

**Practice Second Midterm Exam**

1. Mac 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:

	Mac	Venezuela	Colombia
Expected return	<b>13%</b>	20%	<b>35%</b>
Standard deviation	<b>15%</b>	25%	<b>50%</b>
Correlation with existing Mac's portfolio	1.00	.35	<b>.12</b>
Weight on overall portfolio	-	.25	<b>.10</b>
Beta	<b>.90</b>	1.10	<b>1.40</b>

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

**A.**

- Colombia

$$E[r_{MAC+Col}] = w_{MAC} * E[r_{MAC}] + (1 - w_{MAC}) * E[r_{Col}] \quad \text{(Expected Return of expanded portfolio)}$$

$$= .90 * 0.13 + .10 * .35 = 0.152$$

$$\sigma^2_{MAC+Col} = w_{MAC}^2(\sigma_{MAC}^2) + w_{Col}^2(\sigma_{Col}^2) + 2 w_{MAC} w_{Col} \rho_{MAC,Col} \sigma_{MAC} \sigma_{Col}$$

$$= (.90)^2 * (.15)^2 + (.10)^2 * (.50)^2 + 2 * .90 * .10 * 0.12 * .15 * .50 = 0.022345$$

$$\Rightarrow \sigma_{MAC+Col} = \text{sqrt}(0.022345) = .14948$$

$$SR_{MAC+Col} = E[r_{MAC+Col} - r_f] / \sigma_{MAC+Col} = (.152 - .03) / .14948 = 0.8162$$

- Venezuela

$$E[r_{MAC+Ven}] = .75 * 0.13 + .25 * .20 = .1475 \quad \text{(Expected Return of expanded portfolio)}$$

$$\sigma_{MAC+Ven} = 0.2148$$

$$SR_{MAC+Ven} = (.1475 - .03) / 0.2148 = 0.5470 < SR_{MAC+Col} \quad \Rightarrow \text{Colombia!}$$

**B.**

$$\beta_{MAC+Col} = w_{MAC} * \beta_{MAC} + (1 - w_{MAC}) * \beta_{Col}$$

$$= .90 * .90 + .10 * 1.40 = 0.95$$

$$TR_{MAC+Col} = E[r_{MAC+Col} - r_f] / \beta_{MAC+Col} = (.152 - .03) / 0.95 = 0.1281$$

$$\beta_{MAC+Ven} = 0.95$$

$$TR_{MAC+Ven} = (.1475 - .03) / .95 = 0.1236 < TR_{MAC+Col} \quad \Rightarrow \text{Colombia!}$$

**C.**

$$SR_{MAC} = (.13 - .03) / .15 = .667 < SR_{MAC+Col}$$

$$TR_{MAC} = (.13 - .03) / .90 = .111 < TR_{MAC+Col} \& TR_{MAC+Ven} \Rightarrow \text{No! Mac is not better off without adding any project.}$$

2. Charlie Kelly, an Irish design company, wants to refinance debt amounting to **USD 200 million**. An investment bank suggests issuing a straight bond, with annual coupon payments. The investment bank has the following data available:

Irish government bond yields: 4-year 5.75 % (p.a.)

U.S. Treasury government bond yield: 1-year 1.55% (s.a.)

U.S. Treasury government bond yield: 4-year **1.85 % (s.a.)**

German government bond yield: 4-year 2.25 % (s.a.)

Kelly Euro-Eur bond yield (outstanding debt): German government bonds + **345 bps (s.a.)**

Given the current tight market conditions, an investment bank suggests: a **4-year** full-coupon USD Eurobond and an issue price of 100% (**P=100**).

(1) Following usual market practices, set the coupon and the yield of the new Kelly bond.

**YTM** = risk free rate + spread = **.0185 (s.a.)** + **.0345 (s.a.)** = **.0530 (s.a.)**

**YTM (p.a.)** =  $(1 + .0530/2)^2 = \mathbf{0.0537}$        $\Rightarrow$  since **P=100**  $\Rightarrow$  Coupon = **YTM = 5.37%**

(2) A year from now, there is a big debt crisis in Europe. What would the effect of this crisis be on the value of the bond? Briefly explain your logic.

$CR_{\text{Europe}} \uparrow \Rightarrow YTM_{\text{Europe}} \uparrow \Rightarrow P_{\text{bond}} \downarrow$

(3) Two years from now, the Irish government has a budget surplus. What would the effect of this budget surplus be on the value of the bond? Briefly explain your logic.

Budget surplus = good news:  $CR_{\text{Ireland}} \downarrow \Rightarrow YTM_{\text{Irelande}} \downarrow \Rightarrow P_{\text{bond}} \uparrow$

(4) Three years from now ( $T=1$ ), Kelly wants to buy back the bonds. If the yield to maturity for similar bonds is **8%** and  $S_t = \mathbf{1.20 \text{ USD/EUR}}$ , how much does Kelly have to pay (in EUR) for the bond buyback?

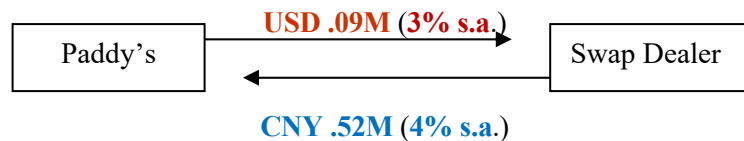
Price of each bond =  $(1 + .0537)/(1 + .08) = \mathbf{0.9756481}$  (under par)

Amount to pay =  $\mathbf{0.9756481} * \mathbf{USD 200 \text{ M}} / \mathbf{1.20 \text{ USD/EUR}} = \mathbf{EUR 162.608 \text{ M}}$

3. The annual Chinese yuan (CNY) interest rate is **5%** (s.a.), while the annual USD interest rate is **1%** (s.a.). Paddy's Co., a U.S. firm, entered into a currency swap with a swap dealer, where Paddy's pays **3%** semi-annually in USD and receives **4%** semi-annually in CNY. The notional principals in the two currencies are USD 6 million and CNY 26 million and they are not exchanged at the end of the swap. The swap will last for another two years. The exchange rate is **0.16 USD/CNY**. For simplicity, assume the term structure in China and in the U.S. is flat.

- A. Draw a diagram showing the semi-annual swap cash flows (in CNY and in USD).  
 B. Value this currency swap for Paddy's Co.  
 C. Suppose CNY interest rates decrease. Without doing any calculations, does the value of the swap increase or decrease for Paddy's Co.?  
 D. A year from now, the exchange rate is **0.14 USD/CNY**. Assuming that nothing else has changed, use the forward contract decomposition approach to calculate the new value of the swap for Paddy's Co.

A.



B. T = 2 years (4 payments)

$$\begin{aligned}
 V_{\text{Paddys}} &= \text{NPV}(\text{CNY receivables}) \times S_t - \text{NPV}(\text{USD payables}) = \\
 &= [\text{CNY } .52\text{M}/(1+.05/2) + \text{CNY } .52\text{M}/(1.025)^2 + \text{CNY } .52\text{M}/(1.025)^3 + \text{CNY } .52\text{M}/(1.025)^4] * .16 \text{ USD/CNY} \\
 &\quad - [\text{USD } .09\text{M}/(1+.01/2) + \text{USD } .09\text{M}/(1+.01/2)^2 + \text{USD } .09\text{M}/(1+.01/2)^3 + \text{USD } .09\text{M}/(1+.01/2)^4] = \\
 &= \text{USD } -0.042548 \text{ M}
 \end{aligned}$$

C.

$$i_{\text{CNY}} \downarrow \Rightarrow \text{NPV}(\text{CNY receivables}) \uparrow \Rightarrow V_{\text{Paddys}} \uparrow$$

D.

$$\begin{aligned}
 F_{t,6\text{-mo}} &= 0.14 \text{ USD/CNY} * (1 + .01/2)/(1 + .05/2) = 0.137268 \text{ USD/CNY} \\
 F_{t,12\text{-mo}} &= 0.14 \text{ USD/CNY} * (1 + .01/2)^2 / (1 + .05/2)^2 = 0.134590 \text{ USD/CNY}
 \end{aligned}$$

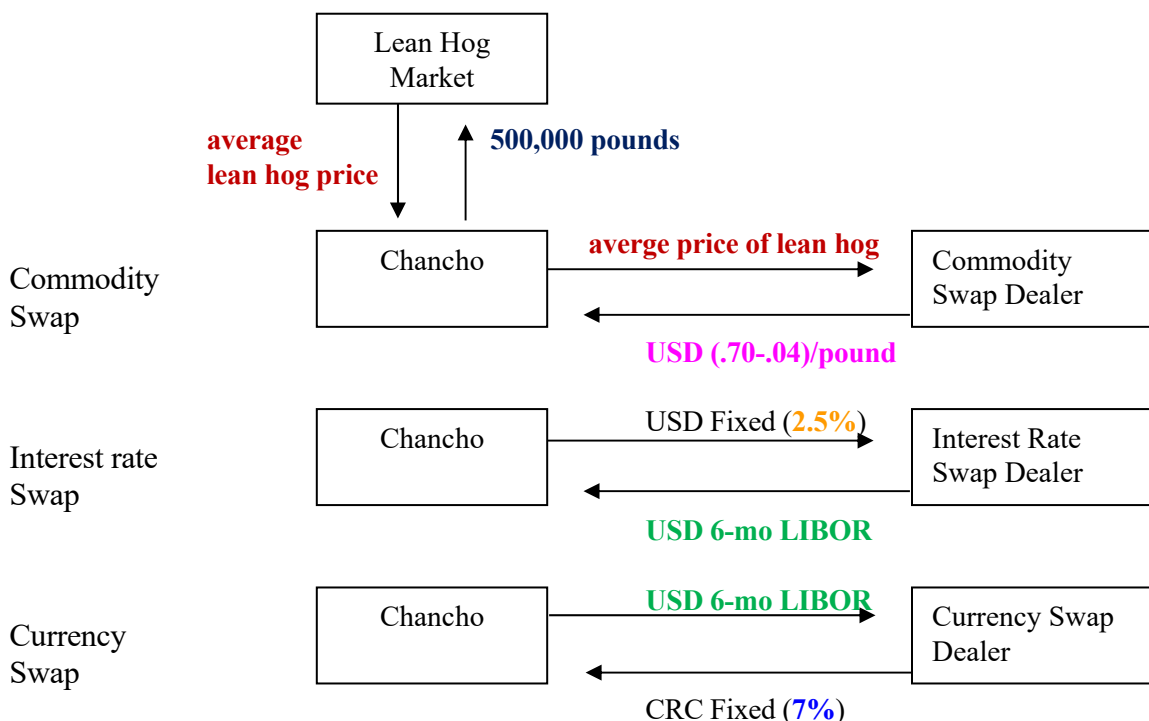
$$\text{Value of CF in 6-mo: } [\text{CNY } .52\text{M} * 0.137268 \text{ USD/CNY} - \text{USD } .09\text{M}]/(1+.01/2) = \text{USD } -0.018528\text{M}$$

$$\text{Value of CF in 12-mo: } [\text{CNY } .52\text{M} * 0.134590 \text{ USD/CNY} - \text{USD } .09\text{M}]/(1+.01/2)^2 = \text{USD } -0.019815\text{M}$$

$$V_{\text{Paddys}} = \text{USD } -0.018528 + \text{USD } -0.019815 = \text{USD } -0.038342$$

4. Chanco Ltd., a Costa Rican firm, exports lean hog meat to the U.S. Chanco sells a 0.5 million pounds of lean hog meat per semester. The price of lean hog in international markets is in USD. The manager of Chanco wants to fix the price of lean hog in terms of colones (CRC) for **one year**. A commodity swap dealer offers a 6-mo mid-quote price of **USD .70 per pound** of lean hog (the dealer **total spread is USD .08**). 6-mo swap interest rates are available at a rate of **2.5%** against 6-mo. LIBOR. 6-mo CRC-for-USD currency swaps are available at a rate of **7%** against 6-mo. LIBOR. The current exchange rate is 560 CRC/USD.

**A. Structured Solution**



**B. Price of lean hog in terms of CRC.**

(1) Fixed semiannual payments to commodity swap dealer:

$$500,000 \text{ pounds} * \text{USD } .66/\text{pound} = \text{USD } 330,000.$$

(2) Notional principal on a USD interest rate swap:

$$\text{USD } 330,000 / (.025/2) = \text{USD } 26,400,000.$$

(3) PV of CFs:  $PV(330,000, .0125, 2 \text{ periods}) = \text{USD } 647,828.1$

(4) Translate to PV of CFs CRC:

$$\text{USD } 647,828.1 * 560 \text{ CRC/USD} = \text{CRC } 362,783,736$$

(5) Coupon on the fixed-rate side of PEN-for-USD swap:

$$\text{Coupon}(PV = \text{CRC } 362,783,736, .035, 2 \text{ periods}) = \text{CRC } 190,969,510$$

(6). Price of lean hog =  $\text{CRC } 190,969,510 / 500,000 \text{ pounds}$

$$= \text{381.94 CRC/pound of lean hog.}$$

5. In 2016, ChemChina, the Chinese chemical giant, bought Syngenta, a Swiss agrochemical company in a USD 43 billion takeover. The takeover was financed mainly by debt; ChemChina's contribution was only USD 5 billion, raising concerns about the company's ability to shoulder the heavy debt burden.

a) What kind of additional risks would ChemChina take? What can ChemChina do to reduce them?

\* Country Risk & FX Risk

\* Diversification & Caps on foreign investments

b) Assume the CHF cost of debt for big Swiss agrochemical companies is 160 bps over government risk-free rate, which is **-0.75%**. Last month, ChemChina borrowed at **5.15%** in China, while Syngenta borrowed at **1%** in Switzerland. What would be the cost of debt of the Syngenta's acquisition for ChemChina? Briefly justify your answer.

$$k_d = 1\%$$

c) Do ChemChina's latest foreign acquisitions would decrease, stay the same or increase ChemChina's cost of capital? Briefly explain (saying "increase" or "decrease" without justification will get you zero points).

It depends on where the acquisition leaves D/V relative to (D/V)\*. It looks like D/V is past (D/V)\* => increase  $k_c$ . (The value of diversification –i.e., lower beta- is not enough to compensate for the increase in the bankruptcy cost).

d) You want to determine the cost of capital for Syngenta. Suppose Syngenta's D/E split is **30%-70%**. Use data from part b. Syngenta has a beta = **1.1**. The Swiss stock market risk premium is **3.6%**, while the Chinese stock market risk premium has an average return of **6%**. The Swiss effective tax rate is **20%**.

$$k_c = D/(E+D) * k_d * (1 - t) + E/(E+D) * k_e$$

$$k_e = -.0075 + 1.1 * .036 = 0.0321$$

$$k_c = .30 * .01 * (1 - .20) + .70 * 0.0321 = 0.0249 (2.49\%)$$

e) Let's complicate the WACC calculation. Suppose that **90%** of Syngenta's profits are generated from sales abroad Switzerland. Suppose you estimate a weighted country equity risk premium for the abroad part, WCER, to be equal to **2%**. Taking this into account, recalculate the cost of capital.

We'll do a weighted average of both equity risk premia:

$$k_e = -.0075 + 1.1 * [.036 * .10 + .02 * .90] = 0.016260$$

$$k_c = D/(E+D) * k_d * (1 - t) + E/(E+D) * k_e = .30 * .01 * (.80) + .70 * 0.016260 = 0.01378 (1.38\%)$$

f) At that time, Chinese analysts said "the better-than-expected November PMI indicates China's manufacturing sector continues to boom." What is the effect of this good economic news on ChemChina's cost of capital?

Lower CR  $\Rightarrow k_f \downarrow \Rightarrow k_c \downarrow$