beers. Mr. Boyd's monthly purchases of Australian beer are AUD 200,000 a month. Mr. Boyd wants to set up a USD/AUD naive hedge that would ensure his ability to make affordable purchases in Australia, should the AUD appreciate. In particular, he is very worried about a potential appreciation of the AUD against the USD in April. Today, the exchange rate is $S_t = 0.9745$ USD/AUD. Mr. Boyd wants flexibility, so he decides to use American option contracts.

- A. Specify what type of options should Mr. Boyd use (calls or puts).
- B. How many standardized PHLX contracts should Mr. Boyd buy?
- C. What is April's transaction exposure for Mr. Boyd?
- D. Using the information given in the WSJ clip (see next page), construct:
 - i) at the money/in-the-money April hedge (choose closest in-the-money option).
 - ii) out-of-the money April hedge.
 - iii) a collar.
 - iv) a zero-cost (or almost zero-cost) collar

(Specify strike prices and premium costs.) Draw a graph showing the net cash flows in April.

E. Suppose Mr. Boyd can buy AUD forward at $F_{t, \text{April}} = 0.98$ USD/AUD. Calculate the cash flows (in USD) in April for Mr. Boyd under the forward contract.

F. Based on the histogram (see DATA), which hedging strategy would you recommend to Mr. Boyd?

G. What are the pros and cons of the forward contract relative to the option alternatives?

PHILADELPHIA OPTIONS

Monday 28, 2011

		Calls		Puts	
		Vol.	Last	Vol.	Last
Australian Dollar					97.45
10,000 Australian Dollars-cents per unit.					
94	Apr	1	4.35	1	0.42
96	Mar	2	2.44	4	0.91
97	Apr	5	2.40	1	1.67
98	Mar	10	1.37	9	1.84
101	Apr	1	0.82	2	4.11

DATA

The histogram below is based on monthly percentage (USD/AUD) changes from 2000:1 to 2010:12.
(Total observations: 132)

<i>Bin</i>	<i>Frequency</i>	<i>Relative frequency</i>
-8.457%	1	0.007576
-5.849%	5	0.037879
-3.241%	22	0.166667
-0.633%	38	0.287879
1.9748%	39	0.295455
4.5829%	16	0.121212
7.1909%	5	0.037879
9.799%	4	0.030303
12.407%	1	0.007576
15.0151%	0	0
17.6232%	0	0
More	1	0.007576

(A) Mr. Boyd should use calls (right to buy AUD)

(B) Number of contracts = AUD 200,000/[10,000/contract] = 20 contracts.

(C) TE: AUD 200,000 x 0.9745 USD/AUD = USD 194,900

(D) April's Net CFs graph: Similar to the one done in class.

(i) ATM ($X_{\text{call}} = .97$ USD/AUD, $p_c = \text{USD } .024$)

Total premium cost: AUD .2 M x USD .024 per AUD = USD 4,800

Net CFs = AUD .2M x .97 USD/AUD + USD 4,800 = **USD 0.1988M** if $S_t > X = .97$
 = AUD .2M x $.S_t$ + **USD 4,800** if $S_t \leq X = .97$

(ii) OTM ($X_{\text{call}} = 1.01$ USD/AUD, $p_c = \text{USD } .0082$)

Total premium cost: AUD .2 M x USD .0082 per AUD = USD 1,640

Net CFs = AUD .2M x 1.01 USD/AUD + USD 1,640 = **USD 0.20364M** if $S_t > X = 1.01$
 = **AUD .2M x $.S_t$ + USD 1,640** if $S_t \leq X = 1.01$

(iii) Collar (buy $X_{\text{call}} = 1.01$ USD/AUD, $p_c = \text{USD } .0082$; sell $X_{\text{put}} = .95$ USD/AUD, $p_p = \text{USD } .0042$)

Total premium cost: AUD .2 M x USD .0040 per AUD = USD 800

Net CFs = AUD .2M x 1.01 USD/AUD + USD 800 = **USD 0.2028M** if $S_t > X = 1.01$
 = **AUD .2M x $.S_t$ + USD 800** if $.94 \leq S_t \leq 1.01$
 = AUD .2M x .94 USD/AUD + USD 800 = **USD 0.1888M** if $S_t < X = .94$

(iv) Zero-cost collar (buy $X_{\text{call}} = 1.01$ USD/AUD, sell 2 $X_{\text{put}} = .95$ USD/AUD, net p = USD -.0002)

Total premium cost: AUD .2 M x (USD .0002 per AUD = USD 40 (almost zero!))

Net CFs = AUD .2M x 1.01 USD/AUD = **USD 0.202M** if $S_t > X = 1.01$

$$= \text{AUD } .2\text{M} \times .S_t \quad \text{if } .94 \leq S_t \leq 1.01$$

$$= \text{AUD } .2\text{M} \times 2(.94 - S_t) \text{ USD/AUD} = \text{USD } 0.376\text{M} - 2\text{USD } .2\text{M} S_t \quad \text{if } S_t < .94$$

(E) Net CFs = AUD .2M x .98 USD/AUD = **USD 0.196M**

(F) Empirical Distribution

s(t)	S(t)	freq	Rel freq (prob)	Cum prob
-8.46%	89.208654	1	0.007576	0.007576
-5.85%	91.75015	5	0.037879	0.045455
-3.24%	94.291646	22	0.166667	0.212122
-0.63%	96.833142	38	0.287879	0.500001
1.97%	99.374443	39	0.295455	0.795456
4.58%	101.91604	16	0.121212	0.916668
7.19%	104.45753	5	0.037879	0.954547
9.80%	106.99913	4	0.030303	0.98485
12.41%	109.54062	1	0.007576	0.992426
15.02%	112.08221	0	0	0.992426
17.62%	114.62381	0	0	0.992426
More	114.624+	1	0.007576	1

Based on the empirical distribution we can evaluate hedging strategies. For example, let's consider the $X_{\text{call}} = .97$ USD/AUD. Interpolating, we get the associated probabilities of each payoff in April.

The likelihood of $S_t \leq .97$ USD/AUD is close to 52% \Rightarrow Net CF = AUD .2M x .S_t + **USD 4,800**

The likelihood of $S_t > .97$ USD/AUD is close to 48% \Rightarrow Net CF = **USD 0.1988M**

Note: 29.5%*.17/2.54 + 28.79% + 16.67% + 3.79% + .76% = 51.984%

Similarly, let's consider the collar. The associated probabilities of each payoff in April are given by:

The likelihood of $.94 \text{ USD/AUD} > S_t$ is close to 19% \Rightarrow Net CF = **USD 0.1888M**

The likelihood of $S_t \in [.94, 1.01]$ is around 68% \Rightarrow Net CF = **AUD .2M x .S_t + USD 800**

The likelihood of $S_t > 1.01$ USD/AUD is close to 13% \Rightarrow Net CF = **USD 0.2028M**

The collar hedge starts to be more appealing than the forward hedge when $S_t < .98$ USD/AUD. The associated likelihood of this event is close to 67%.

There is no dominating strategy, though the zero-cost collar does not look very reasonable. Relative to the straight collar, the zero-cost collar saves USD 760, but adds a 19% chance of doing significantly worse.

Overall, depending on risk preferences, the .97 USD/AUD call is reasonable alternative.

(G) Forward: Pros: No risk
Cons: No flexibility

13. (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 appreciating 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 <u>USD 15 M</u>	GBP 30 M <u>GBP 15 M</u>
Cost	GBP 38.25 M GBP 15 M <u>USD 5M</u>	GBP 39.21 M GBP 15 M <u>USD 5 M</u>
Gross profit	<u>GBP 17.76 M</u> GBP 20.52 M	<u>GBP 18.07 M</u> 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

⇒ 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.

14. (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	β_{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. β_{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.

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

15. (CHAPTER LN III-V). You have data on the SEK/USD and CPI indexes for Sweden and the US from January 1970 to November 1007. You run the following regression: changes in the SEK/USD exchange rate against inflation rate differentials ($I_{\text{Swed}} - I_{\text{US}}$). Below, you have the excel regression output.

1) Let $SSR(H_0) = 0.37515$. Test PPP, using individual t-tests and a joint F-test.

2) Let $S_{\text{Nov}} = 6.326$ SEK/USD, $S_{\text{Dec}} = 6.3889$ SEK/USD and $S_{\text{Jan}} = 6.3521$ SEK/USD.

Suppose that you have a forecast for the inflation rates:

$E_{\text{Nov}}[I_{\text{Swed,Dec}}] = .005$; $E_{\text{Nov}}[I_{\text{Swed,Jan}}] = .001$; $E_{\text{Nov}}[I_{\text{US,Dec}}] = .001$; $E_{\text{Nov}}[I_{\text{US,Jan}}] = .002$.

Forecast the SEK/USD exchange rate in December and January, conditional on November information.

3) Using the MSE and MAE measures, is your PPP model better than the Random Walk?

REGRESSION RESULTS

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.081063264
R Square	0.006571253
Adjusted R Square	0.00431346
Standard Error	0.02901674
Observations	442

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.002450538	0.002450538	2.910476709	0.088711535
Residual	440	0.370467333	0.000841971		
Total	441	0.372917871			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>
Intercept	0.00063769	0.001387156	0.459710491	0.645951097	-0.00208858	0.003364	-0.00209
X Variable 1	0.42083281	0.246676358	1.706011931	0.088711535	-0.06397751	0.905643	-0.06398

1)

$t\text{-stat}(\alpha) = [0.00063769 - 0] / 0.001387156 = 0.459710491 < 1.96 \Rightarrow$ cannot reject $\alpha = 0$

$t\text{-stat}(\beta) = [0.42083281 - 1] / 0.246676358 = -2.347883$ ($|t\text{-stat}| > 1.96$) \Rightarrow reject $\beta = 1$

$F\text{-test}(H_0) = ((0.37515 - 0.37046733) / 2) / (0.37046733 / (440)) = 2.780776186 < 3.02 \Rightarrow$ cannot reject H_0 (PPP true)

2) $E_t[S_{t+1}] = .0063769 + 0.42083281 E_t[(I_d - I_f)_{t+1}]$

$E_{\text{Nov}}[S_{\text{Dec}}] = .0063769 + 0.42083281 E_{\text{Nov}}[(I_{\text{Swed}} - I_{\text{US}})_{\text{Dec}}] = .0063769 + 0.42083281(.005 - .001) = 0.008060$

$$E_{\text{Nov}} [S_{\text{Dec}}] = S_{\text{Nov}} (1 + E_{\text{Nov}} [S_{\text{Dec}}]) = 6.326 \text{ SEK/USD} \times (1 + 0.008060) = 6.376988 \text{ SEK/USD}$$

$$E_{\text{Nov}} [S_{\text{Jan}}] = .0063769 + 0.42083281 E_{\text{Nov}} [(I_{\text{Swed}} - I_{\text{US}})_{\text{Jan}}] = .0063769 + 0.42083281(.001 - .002) = 0.005956$$

$$E_{\text{Nov}} [S_{\text{Jan}}] = E_{\text{Nov}} [S_{\text{Dec}}] (1 + E_{\text{Nov}} [S_{\text{Dec}}]) = 6.376988 \text{ SEK/USD} \times (1 + 0.005956) = 6.414969 \text{ SEK/USD}$$

3)

PPP MSE

$$\varepsilon_{\text{Dec}} = S_{\text{Dec}} - E_{\text{Nov}} [S_{\text{Dec}}] = 6.3889 \text{ SEK/USD} - 6.376988 \text{ SEK/USD} = 0.011912$$

$$\varepsilon_{\text{Jan}} = S_{\text{Jan}} - E_{\text{Nov}} [S_{\text{Jan}}] = 6.3521 \text{ SEK/USD} - 6.414969 \text{ SEK/USD} = -0.062869$$

$$\text{MSE}_{\text{PPP}} = [0.011912^2 + (-0.062869)^2] / 2 = 0.002047$$

$$\text{MAE}_{\text{PPP}} = [0.011912 + 0.062869] / 2 = 0.037391$$

RW MSE

$$\varepsilon_{\text{Dec}} = S_{\text{Dec}} - S_{\text{Nov}} = 6.3889 \text{ SEK/USD} - 6.326 \text{ SEK/USD} = 0.062900$$

$$\varepsilon_{\text{Jan}} = S_{\text{Jan}} - S_{\text{Dec}} = 6.3521 \text{ SEK/USD} - 6.3889 \text{ SEK/USD} = -0.036800$$

$$\text{MSE}_{\text{RW}} = [0.062900^2 + (-0.036800)^2] / 2 = 0.002655$$

$$\text{MAE}_{\text{RW}} = [0.062900 + 0.036800] / 2 = 0.049850$$

PPP seems better than the RW in terms of the MSE and MAE.

16. (CHAPTER LN REVIEW). 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 χ 's and your tests, do you have evidence that the Australian Index has autocorrelation?

$$(A) \text{SE} = 1/\sqrt{278} = .06$$

$$t_1 = .14/.06 = 2.33 > 2; \quad t_4 = .03/.06 = 0.50 < 2$$

$$t_2 = .11/.06 = 1.82 > 2; \quad t_5 = .02/.06 = 0.30 < 2$$

$$t_3 = .06/.06 = 1.00 < 2; \quad t_6 = .05/.06 = 0.82 < 2$$

⇒ Only first order autocorrelation is significantly different from zero. (We're approximating $1.96 \approx 2$.)

(B) $Q(6) = 11.34 < \chi^2_{6,0.05} = 12.58$ ⇒ 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.

M1.II Long question (30 points)

1. (CHAPTER LN V) 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:

$$\Delta S_t = S_t - S_{t-1} = a_s + b_s \Delta S_{t-1} + \varepsilon_{s,t}$$

$$\Delta F_t = F_t - F_{t-1} = a_f + b_f \Delta F_{t-1} + \varepsilon_{f,t}$$

Each element in the covariance matrix is parameterized as follows:

$$\sigma_{s,t}^2 = \alpha_{s0} + \alpha_{s1} e^{2_{s,t-1}} + \beta_{s1} \sigma_{s,t-1}^2$$

$$\sigma_{f,t}^2 = \alpha_{f0} + \alpha_{f1} e^{2_{f,t-1}} + \beta_{f1} \sigma_{f,t-1}^2$$

$$\rho = \sigma_{s,f,t} / \{\sigma_{f,t} \sigma_{s,t}\}^{1/2}$$

Suppose you estimated the above system and you got the following estimates:

$$a_s = .005; b_s = .35; a_f = .009; b_f = .45;$$

$$\alpha_{s0} = .20; \alpha_{s1} = .15; \beta_{s1} = .80; \alpha_{f0} = .30; \alpha_{f1} = .20; \beta_{f1} = .75; \rho = .75.$$

You are given the following data: spot and 30-day forward rates (USD/CHF) for the months of August, September, October, and November.

$$S_{Aug} = .952; S_{Sep} = .940; S_{Oct} = .934; S_{Nov} = .925;$$

$$F_{Aug} = .947; F_{Sep} = .940; F_{Oct} = .936; F_{Nov} = .924;$$

$$\sigma_{s,Oct}^2 = .430; \sigma_{f,Oct}^2 = .410.$$

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

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

ANSWER:

	ΔS_t	$\varepsilon_{s,t}$	$\sigma_{s,t}^2$	ΔF_t	$\varepsilon_{f,t}$	$\sigma_{f,t}^2$	$\sigma_{SF,t}$	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 \times (-.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.

Date	CPI	
	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

$$\text{Naïve model: } S_{t+1}^F = S_t^F (1+I_{\text{GER}})/(1+I_{\text{USA}})$$

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.

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

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

ANSWER

$$\text{Naïve model: } S_{t+1}^F = S_t^F (1+I_{\text{GER}}^F)/(1+I_{\text{USA}}^F)$$

Date	I_{GER}^F	I_{USA}^F	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:

$$y_{HKD,t} = .004 + .85 y_{HKD,t-1} + \epsilon_{HKD,t}$$

$$y_{USD,t} = .003 + .90 y_{USD,t-1} + \epsilon_{USD,t}$$

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 $y_{t+1}(y^F_{t+1})$.

$$y^F_{HKD,2002:2} = .004 + .85 \times 0.0787 = 0.0709$$

$$y^F_{USD,2002:2} = .003 + .90 \times 0.0222 = 0.0230$$

$$S^F_{t+1} = S^F_t [1 + .5 (i_{d,t} - i_{f,t}) + .5 (y^F_{f,t+1} - y^F_{d,t+1})] = 7.4 \times [1 + .5 \times (.205) + .5 \times (.0230 - .0709)] = 7.2986$$

$$\epsilon_{2002:2} = S^F_{2002:2} - S_{2002:2} = 7.2986 - 7.4500 = -0.1514$$

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.

$$S^F_{t+1} = F_{t,90} = S_t [1 + (i_{d,t} - i_{f,t}) \times 90/360] = 7.4 \text{ HKD/USD} \times [1 + (.205) \times 90/360] = 7.4379 \text{ HKD/USD}$$

$$\epsilon_{2002:2} = S^F_{2002:2} - S_{2002:2} = 7.4379 - 7.4500 = -0.0121$$

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) $S^F_{t+1} = S_t = 7.400 \text{ HKD/USD}$.

$$\epsilon_{2002:2} = S^F_{2002:2} - S_{2002:2} = 7.400 - 7.4500 = -0.0500$$

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 not hedge since a depreciation of the HKD against the USD is forecasted.