



**UNIVERSITÉ
DE GENÈVE**

FACULTÉ DES SCIENCES
ÉCONOMIQUES ET SOCIALES

Master of Arts in International Trading, Commodity Finance and Shipping

Prof. Dr. Christopher L. Culp
christopher.culp@unige.ch

+41 (079) 335 84 04
<http://rmcsinc.com/hecGeneve.html>

**HEDGING TOOLS AND TECHNIQUES USING COMMODITY
FUTURES, FORWARDS, AND SWAPS**

PROBLEM SET

There are a total of 100 possible points on this assignment. Please return the completed assignment to me by email no later than March 18, 2012, at 17h00 CET. That gives you just over a month to do it, but hopefully this will not take you more than a few hours.

You may work alone or in groups of up to three people. If you work in a group, please submit only one write-up and put all group members' names on the solutions. Please do *not* compare answers and work with other groups.

Your solutions should be presented in a Word or PDF document – feel free to use Excel if you wish, but please do not send me any Excel files. If you have any questions on the problem set, you are welcome to email and ask me, but before doing so I suggest that you first go through the readings.

Throughout this assignment, please use the futures prices from the included *Financial Times* summary page, and please assume those prices are current as of the various dates given in the problems below. Also feel free to consult the relevant exchange web sites.

In some of the questions, you will need interest rate information. Regardless of the date given in the problem, assume the following interest rates are always the right ones to use: 1-mth LIBOR = 0.26% per annum, 3-mth LIBOR = 0.62% per annum, 6-mth LIBOR = 0.92% per annum, and 1-year LIBOR = 1.33% per annum. To choose the relevant interest rate, use the closest available maturity without going beyond the LIBOR maturity. Day counting is Actual/360, which means you should assume the foregoing LIBORs are for 30, 90, 180, and 360 days. So, for example, if you have 89 days until a futures contract expires and want the relevant interest rate for discounting or computing cost of carry, use the 90-day rate (*i.e.*, 3-mth LIBOR). But if you have 91 days until an expiration you need to use the 180-day (*i.e.*, 6-mth) rate.

Finally, as a hint, do not ever guess at or assume futures contract expiration dates – look them up.

Part I – Sugar [35 points]:

1. **[5 points]** Suppose a company is indifferent between hedging with LIFFE White Sugar and ICE Sugar No. 11 futures and wishes to establish a new short futures hedge on February 20, 2012, for the March delivery month. Which contract must the hedger use and how do you know?
2. **[2 points]** If a sugar producer wants to deliver product into a short position in Belize, which contract will he use?
3. **[2 points]** If a sugar producer wants to deliver product into a short position in the United Arab Emirates, which contract will he use?
4. **[5 points]** A speculator that is not an exchange member wants to trade Sugar No. 11 at ICE NYBOT. Specifically, the speculator plans to establish a long position in the May futures of five contracts. (Assume the position will be established at the closing price for the May futures contract shown in the *Financial Times*.) How much initial margin does the speculator have to deposit with ICE?
5. **[2 points]** Suppose one day after entering into the position, the May futures price falls to 23.20. Does the speculator have to post additional margin? If so, how much?
6. **[2 points]** Suppose two days after entering into the position, the May futures price falls by another \$0.0020 to 23.00. Does the speculator have to post additional margin? If so, how much?
7. **[2 points]** If a trader wants to go long LIFFE White Sugar futures for the latest possible (*i.e.*, most deferred) delivery date and wants to establish the trade on February 10, 2012, which contract (*i.e.*, delivery month and year) does the trader use?
8. **[5 points]** What is the quality basis price difference between the ICE and LIFFE sugar futures contracts? (You can ignore transportation basis and assume the sole reason for the price difference is quality basis.) Please report your answer in dollars per pound. Is the implied basis different depending on which contract months you look at? Why do you think there is a quality basis difference?
9. **[10 points]** Judging solely from the sugar price term structures, when do you think the next major sugar harvest will come to market? Are current inventories high or low relative to demand up until that next harvest? Does the next harvest look like it will be a big one relative to demand or not?

Part II – Wheat [25 points]:

Consider the wheat futures market at the CME CBOT division, and assume today is February 15, 2012. Assume the futures prices today are the same as those shown in the *Financial Times* and that the spot price of wheat today is \$6.50/bu. Assume that the convenience yield (*i.e.*, marginal benefit of holding physical wheat) is constant and equal to 0.25% per annum as a proportion of the spot price.

10. **[15 points]** Assuming that all of the wheat futures prices are equal to their fair values and priced according to the cost of carry relation, what is the cost of physical wheat

storage from February 15, 2012, through each of the futures contract maturities? Your answer will include five different storage costs corresponding to the five futures contracts, and you should report each storage cost as a cumulative lump-sum cost per bushel. You may assume storage costs are paid on the date the futures contracts mature and that there are no interim payments.

11. **[5 points]** Does it seem like there is a benefit to entering into long-term storage contracts? In other words, do you save some money on average by storing for longer?
12. **[5 points]** Do you think that wheat inventories are low or high relative to anticipated demand over the rest of 2012?

Part III – Crude [40 points]:

Suppose today is February 8, 2012. The spot price of WTI crude is \$97.29/bbl., and the spot price of Brent crude is \$114.80/bbl. (Do not use the spot prices in the *FT*.) Assume that the physical cost of storing crude oil is \$0.05/bbl. per day. Suppose all market participants face this same storage cost, and the cost does not depend either on location or whether the oil is WTI or Brent. Assume the cost of storage is paid on the same dates that the Nymex and ICE futures mature and that no interim payments for storage are required – e.g., if you store oil through the date the ICE/IPE June futures contract matures you pay only one lump-sum amount in June.

13. **[15 points]** Calculate the marginal convenience yield for both Brent and WTI crude for oil held in inventory by the marginal storer through the dates that the March, April, May, and June futures contracts mature. (*Hint:* The maturity dates are not the same for ICE Brent and Nymex WTI contracts.) Express your answer as an annualized percentage of the spot price (as in the formula at the top of Exhibit 2.8).
14. **[5 points]** Are Brent and WTI futures in backwardation or contango? Are the levels of the convenience yields you computed in the previous question consistent with these futures price term structures? Explain.
15. **[5 points]** Which of the two futures price term structures (Brent or WTI) has an unusual slope relative to its historical slope?
16. **[5 points]** Give a brief (two or three sentences) that explains the current shapes of the WTI and Brent futures price term structures. (The explanation today is the same one that we discussed in Lecture 3. You do not need to research this.)
17. **[5 points]** Excluding Brent and WTI futures, what other futures prices on the *FT* summary page tell us that the demand for crude oil is relatively strong right now and is expected to remain strong relative to supply through the summer? Explain how you know.
18. **[5 points]** Calculate the gross cracking margin per barrel using Nymex March futures prices.

BASIC METALS

\$/tonne	Cash		3 Mth		Kerb PM 3 Mth close	Day's High/Low (3 Mth)	Open Interest (Lots)	Turnover (Lots)
	Official		Official					
Aluminium	2158/2159	2201/2201.5	2247.0/	2253/2191	828.290	296.767		
Alum Alloy	2130/2140	2150/2160	2179.0/2180.0	2180/2140	9.447	4.116		
Amper Alloy	2190/2191	2225/2235	2265.0/2275.0	2353.5/2250	10.049	2.989		
Copper	8315/8320	8341/8345	8560.0/8565.0	8586.75/8318	274.458	173.211		
Lead	2146.5/2147	2177/2177.5	2224.0/2225.0	2244/2158	110.666	47.749		
Nickel	20775/20780	20840/20845	21305/21310	21455/20781	101.548	39.866		
Tin	23975/24000	24050/24075	24350/24400	24500/23900	18.956	4.233		
Zinc	2087.5/2088	2106/2107	2154.0/2155.0	2154/2080	277.370	123.443		

Spot: 1.5829 3 Mths: 1.5817 6 Mths: 1.5804 9 Mths: 1.5789 Official £/\$ rate: 1.5821
 LME Closing £/\$ rate: 1.5779 Kerb close 17:00.
 Source: Amalgamated Metal Trading www.amt.co.uk

For further trading information see www.lme.co.uk

HIGH GRADE COPPER COMEX

	Sett price	Day's chge	High	Low	Vol 000s	Open Int
Feb	389.70	12.00	389.10	379.10	0.2	0.6
Mar	390.15	12.05	391.45	377.75	51.3	69.5
Apr	390.85	12.00	391.80	379.00	0.0	2.6
May	391.15	12.00	392.25	378.80	5.0	33.7
Total					60.1	153.1

LME WAREHOUSE STOCKS (tonnes)

	Aluminium	+1.850	to	4,996.275
Aluminium Alloy			to	138.120
Amer Alloy		+140	to	155.520
Copper		-1.525	to	329.300
Lead		+3.075	to	366.225
Nickel		+1.086	to	95.598
Zinc		-1.800	to	842.500
Tin		+75	to	9.175

LONDON BULLION MARKET

Gold (Troy oz)	\$ equiv	£ equiv	€ equiv
Closed	1,760.30-1,759.30		
Opening	1,760.25-1,759.25		
Morning fix	1,759.50	1,110.66	1,335.48
Afternoon fix	1,734.00	1,099.07	1,324.57
Day's high	1,764.00		
Day's low	1,733.10		
Previous Close	1,743.70-1,744.70		

Coins	Kruggerand	1,771.85
Sovereigns	432.00	

Loco London Gold Lending Rates (v US\$)	1 mth	0.55	6 mths	0.53
	3 mths	0.61	12 mths	0.65

Silver Fix	p/troy oz	US cts equiv
Spot	2,144.08	3,393

Silver Lending Rates (v US\$)	1 mth	0.52	6 mths	0.39
	3 mths <td>0.42 <td>12 mths <td>0.35</td> </td></td>	0.42 <td>12 mths <td>0.35</td> </td>	12 mths <td>0.35</td>	0.35

Source: London Bullion Market Association, Reuters.

PRECIOUS METALS

GOLD COMEX (100 Troy oz: \$/troy oz)

	Sett price	Day's chge	High	Low	Vol 000s	Open Int
Mar	1,738.9	-18.9	1,764.0	1,726.2	1.1	1.6
Jun	1,743.0	-19.1	1,768.4	1,769.8	3.1	56.8
Total					155.5	418.7

PLATINUM NYMEX (50 Troy oz: \$/troy oz)

	Sett price	Day's chge	High	Low	Vol 000s	Open Int
Jul	1,635.3	2.2	1,637.2	1,625.4	0.0	2.0
Oct	1,638.4	2.2	0.0	0.0	0.0	0.2
Total					5.7	44.7

PALLADIUM NYMEX (100 Troy oz: \$/troy oz)

	Sett price	Day's chge	High	Low	Vol 000s	Open Int
Mar	708.85	1.20	717.00	704.95	6.2	18.4
Jun	710.55	1.20	716.75	706.65	0.1	1.5
Total					6.3	20.2

SILVER COMEX (5,000 Troy oz: Cents/troy oz)

	Sett price	Day's chge	High	Low	Vol 000s	Open Int
Mar	3,374.9	-42.6	3,439.0	3,331.0	51.3	46.6
Jun	3,385.8	-42.2	3,435.0	3,350.0	1.3	6.8
Total					62.1	103.4

GRAIN & OIL SEEDS

WHEAT NYSE LIFFE (100 tonnes: 3 per tonne)

	Sett price	Day's chge	High	Low	Vol 000s	Open Int
Mar	167.45	0.45	167.50	165.00	0.2	0.5
May	167.45	0.45	168.10	166.00	0.3	7.5
Jul	168.45	0.45	0.00	0.00	0.0	0.1
Total					0.6	16.7

WHEAT CBOT (5,000 bu min: cents/60lb bushel)

	Mar <th>660.75 <th>-2.00 <th>671.00 <th>653.25 <th>69.5 <th>167.6</th> </th></th></th></th></th>	660.75 <th>-2.00 <th>671.00 <th>653.25 <th>69.5 <th>167.6</th> </th></th></th></th>	-2.00 <th>671.00 <th>653.25 <th>69.5 <th>167.6</th> </th></th></th>	671.00 <th>653.25 <th>69.5 <th>167.6</th> </th></th>	653.25 <th>69.5 <th>167.6</th> </th>	69.5 <th>167.6</th>	167.6
May	674.00	-4.00	684.75	669.00	24.7	107.9	
Jul	689.00	-2.75	697.50	682.75	17.2	95.4	
Sep	706.00	-2.00	712.75	699.00	4.2	32.6	
Dec	723.25	-1.50	730.50	716.75	6.5	57.2	
Total					122.6	469.7	

MAIZE CBOT (5,000 bu min: cents/56lb bushel)

	Mar <th>644.50 <th>1.50 <th>646.50 <th>638.00 <th>165.1 <th>394.9 </th></th></th></th></th></th>	644.50 <th>1.50 <th>646.50 <th>638.00 <th>165.1 <th>394.9 </th></th></th></th></th>	1.50 <th>646.50 <th>638.00 <th>165.1 <th>394.9 </th></th></th></th>	646.50 <th>638.00 <th>165.1 <th>394.9 </th></th></th>	638.00 <th>165.1 <th>394.9 </th></th>	165.1 <th>394.9 </th>	394.9
May	650.75	1.25	652.75	644.25	61.1	267.0	
Jul	655.50	2.00	656.50	648.50	54.8	211.9	
Sep	604.75	3.25	604.50	596.25	8.7	68.8	
Dec	581.50	2.50	581.75	573.75	29.6	234.4	
Mar	593.25	2.25	593.00	586.00	0.7	42.9	
Total					322.0	1,243.4	

SOYBEANS CBOT (5,000 bu min: cents/60lb bushel)

	Mar <th>1,232.50 <th>15.50 <th>1,236.50 <th>1,214.00 <th>96.5 <th>187.2</th> </th></th></th></th></th>	1,232.50 <th>15.50 <th>1,236.50 <th>1,214.00 <th>96.5 <th>187.2</th> </th></th></th></th>	15.50 <th>1,236.50 <th>1,214.00 <th>96.5 <th>187.2</th> </th></th></th>	1,236.50 <th>1,214.00 <th>96.5 <th>187.2</th> </th></th>	1,214.00 <th>96.5 <th>187.2</th> </th>	96.5 <th>187.2</th>	187.2
May	1,240.75	15.25	1,244.50	1,222.75	32.1	120.9	
Jul	1,250.25	15.25	1,253.50	1,231.75	25.7	97.3	
Aug	1,248.00	15.25	1,250.00	1,235.50	0.3	2.7	
Sep	1,241.50	14.00	1,240.00	1,226.25	0.4	2.0	
Nov	1,237.25	13.50	1,239.00	1,220.00	12.7	72.6	
Total					169.0	504.0	

SOYBEAN OIL CBOT (60,000lbs: cents/lb)

	Mar <th>51.65 <th>0.46 <th>51.69 <th>51.08 <th>45.9 <th>141.1</th> </th></th></th></th></th>	51.65 <th>0.46 <th>51.69 <th>51.08 <th>45.9 <th>141.1</th> </th></th></th></th>	0.46 <th>51.69 <th>51.08 <th>45.9 <th>141.1</th> </th></th></th>	51.69 <th>51.08 <th>45.9 <th>141.1</th> </th></th>	51.08 <th>45.9 <th>141.1</th> </th>	45.9 <th>141.1</th>	141.1
May	52.08	0.46	52.12	51.53	12.5	82.1	
Jul	52.49	0.45	52.52	52.00	7.3	52.7	
Aug	52.62	0.45	52.62	52.15	0.3	6.6	
Sep	52.74	0.44	52.73	52.25	0.3	5.6	
Oct	52.80	0.44	52.82	52.33	0.1	5.5	
Total					71.0	327.4	

SOYBEAN MEAL CBOT (100 tons: \$/tons)

	Mar <th>328.6 <th>5.2 <th>329.8 <th>322.1 <th>36.9 <th>84.5</th> </th></th></th></th></th>	328.6 <th>5.2 <th>329.8 <th>322.1 <th>36.9 <th>84.5</th> </th></th></th></th>	5.2 <th>329.8 <th>322.1 <th>36.9 <th>84.5</th> </th></th></th>	329.8 <th>322.1 <th>36.9 <th>84.5</th> </th></th>	322.1 <th>36.9 <th>84.5</th> </th>	36.9 <th>84.5</th>	84.5
May	330.2	4.9 <th>331.3</th> <th>324.1 <th>6.6</th> <th>35.0</th> </th>	331.3	324.1 <th>6.6</th> <th>35.0</th>	6.6	35.0	
Jul	332.6	4.8	333.5	326.7 <th>4.6</th> <th>31.9</th>	4.6	31.9	
Aug	331.9	4.7	331.6	326.7	0.2	6.5	
Sep	330.5	4.7	330.8	325.7	0.1	5.7	
Oct	327.2	4.4	325.4	325.0	0.1	3.5	
Total					52.6	199.4	

SOFTS

COCOA NYSE LIFFE (10 tonnes: £/tonne)

	Sett price	Day's chge	High	Low	Vol 000s	Open Int
Mar	1,502	53	1,525	1,438	6.9	66.3
May	1,518	53	1,539	1,456	25	22.9
Jul	1,533	53	1,553	1,473	2.2	29.6
Sep	1,543	52	1,560	1,484	0.7	24.5
Dec	1,549	52	1,567	1,490	0.5	18.1
Mar	1,558	56	1,561	1,500	1.0	10.2
Total					14.6	179.2

COCOA NYBOT (10 tonnes: \$/tonne)

	Mar <th>2,300 <th>75 <th>2,339 <th>2,213</th> <th>20.3</th> <th>55.9</th> </th></th></th>	2,300 <th>75 <th>2,339 <th>2,213</th> <th>20.3</th> <th>55.9</th> </th></th>	75 <th>2,339 <th>2,213</th> <th>20.3</th> <th>55.9</th> </th>	2,339 <th>2,213</th> <th>20.3</th> <th>55.9</th>	2,213	20.3	55.9
May	2,327	72	2,363	2,238	13.2	44.1	
Jul	2,353	71 <th>2,385</th> <th>2,268</th> <th>3.8</th> <th>26.7 </th>	2,385	2,268	3.8	26.7	
Sep	2,372	71	2,408	2,288	0.7	15.5	
Dec	2,396	75	2,431	2,310 <th>1.2</th> <th>15.9 </th>	1.2	15.9	
Mar	2,425	78	2,460	2,335	1.5	7.8	
Total					41.0	169.5	

COCOA ICCO (SDR's/Tonne)

Feb 2	Price	Prev.day
Daily	1,472.14	1,473.39

COFFEE NYSE LIFFE (10 tonnes: \$/tonne)

	Mar <th>1,837</th> <th>37 <th>1,853</th> <th>1,814 <th>7.3</th> <th>45.7</th> </th></th>	1,837	37 <th>1,853</th> <th>1,814 <th>7.3</th> <th>45.7</th> </th>	1,853	1,814 <th>7.3</th> <th>45.7</th>	7.3	45.7
May	1,864	38	1,876	1,840	4.5	23.1	
Total					12.6	82.1	

COFFEE 'C' NYBOT (37,500lbs: cent/lb)

	Mar <th>215.95 <th>0.35 <th>218.95 <th>214.60 <th>11.7 <th>54.6</th> </th></th></th></th></th>	215.95 <th>0.35 <th>218.95 <th>214.60 <th>11.7 <th>54.6</th> </th></th></th></th>	0.35 <th>218.95 <th>214.60 <th>11.7 <th>54.6</th> </th></th></th>	218.95 <th>214.60 <th>11.7 <th>54.6</th> </th></th>	214.60 <th>11.7 <th>54.6</th> </th>	11.7 <th>54.6</th>	54.6
May	218.90	0.35	221.75	217.45	5.8	37.9	
Jul	221.90	0.40	224.30	220.70	2.7 <th>9.0</th>	9.0	
Sep	224.70	0.50	227.30 <th>223.55 <th>1.2 <th>19.1 </th></th></th>	223.55 <th>1.2 <th>19.1 </th></th>	1.2 <th>19.1 </th>	19.1	
Dec	228.50	0.75	230.15	227.30	0.6	8.1	
Mar	232.10	0.55	233.70	230.95 <th>0.2 <th>1.2 </th></th>	0.2 <th>1.2 </th>	1.2	
Total					22.2	130.5	

COFFEE ICO (US cents/pound)

Feb 2	Price	Prev.day
Daily	184.13	183.68

WHITE SUGAR NYSE LIFFE (50 tonnes: \$/tonne)

	Mar <th>635.1 <th>5.3 <th>636.0 <th>627.9 <th>4.8 <th>21.8</th> </th></th></th></th></th>	635.1 <th>5.3 <th>636.0 <th>627.9 <th>4.8 <th>21.8</th> </th></th></th></th>	5.3 <th>636.0 <th>627.9 <th>4.8 <th>21.8</th> </th></th></th>	636.0 <th>627.9 <th>4.8 <th>21.8</th> </th></th>	627.9 <th>4.8 <th>21.8</th> </th>	4.8 <th>21.8</th>	21.8
May	619.9	7.6	620.0	610.2 <th>5.3 <th>22.2 </th></th>	5.3 <th>22.2 </th>	22.2	
Aug	605.3	5.7	605.7	597.9 <th>1.7 <th>17.4 </th></th>	1.7 <th>17.4 </th>	17.4	
Oct	605.4	5.2	606.5	599.9	1.1 <th>5.9 </th>	5.9	
Dec	609.4	5.0	609.1	603.3 <th>0.7 <th>2.1 </th></th>	0.7 <th>2.1 </th>	2.1	
Mar	614.9	4.9	614.9	609.4	0.5	3.1	
Total					14.1	72.6	

SUGAR '11' NYBOT (112,000lbs