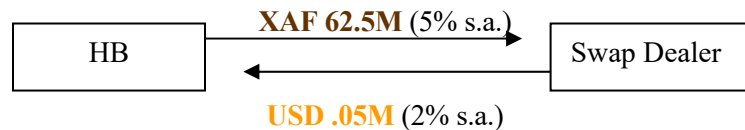**Midterm 2 - Solutions**

Questions – Justify all your answers.

1.
A.

B. T = 1 years (2 payments)
$F_{t,6\text{-mo}}$ = 0.002 USD/XAF * (1+.01/2)/(1+.04/2) = **0.001971 USD/XAF**
$F_{t,12\text{-mo}}$ = 0.002 USD/XAF * $(1+.01/2)^2$ /$(1+.04/2)^2$ = **0.001942 USD/XAF**

Value of CF in 6-mo   = [**USD .05M – XAF 62.50M** * **0.001971 USD/XAF**]/(1 + .01/2)
                           = **USD -0.0728M**
Value of CF in 12-mo   = [**USD .05M – XAF 62.550M** * **0.001942 USD/XAF**]/$(1 + .01/2)^2$
                           = **USD -0.0706M**
Value of CF in 12-mo   = [USD 5M – XAF 2500M * **0.001942 USD/XAF**]/$(1 + .01/2)^2$
                           = **USD 0.1445M**

V_{HB} (in M) = **USD -0.0728M** + **USD -0.0706M** + **USD 0.1445M** = **USD -0.0011M**

C. Now, the coupon in XAF is 7% (s.a.) => payment XAF 87.5M.

Then,
V_{HB}   = NPV(USD receivables) - NPV(XAF payables) x S_t =
       = [USD .05M/(1+.01/2) + USD 5.05M/$(1+.01/2)^2$] –
       – [USD 87.5M/(1+.04/2) + XAF 2587.5M/$(1+.04/2)^2$] *.002 USD/XAF
       = **USD -0.09599M**

2. Version A

	USD r_t	SD	B_{world}	RVOL	Rank
DENMARK	0.12302	0.19611	**0.97842**	0.12574	1
RUSSIA	0.11909	0.33654	**1.42204**	0.08374	2
SOUTH KOREA	0.06618	0.15387	**0.79396**	0.08336	3
SWITZERLAND	0.10431	0.27816	**1.27061**	0.08210	4
MEXICO	0.03783	0.19005	**0.47196**	0.08015	5
USA	0.08122	0.23863	**1.12299**	0.07233	6
TAIWAN	0.06619	0.15166	**0.93038**	0.07115	7
SOUTH AFRICA	0.06499	0.24172	**0.96082**	0.06764	8
CANADA	0.07072	0.20027	**1.08051**	0.06545	9
BRAZIL	0.07348	0.25394	**1.13001**	0.06503	10
MOROCCO	0.06925	0.21555	**1.14581**	0.06044	11
AUSTRALIA	0.08939	0.35411	**1.51304**	0.05908	12
GERMANY	0.04328	0.23134	**1.31480**	0.03292	13
CHILE	0.01077	0.21868	**1.16631**	0.00923	14
EM-Asia	0.0632	0.21690	**1.07970**	**0.04469**	
R_f	0.01498				
SD_World (σm)	**0.1550**				

Equal Weighted Return	0.07284	
Equal Weighted Beta	**1.09297**	
Equal Weighted RVOL	**0.05294**	

b.

	$\sigma^2_{\varepsilon i}$	$(r_i-r_f)(\beta_i/\sigma^2_{\varepsilon \iota})$	$\sigma^2_m\beta_i^2/\sigma^2_{\varepsilon \iota}$	C_i	Included?	Z_i	ω_i
DENMARK	0.0155	6.8376	1.4876	**0.06604**	1	2.7363	**0.9209**
RUSSIA	0.0647	2.2891	0.7512	**0.06770**	1	0.1324	**0.0446**
SOUTH KOREA	0.0386	2.9416	1.0052	**0.06832**	1	0.1026	**0.0345**
SWITZERLAND	0.0085	4.7649	1.7750	**0.06719**	0	0.0000	**0.0000**
MEXICO	0.0266	2.7920	1.1371	**0.06589**	0	0.0000	**0.0000**
USA	0.0022	21.6193	9.4355	**0.05972**	0	0.0000	**0.0000**
TAIWAN	0.0363	1.3257	0.6118	**0.05945**	0	0.0000	**0.0000**
SOUTH AFRICA	0.0338	1.9554	0.9074	**0.05907**	0	0.0000	**0.0000**
CANADA	0.0121	4.9940	2.3258	**0.05821**	0	0.0000	**0.0000**
BRAZIL	0.0704	1.5993	0.7813	**0.05788**	0	0.0000	**0.0000**
MOROCCO	0.0308	0.3505	0.1739	**0.05780**	0	0.0000	**0.0000**
AUSTRALIA	0.0149	4.1686	2.1144	**0.05687**	0	0.0000	**0.0000**
GERMANY	0.0120	3.1039	3.4645	**0.05233**	0	0.0000	**0.0000**
CHILE	0.0151	-0.3241	2.1586	**0.04818**	0	0.0000	**0.0000**

Totals	0.0776	

R_f	0.014978
SD_World (sm)	**0.1550**
C*	**0.0672**

Optimal Portfolio
Beta	**1.0083**
RVOL	**0.1063**

c. It will have no effect. EM-ASIA's RVOL, 0.0447, is lower than the cut-off rate, C*. It would've not entered into OP.

d.

	ω_i
DENMARK	**0.4605**
RUSSIA	**0.0223**
SOUTH KOREA	**0.0173**
SWITZERLAND	**0.0000**
MEXICO	**0.0000**
USA	**0.2500**
TAIWAN	**0.0000**
SOUTH AFRICA	**0.0000**
CANADA	**0.0000**
BRAZIL	**0.0000**
MOROCCO	**0.0000**
AUSTRALIA	**0.0000**
GERMANY	**0.0000**
CHILE	**0.0000**
DENMARK	**0.2500**
Totals	1

Constrained Portfolio
Beta	**1.0067**
RVOL	**0.0780**

No. It cannot improve, since EM-Asia and US are not in the OP.

Caps and floors can protect a portfolio, especially when future returns and variances are not well represented by their past history.

3.

a) $k_{m=Chile}$ (in USD) = **0.0613**

$E[s_t] = E[I_{CH}] - E[I_{US}] \Rightarrow k_{m=Chile}$ (in CLP) = **0.0613** + **0.02** = **0.0813**

$k_c = D/(E+D) \, k_d \, (1-t) + E/(E+D) \, k_e = .70*.09*(.75) + .30*[.07 + 1.3*(\textbf{.0813} - .07)] = 0.07266$

b) $(r_M - r_f)_{Chile}$ (in USD) = $(r_M - r_f)_{US} * \sigma_{Chile}/ \sigma_{US} = (.08895 - .0446) * .197/.1523 = \textbf{0.05736671}$

$(r_M - r_f)_{Chile}$ (in CLP) = $(r_M - r_f)_{Chile}$ (in USD) + $(E[I_{Chile}] - E[I_{US}])$ = **0.05736671** + **.02** = **0.0774**

$k_c = .70 * .09 * (.75) + .30 * [.07 + 1.3 * (\textbf{0.0774})] = \textbf{0.0984}$

c)

$CER_{Chile} \qquad = (r_M - r_f)_{Chile}$ (in USD) - $(r_M - r_f)_{US}$ = **0.05736671** - $(.08895 - .0446)$

$\qquad\qquad\qquad = \textbf{0.01302}$

$\lambda_{JRV-Chile} = .25/.75 = \textbf{0.3333}$

$k_{e,Chile}$ (in USD) = $r_{f,US} + \beta \, (r_M - r_f)_{US} + \lambda_{JRV-Chile} \, CER_{Chile}$

$\qquad\qquad\qquad = .0446 + 1.3 * (.08895 - .0446) + \textbf{0.3333} * (\textbf{0.01302}) = \textbf{0.1066}$

$k_{e,Chile}$ (in CLP) = $k_{e,Chile}$ (in USD) + $(E[I_{Chile}] - E[I_{US}])$ = **0.1066** + **.01** = **0.1166**

$k_c = .70 * .09 * (.75) + .30 * (\textbf{0.1166}) = \textbf{0.08223}$

d)

NPV (in CLP M) = $-2,000 + .75 * CF_1 * [1.04/(\textbf{0.08223} - .04)] = 0 \Rightarrow CF_1 = $ CLP 108.282M

e) Country risk ↑ => NPV↓.

4. Following usual market practices:

i.   Write down the following generic terms for the issue:

Amount of equity raised:	**CAD 500M** * 1 * **5 DKK/CAD = DKK 2,500M**
Number of shares created on exercise:	**DKK 2,500M/DKK 170 = 14,705,882.35**
Number of warrants per bond:	**14,705,882.35*** 1/50,000 = **294.1176**
Value of the warrants attached to each bond of CAD 10,000:	**294.1176** * **DKK 18.529 = DKK 5,449.706**
	= **CAD 1089.941** (=**DKK 5,449.706**/ **5 DKK/CAD**)
	(or **10.90%** of nominal amount)

ii.   Calculate the information required below to complete the pro forma of Koeman's issue:

1. The bond

Amount:	**CAD 500M**
Maturity:	5-year
Coupon:	3.20% (= **2.10%** + **1.10%**)
Issue price:	**100**
Yield:	**3.20%**

2. The warrants

Price of warrant:	**DKK 18.529** (= 1.**3002** * 145 – **170**)
Exercise premium:	**10.90** (= **18.529**/**170**)
Global premium:	**30.02** (=[180+8.53)/145])
Issue price (bond and warrants):	100 + **10.90** = 110.90
Cost of funds (based on total issue price less commissions):	**1.347%**