International Financial Management | FINA 4836
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Final Exam: Solutions

I. Problems (10 points each).

1. Stelman Inc., a U.S. firm, plans to invest in a new project that will be located either in Venezuela or in Colombia. Assume the U.S. risk free rate is 3%. You have the following data on expected returns, volatility, correlations, and weights for each project:

	Stelman	Venezuela	Colombia
Expected return	13%	23%	33%
Standard deviation	15%	30%	50%
Correlation with existing Stelman's portfolio	1.00	.32	.12
Weight on overall portfolio	-	.25	.10
Beta	.90	1.10	1.40

A. Based on the Sharpe Ratio, which project would you recommend to Stelman?
B. Based on the Treynor Ratio, which project would you recommend to Stelman?
C. Is Stelman, under both criteria, better off without adding any project?

ANSWER:

A.

- Venezuela

$E[r_{BOYD+Ven}] = w_{EP}*E[r_{MAC}] + (1- w_{EP})*E[r_{Ven}]$
$= .75 * .13 + .25 * .23 = \mathbf{0.155}$

$\sigma^2_{MAC+Ven} = w_{MAC}^2(\sigma_{MAC}^2) + w_{Ven}^2(\sigma_{Ven}^2) + 2\, w_{MAC}\, w_{Ven}\, \rho_{MAC,Ven}\, \sigma_{MAC}\, \sigma_{Ven}$
$= (.75)^2*(.15)^2 + (.25)^2*(.30)^2 + 2*.75*.25*0.15*.30*.32 = 0023681$
$\Rightarrow \sigma^2_{MAC+H} = \mathbf{.153887}$

$SR_{MAC+Ven} = E[r_{MAC+Ven} - r_r]/ \sigma_{MAC+Ven} = (\mathbf{0.155} - 0.03)/\mathbf{.153887} = \mathbf{0.81228}$

- Colombia

$E[r_{MAC+Col}] = 0.15$
$\sigma_{MAC+Col} = 0.1495$
$SR_{MAC+Col} = (0.15 - 0.03)/0.1495 = \mathbf{0.80277}$ $< SR_{MAC+Ven}$ $\Rightarrow$ Venezuela!

B.

- $\beta_{MAC+Ven} = w_{MAC} *\beta_{MAC} + (1- w_{Ven})*\beta_{Ven}$
$= .75*.90 + .25*1.10 = 0.95$

$TR_{MAC+Ven} = E[r_{MAC+Ven} - r_r]/ \beta_{MAC+Ven} = (\mathbf{0.155} - 0.03)/\mathbf{0.95} = \mathbf{0.1316}$

- $\beta_{MAC+Col} = 0.95$

$TR_{MAC+Col} = (0.15 - 0.03)/.95 = \mathbf{0.1263}$ **(1pt)** $< TR_{MAC+Ven}$ $\Rightarrow$ Venezuela!

C. $SR_{MAC} = (0.13 - 0.03)/.15 = \mathbf{.6667} < SR_{MAC+Ven}$ & $SR_{MAC+Col}$
$TR_{MAC} = (0.13 - 0.03)/.90 = \mathbf{.1111} < TR_{MAC+Ven}$ & $TR_{MAC+Col}$

⇒ No! MAC is not better off without adding any project.

2. You work for Mecano Industries, U.S. MNC. Mecano gives you the following projections for next year:

Currency	Total inflows	Total outflows	Current Exchange rate
NZD	NZD 100,000	NZD 40,000	.80 USD/NZD
SVC (Salvador Colon)	SVC 200,000	SVC 550,000	.09 USD/SVC

a.- What is Mecano's net transaction exposure (NTE)?

TE^{NZD} (in USD) = NZD 60,000 * .80 USD/NZD = **USD 48,000**
TE^{SVC} (in USD) = (SVC 350,000) * .09 USD/SVC = **USD -31,500**

NTE (in USD) = NZD 60,000 * .80 USD/NZD + (SVC 350,000) * .09 USD/SVC = **USD 16,500**

b.- Suppose the NZD and the SVC have a perfect positive correlation. The USD/NZD exchange rate increases to .88 USD/NZD. What is the change in net transaction exposure for Mecano Industries?

$e_{f,t}^{NZD}$ = (.88 - .88)/.88 = .10 (10%) ⇒ $e_{f,t}^{SVC}$ = 10% ⇒ S_t = .099 USD/SVC

NTE (in USD) = NZD 60,000 * .88 USD/NZD + (SVC 350,000) * .099 USD/SVC = **USD 18,150**

⇒ **Change = USD 1,650** (or **10%**)

c.- Go back to part (a). Assume that changes in exchange rates (e_f) follow a normal distribution. The NZD's mean and standard deviation are 0 and .15, respectively; while the SVC's mean and standard deviation are -0.1 and .25, respectively. Determine the VaR (Value-at-Risk) for each currency using a 97.5% confidence level.

- NZD

$e_{f,t} \in [0 \pm 1.96 * .15] = [-0.294; 0.294]$
⇒ TE ∈ [**USD 48,000** * (1 - 0.294); **USD 48,000** * (1 + 0.294)] = [**USD 33,888**; USD 62112]
⇒ VaR(97.5%) = **USD 33,888**

- SVC

$e_{f,t} \in [-0.10 \pm 1.96 * .25] = [-0.59; 0.39]$
⇒ TE ∈ [**(USD -31,500)** * (1 - 0.59); **(USD -31,500)** * (1 + 0.39)] = [(USD -12,915), **(USD -43,785)**]
⇒ VaR(97.5%) = **USD -43,785**

3. It is June 6, 2023. Troll Oil Inc., a U.S. energy company, has a NZD 150 million receivable due in mid-March 2024. Troll Oil decides to use options to reduce FX risk. Available options with March maturity are:

X	Calls	Puts
0.80 USD/NZD	5.29	0.44
0.85 USD/NZD	2.13	1.98
0.90 USD/NZD	0.52	5.36,

where X represents the strike price and premiums are expressed in USD cents –i.e., 1.98 equals to USD 0.0198.
The exchange rate is 0.85 USD/NZD.

A. Calculate the premium cost and use a graph to describe the *net* cash flows, including premium paid, (in USD) in March for Troll Oil under the following choices:
i) at-the-money option
ii) out-of-the money option
iii) a collar, using out-of-the-money options

B. Suppose Troll Oil can sell a NZD forward at $F_{t,March}$ = 0.87 USD/NZD.
i) Calculate the cash flows (in USD) in March for Troll Oil under the forward contract.
ii) What are the pros and cons of the forward contract relative to the option alternative?

(A)

i) ■ ATM (X_c = 0.85 USD/NZD; p_c = USD 0.0198/NZD)
Total premium paid = NZD 150M * USD 0.0198/NZD = USD 2.97M
Worst case scenario = Net Floor = NZD 150M * 0.85 USD/NZD - USD 2.97M = **USD 124.53M**

GRAPH: Check notes

ii) ■ OTM (X_c = 0.80 USD/NZD; p_c = USD 0.0044/NZD)
Total premium paid = NZD 150M * USD 0.0044/NZD = USD 0.66M
Worst case scenario = Net Floor = NZD 150M * 0.80 USD/NZD - USD 0.66M = **USD 119.34M**

GRAPH: Check notes

iii) ■ Collar: Long X_c = 0.80 USD/NZD; p_c = USD 0.0044/NZD
Short X_p = 0.90 USD/NZD; p_p = USD 0.0052/NZD
Net premium = USD -0.0008/NZD
Total premium paid = NZD 900,000 * (USD -0.0008)/NZD = USD -120,000
Worst case scenario = Net Floor = NZD 150M * 0.80 USD/NZD + USD 0.12M = **USD 120.12M**
Best case scenario = Net Cap = NZD 150M * 0.90 USD/NZD + USD 0.12M = **USD 135.12M**

GRAPH: Check notes

(B)

i) Forward CFs: USD 150M * 0.87 USD/NZD = **USD 130.5M**
ii) Pros: Complete certainty (receive USD 130.50M)
Cons: No upside.

4.- Assume that you work for a company that believes in the following model to forecast exchange rates:

$$e_{f,t} = \alpha + ß\ INT_t + \delta\ GDP_t + \varepsilon_t, \qquad (1)$$

where $e_{f,t}$ is the percentage change in the USD/GBP exchange rate in period t, INT_t is the interest rate differential between the U.S. and the U.K., GDP_t represents the income growth rate differentials between the U.S. and the U.K. and ε_t is an error term.

Assume that you have quarterly data for the above variables from 1978:I to 2023:I. You estimated the regression using excel. You got the following output:

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept (α)	-0.0161	0.00673	-2.39065	0.015569
$INT_t = i_d - i_f$	-1.44382	0.22118	-2.00450	0.034245
$GDP_t = y_d - y_f$	-1.2350	0.55438	-2.227702	0.010758

a) Using the regression results, use two t-tests to test the implications of IFE (ß=1 and α =0). Do both tests at the 5% significance level.

b) Assume $S_{t=2023:I}$ = 1.20 USD/GBP. Suppose you are given forecasts for 2023:II: $E[(i_{US}-i_{UK})]_{2023:II}$=.01 and $E[(y_{US}-y_{UK})]_{2023:II}$=0.02. Forecast $S_{t=2023:II}$.

c) Using the Random Walk model forecast $S_{t=2023:II}$. Assume $S_{t=2023:II}$.= 1.21 USD/GBP. Which forecast, the model (1) or the Random Walk, has a smaller error?

ANSWER:

a) t(α=0): -0.0161/0.00673 = **-2.39065** (|-2.39| > **1.96**) ⇒ reject H_0

t(β=1): (-1.44382 - 1)/ 0.22118 = **-11.04901** (|-11.05| > **1.96**) ⇒ reject H_0

b) $E_{2023:I}[e_{f,t=2023:II}]$ = -0.0161 - 1.44382 * $E_{2023:I}[(i_{US} - i_{UK})_{t=2023:II}]$ -1.2350 * $E_{2023:I}[(y_{US}-y_{UK})_{2023:II}]$ =

= -0.0161 - 1.44382 * .01 - 1.2350 * .02 = **-0.05524**

$E_{2023:I}[S_{t=2023:II}]$ = 1.20 USD/GBP * (1 - **0.05524**) = **1.133712 USD/GBP**

c) $E_{2023:I}[S_{t=2023:II}]$ = **1.20 USD**

Since $S_{t=2023:II}$.= 1.21 USD/GBP, RW has smaller error.

5. Mr. Nightman is a U.S. arbitrageur. The one-year interest rate offered in the U.S. is 5%, while the one-year interest rate offered in Australia is 3.5%. The spot rate is 1.32 AUD/USD. Dee Bank offers Mr. Nightman a one-year forward contract at 1.35 AUD/USD.

(1) Determine the arbitrage-free one-year forward contract exchange rate.

$F^{IRP}_{t,1\text{-yr}}$ = 1.32 AUD/USD * (1+.035)/(1+.05) = **1.301145 AUD/USD**

(2) Can Mr. Nightman make a risk-free profit? If yes, describe a covered arbitrage strategy.

$F^{IRP}_{t,1\text{-yr}} \neq F^{DB}_{t,1\text{-yr}}$ = **1.35 AUD/USD** ⇒ Yes, arbitrage is possible.

Covered arbitrage strategy (Key: DB undervalues AUD forward at **1.35 AUD/USD**).

All steps simultaneously done:
1) Borrow AUD 1 at 3.5% for 1 year. ⇒ In 1-yr, repay: **AUD 1.035**
2) Convert to USD at S_t = 1.32 AUD/USD ⇒ Get USD 0.7576
3) Deposit USD 0.7576 at 5% for 1 year. ⇒ In 1-yr, get USD 0.7576 * (1.05) = **USD 0.7955**
4) Sell USD/Buy AUD forward at $F_{t,1\text{-yr}}$ = **1.35 AUD/USD**
⇒ In 1-yr, **USD 0.7955** * 1.35 **AUD/USD** = **AUD 1.0749**

(3) Determine Mr. Nightman's profits.

π = **AUD 1.0749** – **AUD 1.035** = **AUD .0399**. (or **3.99%** per AUD borrowed)

(4) Calculate the forward premium and compare it to the interest rate differential. Based on these numbers, what kind of capital flows will the Australian economy experience?

$p = (F_{t,T} - S_t)/S_t * (360/T)$ = (**1.35** - 1.32)/1.32 * 1 = 0.02727
$i_d - i_f$ = .035 - .05 = -.015
⇒ $p > i_d - i_f$ ⇒ capital ouflows from the domestic economy (Australia)
⇒ *capital outflows* from Australia to USA.

6. Stelman Corporation bought equipment from a Mexican firm. Stelman Corp. will pay MXN 20,000,000 in 90 days (MXN=Mexican peso). It considers using (1) a forward hedge, (2) an option hedge, (3) a money market hedge, or (4) no hedge. Its analysts provide you with the following data:

- Spot rate: .168 USD/MXN
- 90-day forward rate: .17 USD/MXN.
- 90-day (annualized) interest rates are as follows:
  deposit rate: 10% in Mexico, and 5% in the U.S.
  borrowing rate: 11% in Mexico, and 5.25% in the U.S.
- A call option on MXN that expires in 90 days has an exercise price of USD .172 and a premium of USD .004.
- A put option on MXN that expires in 90 days has an exercise price of USD .165 and a premium of USD .002.
- Stelman Corporation forecasted the future spot rate in 90 days as follows:

Possible Outcomes	Probability
.16 USD/MXN	30%
.17 USD/MXN	50%
.18 USD/MXN	20%

A. Calculate the expected amount to pay in 90 days under each hedging strategy.
B. Which strategy would you recommend to Stelman Corporation? Do preferences matter? Be explicit.

1) Forward hedge (buy MXN forward at $F_{t,90}$ = .17 USD/MXN).
Firm will pay MXN 20 M * (.17 USD/MXN) = **USD 3.4 M** in 90 days.

2) Money market hedge (borrow USD at 1.25%, convert to MXN, deposit in Mexico at 6%)

Amount to deposit	MXN 20 M /(1 + .10 * 90/360) = MXN 19.5122 M
Deposit in USD	MXN 19.5122 M * .168 USD/MXN = USD 3,278,050 (amount to borrow)
Firm will pay	USD 3,278,050 * (1 + .0525 * 90/360) = **USD 3,321,074** (*dominates FH*)

3) Option (buy call option, X_c = .172 USD/MXN, p_c = USD .004)
Total premium (including opportunity cost) = MXN 20M * USD .004/MXN (1+.10*90/360) = USD 82,000

Possible Outcomes	Probability	Exercise?	Net Amount to pay
.16 USD/MXN	30%	No	MXN 3.20 M + USD 0.082 = USD 3.282
.17 USD/ MXN	50%	No	MXN 3.40 M + USD 0.082 = USD 3.482
.18 USD/MXN	20%	Yes	MXN 3.44 M + USD 0.082 = USD 3.522

E[Amount to pay] = **USD 3.4301 M**

4) No Hedge (do nothing; just wait)

Possible Outcomes	Probability	Amount to pay
.16 USD/MXN	30%	MXN 3.20 M
.17 USD/ MXN	50%	MXN 3.40 M
.18 USD/MXN	20%	MXN 3.60 M

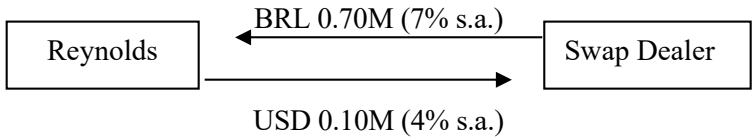
E[Amount to pay] = **USD 3.38 M**

Recommendation: **MM Hedge**; but *preferences matter*. A risk taker manager may not like the 30% chance of getting a lower outcome with the NH than with the MMH.

7. The annual Brazilian real (BRL) interest rate is 8% (s.a.), while the annual USD interest rate is 5% (s.a.). Reynolds Co., a U.S. firm, entered into a currency swap with a swap dealer, where Reynolds pays 4% semi-annually in USD and receives 7% semi-annually in BRL. The principals in the two currencies are USD 5 million and BRL 20 million. The swap will last for another two years. The exchange rate is 0.25 USD/BRL. For simplicity, assume the term structure in Brazil and in the U.S. is flat and that principals are not exchanged.

A. Draw a diagram showing the semi-annual swap cash flows (in BRL and in USD).
B. Value this currency swap for Reynolds Co.
C. Suppose the USD interest rates increase. Without doing any calculations, does the value of the swap increase or decrease for Reynolds Co.?
D. A year from now (2 payments left), the exchange rate is 0.20 USD/BRL. Assuming that nothing else has changed, calculate the new value of the swap for Reynolds Co.

ANSWER:
A.



B. T = 2 years (4 payments)
V_{Paddys} = NPV(BRL receivables) * S_t - NPV(USD payables) =
= [BRL .70M/(1.04) + BRL .70M/$(1.04)^2$ + BRL .70M/$(1.04)^3$ + BRL.70M/$(1.04)^4$] *.25 USD/BRL
- [USD .10M/(1.025) + USD .10M/$(1.025)^2$ + USD .10M/$(1.025)^3$ + USD .10M/$(1.025)^4$] =
= **USD -376,198 M**

C. i_{USD} ↑ ⇒ NPV(USD payables) ↓ ⇒ V_{Paddys} ↑

D. T = 1 years (2 payments)
Going to value each payment in terms of future dollars, using forward rate:
$F_{t,6\text{-mo}}$ = 0.20 USD/BRL * (1+.05/2)/(1+.08/2) = **0.19712 USD/BRL**
$F_{t,12\text{-mo}}$ = 0.20 USD/BRL * $(1+.05/2)^2/(1+.08/2)^2$ = **0.19427 USD/BRL**

Value of CF in 6-mo = [BRL 0.70M * **0.19712 USD/BRL** - USD .10M]/(1 + .05/2) = USD 0.03705 M
Value of CF in 12-mo = [BRL 0.70M * **0.19427 USD/BRL** - USD .10M]/$(1 + .05/2)^2$ = USD 0.03426 M

V_{SLB} = [USD 0.03705 M + USD 0.03426 M] = **USD 0.07131 M**

8. Kelly Corporation, a U.S.-based MNC, has a subsidiary in Argentina that produces and sells organic agricultural products. The subsidiary believes it could also enter into the wheat market. The following data has been compiled for the wheat project -in pesos (SVC):

- Initial outlay: SVC 300 million
- Life of the project: 3 years
- Sales per year: SVC 250 million
- Cost of Goods per year: SVC 120 million
- Salvage value: SVC 100 million
- The maximum annual depreciation allowed is 10% of initial outlay.
- Exchange rate: 10 SVC/USD
- Forecasted exchange rates: $E[S_{t+1}]$=12 SVC/USD; $E[S_{t+2}]$=15 SVC/USD; $E[S_{t+3}]$= 20 SVC/USD.
- The Argentine government imposes a 10% tax on profits.
- The Argentine government also imposes a 20% withholding tax on any funds remitted to the U.S. parent house (including salvage value).
- The U.S. government imposes a 10% tax on remitted funds, excluding salvage value. No tax credit is allowed.
- The required rate of return is 15%.

i.- What is the evaluation of the project for Kelly Corporation's Argentine subsidiary?
ii.- What is the evaluation of the project for Kelly Corporation?
iii.- Would you recommend the project to Kelly Corporation?

i) (in millions)

	Year 1	Year 2	Year 3	SV
Revenue	SVC 250	SVC 250	SVC 250	
COGS	SVC 120	SVC 120	SVC 120	
Gross Profit	SVC 130	SVC 130	SVC 130	
Depreciation	SVC 30	SVC 30	SVC 30	
Earnings Before Taxes	**SVC 100**	**SVC 100**	**SVC 100**	
Tax (10%)	SVC 10	SVC 10	SVC 10	
Earnings After Taxes	SVC 90	SVC 90	SVC 90	
Free Cash Flows (EAF + Dep)	**SVC 120**	**SVC 120**	**SVC 120**	**SVC 100**

NPV (discount rate=12%) = **SVC 39.7386 M** > 0 ⇒ YES!

ii) (in millions)

Free Cash Flows (EAF + Dep)	**SVC 120**	**SVC 120**	**SVC 120**	**SVC 100**
withholding tax (20%)	SVC 24	SVC 24	SVC 24	SVC 20
Net CFs to be remitted	SVC 96	SVC 96	SVC 96	SVC 80
U.S. Local tax (10%)	SVC 9.6	SVC 9.6	SVC 9.6	
Net CFs to be remitted (in SVC)	SVC 85.4	SVC 85.4	SVC 85.4	SVC 80
Exchange Rate of SVC	USD 1/12	USD 1/15	USD 1/20	USD 1/20
CFs to be remitted (in USD)	**USD 7.2**	**USD 5.76**	**USD 4.32**	**USD 4**

NPV (discount rate=12%) = **USD -13.91 M** < 0 ⇒ No!

iii) The NPV is negative ⇒ Kelly should say no to project.

II. CASE (25 points)
These questions are based on the FX Empire article. Briefly answer the following questions:
Note: No points will be given by simply writing lines from the article.

1) According to analyst, strong incoming flows of foreign capital are boosting the Mexican peso. Show with a graph the effect of inflows of foreign capital on the MXN/USD exchange rate. (No graph, no points). Briefly explain.

More USD capital inflows ⇒ More USD supply. S_t (MXN/USD) ↓

Graph: Check Notes.

2) During 2023, interest rates in Mexico have been increasing relative to U.S. interest rates. What is the effect of this higher interest rate differential on the MXN/USD? Draw a graph (No graph, no points). Briefly explain.

$(i_{MXN} - i_{USD})$ ↑ ⇒ More US residents invest in Mexico (Supply of USD ↑).
Less Mexican residents invest in U.S. (Demand of USD ↓).
⇒ S_t (MXN/USD) ↓

Graph: Check Notes.

3) According to the four largest banks in Mexico the USD will appreciate over 18 MXN/USD at the close of 2023.Given what you learned in class, what do you think of this prediction? Provide a forecast for the MXN/USD exchange rate at the close of 2023.

Random Walk best forecasting model. Forecasts are nonsense. Best forecast: Today's S_t = 17.01 MXN/USD.

4) Assume the current U.S. T-bill interest rate is 5%. Using IFE, forecast next year's MXN/USD exchange rate.

Interest rates: i_{MXN} = 11.25% & i_{USD} = 5%.

$e_{f,t} \approx (i_{MXN} - i_{USD})$ = 11.25% – 5%. = **6.25%**
=> $S_{t+1} \approx S_t * (1 + i_{MXN} - i_{USD})$ = [17.01 MXN/USD] * (1 + **.0625**) = 18.07313 MXN/USD

5) Suppose that Banxico, the Mexican Central Bank, decides to intervene to stop the appreciation of the MXN against the USD. Draw two graphs showing the effect of Banxico's intervention on the FX market and on Mexican money markets. (No graphs, no points.)

FX Intervention: Banxico buys USD (pays with MXN)

Effect on FX Mkt: Demand for USD ↑ ⇒ S_t (MXN/USD) ↑
Effect on Mexican Money Mkt: Supply of MXN ↑ ⇒ i_{MXN} ↓

Graphs: Check Notes.