Version 1.2

# PRiME
# Margining Guide

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# INTRODUCTION

The **P**ortfolio **Ri**sk **M**argining System of HK**E**X (PRiME) is the margining methodology adopted in DCASS that is used to calculate the margin requirements of futures and/or options products cleared by HKCC and SEOCH. This document outlines the basic concepts of PRiME and its margin algorithm and sets out examples regarding margin calculations performed under PRiME.

**Part 1. Margining Basis for Different Account Types in DCASS**

This part sets out the basis of margining that will be applied by HKCC and SEOCH on respective accounts in DCASS.

**Part 2. PRiME Calculation Algorithm**

This part explains how the margin requirements are calculated. It describes the different components in arriving at the final margin requirement.

**Part 3. Examples**

This part contains examples to illustrate the steps in calculating the margin requirement as stated in Part 2.

# Part 1. Margining Basis for Different Account Types in DCASS

The different types of account maintained by HKCC and SEOCH for each Clearing Participant in DCASS are set forth in their respective Clearing House Procedures. The Clearing House margin calculation for each type of account is different depending on whether it is margined on a net or gross basis.

Account types in DCASS subject to net margining are House, Market Maker, Individual Client and Client Offset Claim Accounts.

Account types in DCASS subject to gross margining are Omnibus Client, Sink and Daily Accounts.

# Part 2. PRiME Calculation Algorithm

## 2.1. Risk Arrays

The Risk Array represents how a derivative instrument (for example, an option on a future) will gain or lose value from the current point in time to a specific point in time in the near future which is typically set to one trading day. PRiME evaluates the maximum likely loss that may reasonably occur over one trading day under a set of the risk scenarios.

The specific set of the risk scenarios are defined in terms of (a) how much the price of the underlying instrument is expected to change over one trading day which is defined as the Price Scan Range, and (b) how much the volatility of that underlying price is expected to change over one trading day which is defined as the Volatility Scan Range. The results of the calculation for each risk scenario, the amount by which the derivative instrument will gain or lose value over one trading day under that risk scenario, is called the Risk Array value for that scenario. The set of Risk Array values for that contract under the full set of risk scenarios constitutes the Risk Array.

Risk Array values are calculated for a single long position. "Long" means long the instrument, not long the market: buying a put and buying a call both constitute long positions in PRiME. Risk Arrays for all contracts in PRiME have the same structure and are constructed for a long position. A Risk Array for a short position can be obtained by multiplying values in the Risk Array for the long position by minus 1.

Risk Array values are typically represented in the currency in which the contract is denominated. All dollar values are losses rounded to the nearest $1. A positive number shows a value loss and a negative number shows a value gain.

The two scenarios on Line 15 and 16 are designed to cover the loss of out-of-the-money options due to the unexpected adverse price move.

The Composite Delta is computed for the purpose of Intracommodity Spread Charge calculations and shown in Line 17.

| Line | Underlying Price Change | Volatility Change |
|---|---|---|
| 1. | Unchanged | Up |

| | | |
|---|---|---|
| 2. | Unchanged | Down |
| 3. | Up 1/3 the Price Scan Range | Up |
| 4. | Up 1/3 the Price Scan Range | Down |
| 5. | Down 1/3 the Price Scan Range | Up |
| 6. | Down 1/3 the Price Scan Range | Down |
| 7. | Up 2/3 the Price Scan Range | Up |
| 8. | Up 2/3 the Price Scan Range | Down |
| 9. | Down 2/3 the Price Scan Range | Up |
| 10. | Down 2/3 the Price Scan Range | Down |
| 11. | Up 3/3 the Price Scan Range | Up |
| 12. | Up 3/3 the Price Scan Range | Down |
| 13. | Price Down 3/3 the Price Scan Range | Up |
| 14. | Price Down 3/3 the Price Scan Range | Down |
| 15. | Price Up by multiple of the Price Scan Range. The multiple is governed by the Extreme Move Multiplier (Cover certain fraction of loss. The fraction is governed by the Extreme Move Coverage Fraction) | Unchanged |
| 16. | Price Down by multiple of the Price Scan Range. The multiple is governed by the Extreme Move Multiplier (Cover certain fraction of loss. The fraction is governed by the Extreme Move Coverage Fraction) | Unchanged |
| 17. | Composite Delta | N/A |

## 2.2. Scan Risk

The steps to calculate Scan Risk for portfolio's positions in one Combined Commodity are shown below for gross and net margined accounts.

For each futures and option position in one Combined Commodity,

1. Select the Risk Arrays where this portfolio has positions. Ignore the arrays where this portfolio does not have positions.

2. Multiply the value gain or loss on each line of each selected array by the corresponding position size.

   For long futures, long calls and long puts, multiply by a positive position size. For short futures, short calls and short puts, multiply by a negative position size.

   For SEOCH's premium-style options, position size for long positions in gross margined account will be set to 0 for margining purpose.

   Examples: If a position is long 2 calls, multiply by +2
   If a position is short 2 calls, multiply by –2

   For each of the 16 Risk Array risk scenarios,
   Loss (Gain) = Position size X Loss (Gain) per long position

3. Sum for the total within the same Combined Commodity.

For net margined account, add across arrays on each line to find the Total Loss of this Combined Commodity. Scan Risk is the largest total loss in the 16 scenarios. If the largest total loss is negative, set the Scan Risk to be zero.

Example :

The Risk Arrays after multiplying the position size of a net margined account are as below.

| Scenario | HKB92.50H3 20 short | HKB80.00U3 50 long | HKB70.00X3 30 short | Total |
|---|---|---|---|---|
| 1 | 3,040 | -1,350 | 540 | 2,230 |
| 2 | -1,680 | 350 | -120 | -1,450 |
| 3 | 13,100 | -650 | 330 | 12,780 |
| 4 | 9,840 | 400 | -120 | 10,120 |
| 5 | -5,800 | -2,500 | 810 | -7,490 |
| 6 | -11,720 | 300 | -120 | -11,540 |
| 7 | 24,120 | -200 | 210 | 24,130 |
| 8 | 22,120 | 400 | -120 | 22,400 |
| 9 | -13,200 | -4,250 | 1,200 | -16,250 |
| 10 | -19,600 | 150 | -90 | -19,540 |
| 11 | 35,860 | 50 | 90 | 36,000 |
| 12 | 34,720 | 400 | -120 | 35,000 |
| 13 | -19,020 | -6,800 | 1,710 | -24,110 |
| 14 | -24,940 | -250 | -90 | -25,280 |
| 15 | 33,380 | 100 | -30 | 33,450 |
| 16 | -9,000 | -14,150 | 1,650 | -21,500 |

Scan Risk for this Combined Commodity is the Largest Total Loss, i.e., $36,000

For gross margined account, Scan Risk for each contract is separately calculated.

Example :

The Risk Arrays after multiplying the position size of a gross margined account are as below.

| Scenario | HKB92.50H3 20 short | HKB80.00U3 50 long | HKB70.00X3 30 short |
|---|---|---|---|
| 1 | 3,040 | 0 | 540 |
| 2 | -1,680 | 0 | -120 |
| 3 | 13,100 | 0 | 330 |
| 4 | 9,840 | 0 | -120 |
| 5 | -5,800 | 0 | 810 |
| 6 | -11,720 | 0 | -120 |
| 7 | 24,120 | 0 | 210 |
| 8 | 22,120 | 0 | -120 |
| 9 | -13,200 | 0 | 1,200 |
| 10 | -19,600 | 0 | -90 |
| 11 | 35,860 | 0 | 90 |
| 12 | 34,720 | 0 | -120 |

| | | | |
|---|---|---|---|
| 13 | -19,020 | 0 | 1,710 |
| 14 | -24,940 | 0 | -90 |
| 15 | 33,380 | 0 | -30 |
| 16 | -9,000 | 0 | 1,650 |

Scan Risk for short 20 HKB92.50H3 = $35,860
Scan Risk for short 30 HKB70.00X3 = $1,710

## 2.3. Composite Delta

PRiME uses delta information to form spreads. Delta values measure the manner in which a future's or an option's value will change in relation to changes in the value of the underlying instrument. Futures deltas are always 1.0; options deltas range from -1.0 to +1.0. Moreover, options deltas are dynamic: a change in value of the underlying instrument will affect not only the option's price, but also its delta statistic.

PRiME employs only one Composite Delta value per contract, called the "Composite Delta". It is derived as the weighted average of the deltas associated with each underlying price scan point. The weights associated with each scan point are based upon the probability of the associated price movement, with more likely price changes receiving higher weights and less likely price changes receiving lower weights.

## 2.4. Intracommodity (Intermonth) Spread Charge

As PRiME scans underlying prices within a single underlying instrument, it assumes that price moves correlate perfectly across contract months. Since price moves across contract months do not generally exhibit perfect correlation, PRiME adds an Intracommodity Spread Charge to the Scan Risk associated with each underlying instrument under net margining. No Intracommodity Spread Charge will be applied for gross-margined accounts.

For each underlying instrument in which the portfolio has positions, PRiME identifies the Composite Delta associated with that underlying. As spreads are formed, PRiME keeps track for each tier (a set of consecutive contract months) of how many Composite Deltas have been consumed by spreading for the tier. For each spread formed, PRiME assesses a charge per spread at the specified charge rate for the spread. The total of all of these charges for a particular Combined Commodity constitutes the Intracommodity Spread Charge for that Combined Commodity.

The steps to calculate Intracommodity Spread Charge for portfolio's positions in one Combined Commodity are shown below.

For each futures or option in this Combined Commodity,

1. Identify the contract months for each tier.

   Select a contract month where this portfolio has positions for each tier. Ignore the contract months where this portfolio does not have positions.

2. Calculate the Composite Delta for each contract month.

   A. Within this contract month, select the Risk Arrays where this portfolio has positions. Ignore the Risk Arrays where his portfolio does not have positions.

   B. Multiply Line 17 on each selected Risk Array by the corresponding position size. Line 17 contains the Composite Delta value.

      For long futures, long calls and long puts, multiply by a positive position size. For short futures, short calls and short puts, multiply by a negative position size.

      For Combined Commodity which contains standard and mini contracts (or capital adjusted contracts), the Composite Delta should be adjusted by the Delta Scaling Factor before being multiplied by the position size.

      Examples: If a position is long 2 standard call contracts and Delta Scaling Factor is 1.00, multiply by +2 and 1.00
      If a position is short 2 mini call contracts and Delta Scaling Factor = 0.2, multiply by -2 and 0.20

   C. Add the figures calculated in step B for all options and futures in this contract month to find this contract month's Composite Delta.

   D. Repeat steps A to C for each contract month.

3. Calculate the total net long Composite Delta/short Composite Delta.

   A. Identify the contract months where this portfolio has net long/short Composite Delta.

   B. Add up the net long/short Composite Deltas to find the total net long/short Composite Delta.

4. Calculate the number of Intracommodity Spreads.

   A. Compare the absolute value of the total net long Composite Delta value to the absolute value of the total net short Composite Delta value. Select the smaller absolute value.

   B. The result in step A is the number of Intracommodity Spreads.

      Examples: If the total net long Composite Delta value is +5 and the total net short Composite Delta value is -3, then form 3 Intracommodity Spreads.

      If the total net long Composite Delta value is +2 and the total net short Composite Delta value is -6, then form 2 Intracommodity Spreads.

5. Calculate the Intracommodity Spread Charge.

   Multiply the number of Intracommodity Spreads by the Intracommodity Spread Charge Rate for this Combined Commodity. The result is the Intracommodity Spread Charge.

   Example:

If the Intracommodity Spread Charge Rate is $7,500 and there are 2 spreads, then the Intracommodity Spread Charge is $15,000.

## 2.5. Spot Month Charge

PRiME applies a Spot Month Charge to each applicable spot month contract (specified by the clearing house from time to time) to cover additional risk that may arise during the period leading up to the final settlement.

The steps to calculate the Spot Month Charge for portfolio's positions in one Combined Commodity are shown below for gross and net margined accounts.

1. Identify the Composite Delta of each applicable spot month contract consumed by Intracommodity Spread (for net margined account).

2. Identify the Composite Delta of each applicable spot month contract remaining in outrights.

3. Multiply the result in step 1 by the Spot Month Charge per Delta consumed by Intracommodity Spread (for net margined account).

4. Multiply the result in step 2 by the Spot Month Charge per Delta remaining in outrights.

5. Add up the results in step 3 and 4.

6. Repeat step 1 to 5 for each applicable spot month contract.

## 2.6. Commodity Risk

Commodity Risk is the total risk of all contracts within the same Combined Commodity.

Commodity Risk = Scan Risk + Intracommodity Spread Charge + Spot Month Charge

## 2.7. Intercommodity Spread Credit

PRiME applies Intercommodity Spread Credits for applicable spread positions between Combined Commodities (specified by the clearing house from time to time) with correlation in their underlying price movements in order to reflect the risk reduction nature of such spread positions. Intercommodity Spread Credit is only applied to positions held in net-margined accounts.

For net margined accounts, the steps to calculate the Intercommodity Spread Credit are shown below.

1. Identify the applicable Intercommodity Spreads and related parameters

    A. Priority – PRiME assigns a priority number of each spread. This priority determines the sequence of spread formed in the portfolio.

B. Leg – Each spread involves two Combined Commodities (two "legs") and each leg indicates the side of the market in terms of "A" or "B". If the sides are different (A vs. B), the signs of Composite Deltas of two legs must be opposite to form the spread. If the sides are the same (A vs. A), the signs of Composite Deltas of two legs must be the same to form the spread.

C. Delta per Spread Ratio – specifies how many Composite Deltas for each leg to form an Intercommodity Spread.

D. Spread Credit Rate – specifies the rate of credit applied for such spread formed.

2. For each Combined Commodity, sum up the Composite Delta of each contract month of a Combined Commodity to obtain the Composite Delta of this Combined Commodity. The calculation of Composite Delta of each contract month can be referred to Section 2.4 - Intracommodity (Intermonth) Spread Charge.

3. Work from the Intercommodity Spread with priority in descending order, form spreads as many as possible according to the Delta per Spread Ratio, the leg side and the available Composite Delta. Any Composite Delta remained from a spread formed will be used to form other spreads in next priority, if applicable.

The number of spread is obtained by the following formula:

Number of Spread

$$= \text{Minimum of } \left[ \frac{\text{Available Composite Delta of Leg 1}}{\text{Delta/Spread Ratio of Leg 1}} \text{ and } \frac{\text{Available Composite Delta of Leg 2}}{\text{Delta/Spread Ratio of Leg 2}} \right]$$

Note: Number of Spread is rounded to 4 decimal places

4. Calculate the Weighted Price Risk (WPR) of each Combined Commodity

In Scan Risk, PRiME considers the changes in underlying price, option volatility and the passage of time.

Scan risk = Price Risk + Volatility Risk + Time Risk

The steps follow will make use of the above relationship.

A. Identify the Scenario 1 and 2 from the Risk Array of portfolio losses in a Combined Commodity. These two scenarios represent when:

Time passes by one trading day
Volatility moves up / down
Price remains unchanged

Average the losses in Scenario 1 and 2 in order to average out the Volatility Risk, and leaving only the Time Risk.

Time Risk = (Scenario 1 Loss + Scenario 2 Loss) / 2

Note: Time Risk is rounded to 2 decimal places.

B. Identify from the Risk Array with the maximum Scan Risk Scenario of this Combined Commodity and its corresponding scenario which represents the same price movement but opposite volatility move. These two scenarios represent when:

Time passes by one trading day
Volatility moves up / down
Same price change

The below mapping table showing the corresponding scenario (Paired Scenario) of each Scan Risk Scenario:

| Scan Risk Scenario | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Paired Scenario | 2 | 1 | 4 | 3 | 6 | 5 | 8 | 7 | 10 | 9 | 12 | 11 | 14 | 13 | 15 | 16 |

C. Average the losses on the Scan Risk Scenario and its Paired Scenario in order to average out the Volatility Risk from these two scenarios. Deduct the Time Risk (from step A above) to obtain the Price Risk.

Price Risk = Scan Risk - Volatility Risk - Time Risk

Price Risk = (Scan Risk Scenario Loss + Paired Scenario Loss) / 2 - Time Risk

Note: Price Risk is rounded to 2 decimal places.

D. Divide the Price Risk of this Combined Commodity by the absolute values of its Composite Delta to obtain the Weighted Price Risk of this Combined Commodity. This is the Price Risk per delta of this particular Combined Commodity in the portfolio. If the Price Risk is negative, set the Price Risk to zero.

$$\text{Weighted Price Risk} = \text{Max}\left(\frac{\text{Price Risk}}{|\text{Composite Delta}|}, 0\right)$$

Note: the Weighted Price Risk is rounded to 2 decimal places

E. Repeat A to D for each Combined Commodity involved in Intercommodity Spread

5. Calculate the Intercommodity Spread Credit

A. Select the Intercommodity Spread formed according to the spread priority

B. Identify the Spread Credit Rate for this Intercommodity Spread and number of spread formed.

C. Identify the first leg (Combined Commodity) in the spread and the Delta per Spread Ratio of this leg.

D. Multiply Weighted Price Risk of this leg with the number of spread formed, Spread Credit Rate and the Delta per Spread Ratio of this leg

Intercommodity Spread Credit
= Weighted Price Risk × Number of Intercommodity Spread × Delta per Spread Ratio × Spread Credit Rate

Note: the Intercommodity Spread Credit Price Risk is rounded to nearest integer

E. Repeat C and D for the second leg in the spread

F. Repeat A to E to form other Intercommodity Spreads in next priority

G. Aggregate the Intercommodity Spread Credit of all priorities for each Combined Commodity to obtain the total Intercommodity Spread Credit of that Combined Commodity.

## 2.8. Short Option Minimum Charge

PRiME requires a Short Option Minimum Charge for each short option in a portfolio. It serves as a lower bound of margin requirement for the Combined Commodity comprising short options.

For the Combined Commodity,

1. Identify the Short Option Minimum Charge Rate for this commodity.

2. Count the number of short call and put options in this portfolio's positions in this Combined Commodity. Do not count long calls, long puts and futures. Take the maximum of number of short call and put options.

3. Multiply the result in step 1 by the result in step 2. The result is the Combined Commodity Short Option Minimum Charge.

   For Combined Commodity which contains standard and mini contracts (or capital adjusted contracts), the number of short call and put should be adjusted by the Delta Scaling Factor before being multiplied by the Short Option Minimum Charge Rate.

   Short Option Minimum Charge
   = Maximum (number. of short call, number of short put) x Short Option Minimum Charge Rate x Delta Scaling Factor

   Examples:
   Short 5 standard call contracts (Short Option Minimum Charge Rate is $6,000, Delta Scaling Factor is 1.00);
   Short 2 standard put contracts (Short Option Minimum Charge Rate is $6,000, Delta Scaling Factor is 1.00);
   Short 5 mini put contracts (Short Option Minimum Charge Rate is $6,000, Delta Scaling Factor is 0.20);

Short 2 mini call contracts (Short Option Minimum Charge Rate is $6,000, Delta Scaling Factor is 0.20)

Short Option Minimum Charge
= Max [(5 x 1.00 + 2 x 0.20), (2 x 1.00 + 5 x 0.20)] x $6,000 = $32,400

## 2.9. Risk Margin

Risk Margin is the term referring to the total risk of all contracts within the same Combined Commodity, considering the margin offset from intercommodity spread credit and also the Short Option Minimum Charge.

Risk Margin = Max (Commodity Risk – Intercommodity Spread Credit, Short Option Minimum Charge)

## 2.10. Long Option Value

Long Option Value is applied to all long options in each Combined Commodity. It serves as an upper bound of Risk Margin for each Combined Commodity with solely long calls and/or long put.

For each long option contract in this Combined Commodity,

1. Multiply the number of long positions by option contract value to obtain Long Option Value for each of the contract.

   Long Option Value = number of long positions x option contract value

   *where option contract value = option price as determined by the Clearing House x contract multiplier*

2. Add up all the Long Option Value in step 1 to derive Long Option Value for the Combined Commodity.

## 2.11. Mark-to-Market Margin (for SEOCH's premium-style options only)

Mark-to-Market Margin is the total option value of all contracts within the same Combined Commodity.

For each Combined Commodity,

1. Multiply the number of long/short positions by their respective option contract value to obtain Long Option Value/ Short Option Value for each of the contract.

   Long Option Value = number of long positions x option contract value
   Short Option Value = number of short positions x option contract value

   *where option contract value = option price as determined by the Clearing House x contract multiplier*

3. Subtract the sum of Long Option Value from the sum of Short Option Value in step 1 to derive Mark-to-Market Margin.

   Mark-to-market margin = ∑ Short Option Value - ∑ Long Option Value

## 2.12. Total Margin Requirement for Net Margining

1. Calculate Commodity Risk and deduct from it the Intercommodity Spread Credit, if any.

2. Calculate Risk Margin by taking the maximum of result from step 1 and Short Option Minimum Charge.

3. Check to see if all of the positions for this Combined Commodity are solely long puts and/or long calls. If so, and if this result is greater than the Long Option Value, reduce this result to the Long Option Value.

4. Repeat steps 1 through 3 for all the Combined Commodity in the portfolio.

5. Group the result in step 4 by Currency of the Contract.

6. For HKCC's futures and futures-style options, Total Margin Requirement in each Currency of the Contract

   = ∑ Result from step 5 of that Currency of the Contract

7. For SEOCH's premium-style options,

   A. Calculate the Mark-to-Market Margin (i.e. total option value) of that Currency of the Contract
   = ∑ Short Option Value of that Currency of the Contract - ∑ Long Option Value of that Currency of the Contract

   B. Calculate the Total Margin Requirement in each Currency of the Contract
   = ∑ Result from step 5 of that Currency of the Contract + Mark-to-Market Margin of that Currency of the Contract

   C. Check to see if there is a margin credit (negative Total Margin Requirement) in one Currency of the Contract and a margin debit (positive Total Margin Requirement) in other Currency of the Contract. If so, apply the margin credit to offset the margin debit. Before the offset, convert the margin credit into the currency (conversion rate will be determined by the clearing house from time to time) in which the margin debit is denominated.

   D. If step C results in margin debit(s), the margin debit(s) will become the Total Margin Requirement. If step C results in margin credit(s), the margin credit will be set to zero and there will be no Total Margin Requirement.

## 2.13. Total Margin Requirement for Gross Margining

1. Calculate Scan Risk for each of the contract.

2. Calculate Spot Month Charge for each of the applicable contract.

3. Calculate Risk Margin by taking the maximum of result from the sum of step 1 and 2, and the Short Option Minimum Charge for the contract.

4. Repeat steps 1 through 3 for all the contracts in the portfolio.

5. Group the result in step 4 by Currency of the Contract

6. Add up the result in step 5.

   For HKCC's futures and futures-style options, Total Margin Requirement in each Currency of the Contract
   = ∑ Result from step 5 of that Currency of the Contract

   For SEOCH's premium-style options, Total Margin Requirement in each Currency of the Contract
   = ∑ Result from step 5 of that Currency of the Contract + Mark-to-Market Margin of that Currency of the Contract

# Part 3. Examples

## 3.1 HKCC Products

**Portfolio A under Net Margining**

Long 1 MAY HSI Futures
Short 4 JUN Mini-HSI Futures

HSI and Mini-HSI contracts are grouped into the same Combined Commodity. Delta Scaling Factor for HSI is 1.0 and mini-HSI is 0.2.

**1. Scan Risk**

**Risk Arrays:**

| Line | +1 MAY HSI Futures P/L | -4 JUN Mini-HSI Futures P/L | Total P/L ($) |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 |
| 3 | -10,000 | +8,000 | -2,000 |
| 4 | -10,000 | +8,000 | -2,000 |
| 5 | +10,000 | -8,000 | +2,000 |
| 6 | +10,000 | -8.000 | +2,000 |
| 7 | -20,000 | +16,000 | -4,000 |
| 8 | -20,000 | +16,000 | -4,000 |
| 9 | +20,000 | -16,000 | +4,000 |
| 10 | +20,000 | -16,000 | +4,000 |
| 11 | -30,000 | +24,000 | -6,000 |
| 12 | -30,000 | +24,000 | -6,000 |
| 13 | +30,000 | -24,000 | **+6,000** |
| 14 | +30,000 | -24,000 | **+6,000** |
| 15 | -21,000 | +16,800 | -4,200 |
| 16 | +21,000 | -16,800 | +4,200 |
| 17 | +1.00 | -4.00 | |

⇒ **Scan Risk = $ 6,000**

**2. Intracommodity Spread Charge**

Composite Delta for HSI Futures: +1
Composite Delta for Mini-HSI Futures: +1

The Composite Delta after adjusted by the Delta Scaling Factor:
Long 1 MAY HSI Futures = +1 x 1 x 1.0 = +1
Short 4 JUN Mini-HSI Futures = +1 x (-4) x 0.2 = -0.8

0.8 Intracommodity Spread can be formed

⇒ **Intracommodity Spread Charge = 0.8 x $7,500 = $6,000**

**3. Total Margin Requirement**

Total Margin Requirement
= Max (Commodity Risk, Short Option Minimum Charge)
= Max (Scan Risk + Intracommodity Spread Charge, 0)
= Max (6,000 + 6,000,0)
= $12,000

**Portfolio A under Gross Margining**

Long 1 MAY HSI Futures
Short 4 JUN Mini-HSI Futures

**1. Scan Risk**

**Risk Arrays:**

| Line | +1 MAY HSI Futures P/L | -4 JUN Mini-HSI Futures P/L |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | -10,000 | +8,000 |
| 4 | -10,000 | +8,000 |
| 5 | +10,000 | -8,000 |
| 6 | +10,000 | -8.000 |
| 7 | -20,000 | +16,000 |
| 8 | -20,000 | +16,000 |
| 9 | +20,000 | -16,000 |
| 10 | +20,000 | -16,000 |
| 11 | -30,000 | +24,000 |
| 12 | -30,000 | **+24,000** |
| 13 | +30,000 | -24,000 |
| 14 | **+30,000** | -24,000 |
| 15 | -21,000 | +16,800 |
| 16 | +21,000 | -16,800 |
| 17 | +1.00 | -4.00 |

**Scan Risk**
**⇒ Long 1 MAY HSI Futures: 30,000**
**⇒ Short 4 JUN Mini-HSI Futures: 24,000**

**2. Total Margin Requirement**

Total Margin Requirement
= $\sum$ [Max (Scan Risk, Short Option Minimum Charge) for each contract]
= Max (30,000,0) + Max (24,000,0)
= $54,000

**Portfolio B under Net Margining**

Long 1 MAY HSI Futures

Short 2 JUN HSI 10,000 Call Options

**1. Scan Risk**

**Risk Arrays:**

| Line | +1 MAY HSI Futures P/L | -2 JUN HSI 10,000 Call P/L | Total P/L ($) |
|---|---|---|---|
| 1 | 0 | +4,336 | +4,336 |
| 2 | 0 | -4,337 | -4,337 |
| 3 | -10,000 | +5,555 | -4,445 |
| 4 | -10,000 | +7,054 | -2,946 |
| 5 | +10,000 | -5,166 | +4,834 |
| 6 | +10,000 | -13,488 | -3,488 |
| 7 | -20,000 | +28,404 | +8,404 |
| 8 | -20,000 | +20,539 | +539 |
| 9 | +20,000 | -12,939 | +7,061 |
| 10 | +20,000 | -20,422 | -422 |
| 11 | -30,000 | +42,735 | **+12,735** |
| 12 | -30,000 | +35,842 | +5,842 |
| 13 | +30,000 | -19,057 | +10,943 |
| 14 | +30,000 | -25,338 | +4,662 |
| 15 | -21,000 | +31,745 | +10,745 |
| 16 | +21,000 | -10,717 | +10,283 |
| 17 | +1.00 | -1.04 | |

⇒ **Scan Risk = $ 12,735**

**2. Intracommodity Spread Charge**

Composite Delta for 1 HSI Futures: +1
Composite Delta for 1 10,000 HSI Call Options: +0.52

The Composite Delta after adjusted by Delta Scaling Factor
Long 1 MAY HSI Futures = +1 x 1 = +1
Short 2 JUN HSI Call Options = +0.52 x (-2) = -1.04

i.e. One Intracommodity Spread can be formed

⇒ Intracommodity Spread Charge = 1 x $7,500 = $7,500

**3. Short Option Minimum Charge**

Short Option Minimum = $6,000 x 2 = $12,000

**4. Total Margin Requirement**

Total Margin Requirement
= Max [Commodity Risk, Short Option Minimum Charge]
= Max [Scan Risk + Intracommodity Spread Charge, Short Option Minimum Charge]
= Max [12,735 + 7,500, 12,000]
= $20,235

**Portfolio B under Gross Margining**

Long 1 MAY HSI Futures
Short 2 JUN HSI 10,000 Call Options

**1. Scan Risk**

**Risk Arrays:**

| Line | +1 MAY HSI Futures P/L | -2 JUN HSI 10,000 Call P/L |
|---|---|---|
| 1 | 0 | +4,336 |
| 2 | 0 | -4,337 |
| 3 | -10,000 | +5,555 |
| 4 | -10,000 | +7,054 |
| 5 | +10,000 | -5,166 |
| 6 | +10,000 | -13,488 |
| 7 | -20,000 | +28,404 |
| 8 | -20,000 | +20,539 |
| 9 | +20,000 | -12,939 |
| 10 | +20,000 | -20,422 |
| 11 | -30,000 | **+42,735** |
| 12 | -30,000 | +35,842 |
| 13 | +30,000 | -19,057 |
| 14 | **+30,000** | -25,338 |
| 15 | -21,000 | +31,745 |
| 16 | +21,000 | -10,717 |
| 17 | +1.00 | -1.04 |

**Scan Risk**
**⇒Long 1 MAY HSI Futures: 30,000**
**⇒Short 2 JUN HSI 10,000 Call Options: 42,735**

**2. Total Margin Requirement**

Total Margin Requirement
= ∑ [Max (Scan Risk, Short Option Minimum Charge) for each contract]
= Max (30,000,0) + Max [42,735, 2 x 6,000]
= $72,735

**Portfolio C under Net Margining**

Long 2 MAR CNH Futures (applicable to Spot Month Charge)
Short 1 APR CNH Futures

**1. Scan Risk**

**Risk Arrays:**

| Line | +2 MAR CNH Futures P/L | -1 APR CNH Futures P/L | Total P/L (RMB) |
|---|---|---|---|
| 1 | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 |
| 3 | -4,000 | +2,000 | -2,000 |
| 4 | -4,000 | +2,000 | -2,000 |
| 5 | +4,000 | -2,000 | +2,000 |
| 6 | +4,000 | -2,000 | +2,000 |
| 7 | -8,000 | +4,000 | -4,000 |
| 8 | -8,000 | +4,000 | -4,000 |
| 9 | +8,000 | -4,000 | +4,000 |
| 10 | +8,000 | -4,000 | +4,000 |
| 11 | -12,000 | +6,000 | -6,000 |
| 12 | -12,000 | +6,000 | -6,000 |
| 13 | +12,000 | -6,000 | **+6,000** |
| 14 | +12,000 | -6,000 | **+6,000** |
| 15 | -10,800 | +5,400 | -5,400 |
| 16 | +10,800 | -5,400 | +5,400 |
| 17 | +2.00 | -1.00 | |

⇒ **Scan Risk = RMB 6,000**

**2. Intracommodity Spread Charge**

Composite Delta for Long 2 MAR CNH Futures = +1 x 2 = +2
Composite Delta for Short 1 APR CNH Futures = +1 x (-1) = -1

1 Intracommodity Spread can be formed

⇒ Intracommodity Spread Charge = 1 x RMB 3,600 = RMB 3,600

**3. Spot Month Charge**

Delta of spot month contract consumed by Intracommodity Spread = 1
Delta of spot month contract remaining in outrights = 1

⇒ Spot Month Charge
= (Delta consumed by spread x Spot Month Charge per Delta consumed by spread)
+ (Delta remaining in outrights x Spot Month Charge per Delta remaining in outrights)
= RMB (1 x 1,200 +1 x 1,200) = RMB 2,400

**4. Total Margin Requirement**

Total Margin Requirement
= Max (Commodity Risk, Short Option Minimum Charge)
= Max (Scan Risk + Intracommodity Spread Charge + Spot Month Charge, 0)
= Max (6,000 + 3,600 + 2,400, 0)
= RMB 12,000

**Portfolio C under Gross Margining**

Long 2 MAR CNH Futures (applicable to Spot Month Charge)
Short 1 APR CNH Futures

**1. Scan Risk**

**Risk Arrays:**

| Line | +2 MAR CNH Futures P/L | -1 APR CNH Futures P/L |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | -4,000 | +2,000 |
| 4 | -4,000 | +2,000 |
| 5 | +4,000 | -2,000 |
| 6 | +4,000 | -2,000 |
| 7 | -8,000 | +4,000 |
| 8 | -8,000 | +4,000 |
| 9 | +8,000 | -4,000 |
| 10 | +8,000 | -4,000 |
| 11 | -12,000 | **+6,000** |
| 12 | -12,000 | **+6,000** |
| 13 | **+12,000** | -6,000 |
| 14 | **+12,000** | -6,000 |
| 15 | -10,800 | +5,400 |
| 16 | +10,800 | -5,400 |
| 17 | +2.00 | -1.00 |

**Scan Risk**
**⇒ Long 2 MAR CNH Futures : 12,000**
**⇒ Short 1 APR CNH Futures : 6,000**

**2. Spot Month Charge**

Delta of spot month contract remaining in outrights = 2

⇒ Spot Month Charge
= Delta remaining in outrights x Spot Month Charge per Delta remaining in outrights
= 2 x RMB 1,200 = RMB 2,400

**3. Total Margin Requirement**

Total Margin Requirement
= Σ [Max (Scan Risk + Spot Month Charge, Short Option Minimum Charge) for each contract]
= Max (12,000 + 2,400, 0) + Max (6,000 + 0, 0)
= RMB 20,400

**Portfolio D under Net Margining**

Short 2 MAR AAA Futures
Long 2 Apr AAA 20000 Call
Long 2 MAR BBB Futures

Intercommodity Spread (HKCC)

| Priority | Leg 1 | | | Leg 2 | | | Spread Credit Rate |
|---|---|---|---|---|---|---|---|
| | Combined Commodity | Delta per Spread Ratio | Side | Combined Commodity | Delta per Spread Ratio | Side | |
| 1 | CAH | 1 | A | CAR | 2 | B | 75% |
| 2 | BBB | 3 | A | AAA | 2 | B | 70% |
| 3 | BBB | 5 | A | CAH | 4 | B | 50% |

**1. Scan Risk**

**Risk Arrays of BBB:**

| Line | +2 MAR BBB Futures P/L | Total P/L P/L |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | -26,500 | -26,500 |
| 4 | -26,500 | -26,500 |
| 5 | 26,500 | 26,500 |
| 6 | 26,500 | 26,500 |
| 7 | -53,000 | -53,000 |
| 8 | -53,000 | -53,000 |
| 9 | 53,000 | 53,000 |
| 10 | 53,000 | 53,000 |
| 11 | -79,500 | -79,500 |
| 12 | -79,500 | -79,500 |
| 13 | 79,500 | **79,500** |
| 14 | 79,500 | **79,500** |
| 15 | -71,550 | -71,550 |
| 16 | 71,550 | 71,550 |
| 17 | +2.00 | |

⇒ **Scan Risk of BBB = HKD79,500**

**Risk Arrays of AAA:**

| Line | -2 MAR AAA Futures P/L | +2 APR 20000 AAA Call P/L | Total P/L P/L |
|---|---|---|---|
| 1 | 0 | -14,892 | -14,892 |
| 2 | 0 | 16,086 | 16,086 |

| | | | |
|---|---|---|---|
| 3 | 39,800 | -39,244 | 556 |
| 4 | 39,800 | -9,834 | 29,966 |
| 5 | -39,800 | 6,734 | -33,066 |
| 6 | -39,800 | 37,866 | -1,934 |
| 7 | 79,500 | -66,144 | 13,356 |
| 8 | 79,500 | -39,414 | 40,086 |
| 9 | -79,500 | 25,526 | -53,974 |
| 10 | -79,500 | 55,288 | -24,212 |
| 11 | 119,300 | -95,354 | 23,946 |
| 12 | 119,300 | -72,022 | **47,278** |
| 13 | -119,300 | 41,460 | -77,840 |
| 14 | -119,300 | 68,456 | -50,844 |
| 15 | 107,400 | -90,118 | 17,282 |
| 16 | -107,400 | 26,976 | -80,424 |
| 17 | -2.00 | +1.16 | |

⇒ **Scan Risk of AAA = HKD47,278**

## 2. Intracommodity Spread Charge

Composite Delta for AAA Futures: +1
Composite Delta for AAA 20000 Call: +0.58

The Composite Delta after adjustment by the Delta Scaling Factor:
Short 2 MAR AAA Futures = +1 x (-2) x 1.0 = -2.00
Long 2 APR AAA 20000 Call = +0.58 x (+2) x 1.0 = +1.16

1.16 Intracommodity Spread can be formed

⇒ Intracommodity Spread Charge = 1.16 x HKD 7,500 = HKD8,700

## 3. Intercommodity Spread Credit

a. Number of Intercommodity Spread

| Intercommodity Spread Priority [a)] | 2.BBB-AAA |
|---|---|
| Composite Delta[b)] available to form Intercommodity Spread: | |
| BBB | +1 x (+2) x 1.0 = +2.00 |
| AAA | +1 x (-2) x 1.0 + 0.58 x (+2) x 1.0 = -0.84 |
| Number of Intercommodity Spread formed | Min(\|+2\|/3,\|-0.84\|/2) = 0.4200 |

Note:
a) As there are no delta from CAH and CAR in this portfolio, it is not possible to form the CAH-CAR spread.
b) The Composite Deltas are all adjusted by their Delta Scaling Factors.

b. Weighted Price Risk (WPR)

| **Combined Commodity** | **BBB** | **AAA** |
|---|---|---|
| Time Risk = (Scenario 1 Loss + Scenario 2 Loss)/2 | (0 + 0)/2 = HKD 0 | (-14,892 + 16,086)/2 = HKD597.00 |
| Scan Risk Scenario | 13 | 12 |
| Paired Scenario | 14 | 11 |
| Price Risk = (Scan Risk Scenario Loss+ Paired Scenario Loss)/2 - Time Risk | (79,500+79,500)/2 -0 = HKD 79,500.00 | (47,278 + 23,946)/2 -597 = HKD 35,015.00 |
| Composite Delta | +2 | -0.84 |
| WPR = Price Risk/ \|Composite Delta\| | 79,500.00/\|+2\| = HKD 39,750.00 | 35,015.00/\|-0.84\| = HKD 41,684.52 |

c. Intercommodity Spread Credit

| **Combined Commodity** | **BBB** | **AAA** |
|---|---|---|
| WPR | HKD 39,750.00 | HKD 41,684.52 |
| Intercommodity Spread:<br><br>Priority 2. BBB-AAA | | |
| a) Number of Spread | 0.4200 | 0.4200 |
| b) Delta per Spread Ratio | 3 | 2 |
| c) Spread Credit Rate | 70% | 70% |
| Intercommodity Spread Credit = WPR × a) × b) × c) | HKD 35,060 | HKD 24,510 |
| Intercommodity Spread Credit of Combined Commodity | HKD 35,060 | HKD 24,510 |

**5. Total Margin Requirement**

Total Margin Requirement
= ∑ [Max (Commodity Risk – Intercommodity Spread Credit, Short Option Minimum Charge) for each Combined Commodity]
= ∑ [Max (Scan Risk + Intracommodity Charge + Spot Month Charge- Intercommodity Spread Credit, Short Option Minimum Charge) for each Combined Commodity]
= Max(79,500 – 35,060,0) + Max(47,278 + 8,700 – 24,510, 0)
= 44,440 + 31,468
= HKD 75,908

**Portfolio E under Net Margining**

Long 2 MAR BBB Futures
Short 2 MAR CAR Futures

Long 1 MAR CAH Futures

CAR Futures is traded and settled in RMB

Intercommodity Spread (HKCC)

| Priority | Leg 1 | | | Leg 2 | | | Spread Credit Rate |
|---|---|---|---|---|---|---|---|
| | Combined Commodity | Delta per Spread Ratio | Side | Combined Commodity | Delta per Spread Ratio | Side | |
| 1 | CAH | 1 | A | CAR | 1 | B | 75% |
| 2 | BBB | 3 | A | AAA | 2 | B | 70% |
| 3 | CAR | 4 | A | BBB | 5 | B | 50% |

**1. Scan Risk**

**Risk Arrays of CAH:**

| Line | +1 MAR CAH Futures P/L | Total P/L P/L(HKD) |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | -1,500 | -1,500 |
| 4 | -1,500 | -1,500 |
| 5 | +1,500 | +1,500 |
| 6 | +1,500 | +1,500 |
| 7 | -3,000 | -3,000 |
| 8 | -3,000 | -3,000 |
| 9 | +3,000 | +3,000 |
| 10 | +3,000 | +3,000 |
| 11 | -4,500 | -4,500 |
| 12 | -4,500 | -4,500 |
| 13 | +4,500 | **+4,500** |
| 14 | +4,500 | **+4,500** |
| 15 | -4,050 | -4,050 |
| 16 | +4,050 | +4,050 |
| 17 | +1.00 | |

⇒ **Scan Risk of CAH= HKD 4,500**

**Risk Arrays of CAR:**

| Line | -2 MAR CAR Futures P/L | Total P/L P/L(RMB) |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | +2,400 | +2,400 |

| | | |
|---|---|---|
| 4 | +2,400 | +2,400 |
| 5 | -2,400 | -2,400 |
| 6 | -2,400 | -2,400 |
| 7 | +4,800 | +4,800 |
| 8 | +4,800 | +4,800 |
| 9 | -4,800 | -4,800 |
| 10 | -4,800 | -4,800 |
| 11 | +7,200 | **+7,200** |
| 12 | +7,200 | **+7,200** |
| 13 | -7,200 | -7,200 |
| 14 | -7,200 | -7,200 |
| 15 | +6,480 | +6,480 |
| 16 | -6,480 | -6,480 |
| 17 | -2.00 | |

⇒ **Scan Risk of CAR= RMB 7,200**

**Risk Arrays of BBB:**

| Line | +2 MAR BBB Futures P/L | Total P/L P/L(HKD) |
|---|---|---|
| 1 | 0 | 0 |
| 2 | 0 | 0 |
| 3 | -26,500 | -26,500 |
| 4 | -26,500 | -26,500 |
| 5 | 26,500 | 26,500 |
| 6 | 26,500 | 26,500 |
| 7 | -53,000 | -53,000 |
| 8 | -53,000 | -53,000 |
| 9 | 53,000 | 53,000 |
| 10 | 53,000 | 53,000 |
| 11 | -79,500 | -79,500 |
| 12 | -79,500 | -79,500 |
| 13 | 79,500 | **79,500** |
| 14 | 79,500 | **79,500** |
| 15 | -71,550 | -71,550 |
| 16 | 71,550 | 71,550 |
| 17 | +2.00 | |

⇒ **Scan Risk of BBB = HKD 79,500**

**2. Intercommodity Spread Credit**

a. Number of Intercommodity Spread

Since the spread CAH-CAR is higher in priority, it will be formed first before CAR-BBB

| Intercommodity Spread Priority [a)] | 1.CAH-CAR | 3.CAR-BBB |
|---|---|---|
| Composite Delta available to form Intercommodity Spread: | | |
| CAH<br>CAR<br>BBB | +1 x (+1) x 1.0 = +1<br>+1 x (-2) x 1.0 = -2 | <br>-2 – (-1)= -1 [b)]<br>+1 x (+2) x 1.0 = +2 |
| Number of Intercommodity Spread formed | Min(\|+1\|/1,\|-2\|/1) = 1 | Min(\|-1\|/4, \|+2\|/5) = 0.25 |

Note:

a. Since there is no delta from AAA, forming spread of BBB-AAA is not possible.

b. Available delta of CAR to form CAR-BBB spread is -1 instead of -2 as -1 delta has already been consumed by the CAH-CAR spread higher in priority. Available delta of CAR for CAR-BBB spread = -2.00 – Number of Intercommodity Spread formed in CAH-CAR x Delta per Spread of CAR in that CAH-CAR spread = -2 – (1x-1).

b. Weighted Price Risk(WPR)

| **Combined Commodity** | **CAH** | **CAR** | **BBB** |
|---|---|---|---|
| Time Risk = (Scenario 1 Loss+ Scenario 2 Loss)/2 | 0 | 0 | 0 |
| Scan Risk Scenario | 13 | 11 | 13 |
| Paired Scenario | 14 | 12 | 14 |
| Price Risk = (Scan Risk Scenario Loss + Paired Scenario Loss)/2 - Time Risk | (4,500+4,500)/2 - 0 = HKD 4,500.00 | (7,200+7,200)/2 - 0 = RMB 7,200.00 | (79,500+79,500) /2 - 0 = HKD 79,500.00 |
| Composite Delta | +1 | -2 | +2 |
| WPR = Price Risk/ \|Composite Delta\| | 4,500.00/\|+1\| = HKD 4,500.00 | 7,200.00/\|-2\| = RMB 3,600.00 | 79,500.00/\|+2\| = HKD 39,750.00 |

c. Intercommodity Spread Credit

| **Combined Commodity** | **CAH** | **CAR** | **BBB** |
|---|---|---|---|
| WPR | HKD 4,500.00 | RMB 3,600.00 | HKD 39,750.00 |
| Intercommodity Spread:<br><br>Priority 1.CAH-CAR | | | |
| a)Number of Spread | 1 | 1 | N/A |
| b)Delta per Spread Ratio | 1 | 1 | N/A |
| c)Spread Credit Rate | 75% | 75% | N/A |

| | | | |
|---|---|---|---|
| Intercommodity Spread Credit = WPR × a) × b) × c) | HKD 3,375 | RMB 2,700 | N/A |
| Priority 3.CAR-BBB | | | |
| a)Number of Spread | N/A | 0.25 | 0.25 |
| b)Delta per Spread Ratio | N/A | 4 | 5 |
| c)Spread Credit Rate | N/A | 50% | 50% |
| Intercommodity Spread Credit = WPR × a) × b) × c) | N/A | RMB1,800 | HKD 24,844 |
| Intercommodity Spread Credit of Combined Commodity | HKD 3,375 | 2,700 + 1,800 = RMB 4,500 | HKD 24,844 |

**3. Total Margin Requirement**

Total Margin Requirement
= ∑ [Max (Commodity Risk – Intercommodity Spread Credit, Short Option Minimum Charge) for each Combined Commodity]
= ∑ [Max (Scan Risk + Intracommodity Charge + Spot Month Charge- Intercommodity Spread Credit, Short Option Minimum Charge) for each Combined Commodity]

Total Margin Requirement (HKD)
= Total Margin Requirement of CAH + Total Margin Requirement of BBB
= Max (4,500 – 3,375, 0) + Max (79,500 – 24,844, 0)
= 1,125 + 54,656
= HKD 55,781

Total Margin Requirement (RMB)
= Total Margin Requirement of CAR
= Max (7,200 – 4,500, 0)
= RMB 2,700

## 3.2 SEOCH Products

**Portfolio F under Net Margining**

Long 1 MAY HKB90.00 Call, Settlement Price = HKD 1.00
Short 2 JUN HKB100.00 Call, Settlement Price = HKD 0.60
Long 1 MAY RMZ50.00 Call, Settlement Price = RMB 3.00

HKB is denominated in HKD while RMZ is denominated in RMB.

**1. Scan Risk**

**Risk Arrays of HKB (HKD):**

| Line | +1 MAY HKB90.00 Call P/L | -2 JUN HKB100.00 Call P/L | Total P/L (HKD) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 1 | 0 | +80 | +80 |
| 2 | +1,100 | -50 | +1,050 |
| 3 | -623 | +1,234 | +611 |
| 4 | -623 | +1,126 | +503 |
| 5 | +623 | -1,018 | -395 |
| 6 | +623 | -1,288 | -665 |
| 7 | -1,247 | +2,422 | +1,175 |
| 8 | -1,247 | +2,366 | +1,119 |
| 9 | +1,242 | -2,018 | -776 |
| 10 | +1,242 | -2,408 | -1,166 |
| 11 | -1,871 | +3,642 | **+1,771** |
| 12 | -1,871 | +3,612 | +1,741 |
| 13 | +1,854 | -2,946 | -1,092 |
| 14 | +1,868 | -2,414 | -546 |
| 15 | -1,310 | +2,574 | +1,264 |
| 16 | +1,251 | -1,810 | -559 |
| 17 | +1 | -1.30 | |

⇒ **Scan Risk = HKD 1,771**

**Risk Arrays of RMZ (RMB):**

| Line | +1 MAY RMZ50.00 Call P/L | Total P/L (RMB) |
|---|---|---|
| 1 | -315 | -315 |
| 2 | +393 | +393 |
| 3 | -840 | -840 |
| 4 | -198 | -198 |
| 5 | +124 | +124 |
| 6 | +812 | +812 |
| 7 | -1,445 | -1,445 |
| 8 | -924 | -924 |
| 9 | +475 | +475 |
| 10 | +1,063 | +1,063 |
| 11 | -2,120 | -2,120 |
| 12 | -1,736 | -1,736 |
| 13 | +742 | +742 |
| 14 | +1,185 | **+1,185** |
| 15 | -2,094 | -2,094 |
| 16 | +375 | +375 |
| 17 | +0.50 | |

⇒ **Scan Risk = RMB 1,185**

**2. Intracommodity Spread Charge**

Composite Delta for 1 MAY HKB90.00 Call: +1
Composite Delta for 1 JUN HKB100.00 Call: +0.65

The Composite Delta:
Long 1 MAY HKB90.00 Call = +1 x 1 = +1
Short 2 JUN HKB100.00 Call = + 0.65 x (-2) = -1.30

i.e. One Intracommodity Spread of HKB can be formed in the Portfolio F

⇒ **Intracommodity Spread Charge = 1 x HKD 450 = HKD 450**

Composite Delta for 1 MAY RMZ50.00 Call: +0.5

The Composite Delta:
Long 1 MAY RMZ50.00 Call = +1 x 0.5 = +0.5

i.e. As there is only one contract month, no Intracommodity Spread of RMZ can be formed in the Portfolio F.

**3. Short Option Minimum Charge**

Short Option Minimum of HKB = HKD 500 x 2= HKD 1,000
Short Option Minimum of RMZ = RMB 0

**4. Long Option Value**

Long Option Value of RMZ = RMB 3.00 x 400 = RMB 1,200

**5. Total Margin Requirement**

Total Margin Requirement of a Combined Commodity with short options
= Max [Commodity Risk, Short Option Minimum Charge] + Mark-to-Market Margin
= Max [Scan Risk + Intracommodity Spread Charge, Short Option Minimum Charge] + Mark-to-Market Margin

Total Margin Requirement of a Combined Commodity with solely long puts and/or long calls
= Min [(Scan Risk + Intracommodity Spread Charge), Long Option Value] + Mark-to-Market Margin

Total Margin Requirement of HKB (HKD)
= Max [1,771 + 450, 1,000] + (-HKD 1.00 x 1 x 400 + HKD 0.60 x 2 x 400)
= HKD 2,301

Total Margin Requirement of RMZ (RMB)
= Min [(1,185 + 0), 1,200] + (-RMB 3.00 x 400)
= -RMB 15

Since there is a margin credit in RMB (i.e. negative Total Margin Requirement) and margin debit in HKD (i.e. positive Total Margin Requirement), the margin credit will be used to offset the margin debit. Before the offset, the margin credit will first be converted into the currency in which margin debit is denominated.

Assuming the Conversion rate for RMB/HKD = 1.2267,

Total Margin Requirement after cross-currency margin credit offset
= HKD 2,301 – RMB 15 x 1.2267
= HKD 2,283

**Portfolio G under Gross Margining**

Long 1 MAY HKB90.00 Call
Short 2 JUN HKB100.00 Call, Settlement Price = HKD 0.60
Long 1 MAY RMZ50.00 Call

**1. Scan Risk**

**Risk Arrays of HKB (HKD):**

| Line | +1 MAY HKB90.00 Call* P/L | -2 JUN HKB100.00 Call P/L |
|---|---|---|
| 1 | 0 | +80 |
| 2 | 0 | -50 |
| 3 | 0 | +1,234 |
| 4 | 0 | +1,126 |
| 5 | 0 | -1,018 |
| 6 | 0 | -1,288 |
| 7 | 0 | +2,422 |
| 8 | 0 | +2,366 |
| 9 | 0 | -2,018 |
| 10 | 0 | -2,408 |
| 11 | 0 | **+3,642** |
| 12 | 0 | +3,612 |
| 13 | 0 | -2,946 |
| 14 | 0 | -2,414 |
| 15 | 0 | +2,574 |
| 16 | 0 | -1,810 |
| 17 | 0 | -1.30 |

* Long position is ignored

**⇒ Scan Risk = HKD 3,642**

**Risk Arrays of RMZ (RMB):**

| Line | +1 MAY RMZ 50.00 Call* P/L |
|---|---|
| 1 | 0 |
| 2 | 0 |

| | |
|---|---|
| 3 | 0 |
| 4 | 0 |
| 5 | 0 |
| 6 | 0 |
| 7 | 0 |
| 8 | 0 |
| 9 | 0 |
| 10 | 0 |
| 11 | 0 |
| 12 | 0 |
| 13 | 0 |
| 14 | 0 |
| 15 | 0 |
| 16 | 0 |
| 17 | 0 |

* Long position is ignored

⇒ **Scan Risk = RMB 0**

**2. Total Margin Requirement**

Total Margin Requirement of HKB (HKD)
= ∑ [Max (Scan Risk, Short Option Minimum Charge) for each contract] + Mark-to-Market Margin
= Max [3,642, 2 x 500] + (0.6 x 2 x 400)
= 3,642 + 480
= HKD 4,122

Total Margin Requirement of RMZ (RMB)
= RMB 0

**Portfolio H under Net Margining**

Long 1 MAY RHK 45.00 Call, Settlement Price = 5.50
Short 1 MAY RMZ 50.00 Call, Settlement Price = 1.80
RHK is denominated in HKD while RMZ is denominated in RMB.

Intercommodity Spread (SEOCH):

| Priority | Leg 1 | | | Leg 2 | | | Spread Credit Rate |
|---|---|---|---|---|---|---|---|
| | Combined Commodity | Delta per Spread Ratio | Side | Combined Commodity | Delta per Spread Ratio | Side | |
| 1 | RHK | 1 | A | RMZ | 1 | B | 75% |

**1. Scan Risk**

**Risk Arrays of RHK (HKD):**

| Line | +1 MAY RHK 45.00 Call P/L | Total P/L (HKD) |
|---|---|---|
| 1 | -215 | -215 |
| 2 | +210 | +210 |
| 3 | -930 | -930 |
| 4 | -620 | -620 |
| 5 | +441 | +441 |
| 6 | +984 | +984 |
| 7 | -1,693 | -1,693 |
| 8 | -1,480 | -1,480 |
| 9 | +1,029 | +1,029 |
| 10 | +1,665 | +1,665 |
| 11 | -2,492 | -2,492 |
| 12 | -2,353 | -2,353 |
| 13 | +1,539 | +1,539 |
| 14 | +2,216 | **+2,216** |
| 15 | -2,289 | -2,289 |
| 16 | +921 | +921 |
| 17 | +0.80 | |

⇒ **Scan Risk = HKD 2,216**

**Risk Arrays of RMZ (RMB):**

| Line | -1 MAY RMZ 50.00 Call P/L | Total P/L (RMB) |
|---|---|---|
| 1 | +315 | +315 |
| 2 | -393 | -393 |
| 3 | +840 | +840 |
| 4 | +198 | +198 |
| 5 | -124 | -124 |
| 6 | -812 | -812 |
| 7 | +1,445 | +1,445 |
| 8 | +924 | +924 |
| 9 | -475 | -475 |
| 10 | -1,063 | -1,063 |
| 11 | +2,120 | **+2,120** |
| 12 | +1,736 | +1,736 |
| 13 | -742 | -742 |
| 14 | -1,185 | -1,185 |
| 15 | +2,094 | +2,094 |
| 16 | -375 | -375 |
| 17 | -0.50 | |

⇒ **Scan Risk = RMB 2,120**

**2. Intercommodity Spread Credit**

a. Number of Intercommodity Spread

| Intercommodity Spread Priority | 1.RHK-RMZ |
|---|---|
| Composite Delta available to form Intercommodity Spread: | |
| RHK<br>RMZ | +0.8 x (+1) x 1.0 = +0.80<br>-0.5 x (+1) x 1.0 = -0.50 |
| Number of Intercommodity Spread formed | Min(\|+0.80\|/1,\|-0.50\|/1) = 0.5000 |

b. Weighted Price Risk (WPR)

| **Combined Commodity** | **RHK** | **RMZ** |
|---|---|---|
| Time Risk = (Scenario 1 Loss+ Scenario 2 Loss)/2 | (-215 + 210)/2 = - 2.50 | (+315 – 393)/2 = -39.00 |
| Scan Risk Scenario | 14 | 11 |
| Paired Scenario | 13 | 12 |
| Price Risk = (Scan Risk Scenario Loss + Paired Scenario Loss)/2 - Time Risk | (2,216 + 1,539)/2 – (-2.50) =HKD 1,880.00 | (2,120 + 1,736)/2 – (-39) =RMB 1,967.00 |
| Composite Delta | +0.80 | -0.50 |
| WPR = Price Risk/ \|Composite Delta\| | 1,880/\|+0.80\| = HKD 2,350.00 | 1,967/\|-0.50\| = RMB 3,934.00 |

c. Intercommodity Spread Credit

| **Combined Commodity** | **RHK** | **RMZ** |
|---|---|---|
| WPR | HKD 2,350.00 | RMB 3,934.00 |
| Intercommodity Spread:<br><br>Priority 1.RHK-RMZ<br>a)Number of Spread | <br><br><br>0.5000 | <br><br><br>0.5000 |
| b)Delta per Spread Ratio | 1 | 1 |
| c)Spread Credit Rate | 75% | 75% |
| Intercommodity Spread Credit = WPR × a) × b) × c) | HKD 881 | RMB 1,475 |
| Intercommodity Spread Credit of Combined Commodity | **HKD 881** | **RMB 1,475** |

**3. Short Option Minimum**

Short Option Minimum of RMZ = 200 x 1 = RMB 200

**4. Long Option Value**

Long Option Value of RHK = 400 x HKD 5.50 = HKD 2,200

**5. Total Margin Requirement**

Total Margin Requirement of a Combined Commodity with short options
= Max [Commodity Risk – Intercommodity Spread Credit, Short Option Minimum Charge] + Mark-to-Market Margin

Total Margin Requirement of a Combined Commodity with solely long puts and/or long calls
= Min [(Commodity Risk – Intercommodity Spread Credit), Long Option Value] + Mark-to-Market Margin

Total Margin Requirement (HKD)
= Total Margin Requirement of RHK
= Min (2,216 – 881, 2,200) + (- 5.50 x 400)
= HKD 1,335 – 2,200
= - HKD 865

Total Margin Requirement (RMB)
= Total Margin Requirement of RMZ
= Max (2,120 – 1,475, 200) + (1.80 x 400)
= RMB 645 + 720
= RMB 1,365

Since there is margin credit in HKD (i.e. negative Total Margin Requirement) and margin debit in RMB, the margin credit will be used to offset the margin debit. Before the offset, the margin credit will first be converted into the currency in which margin debit is denominated. Assuming the Conversion rate for HKD/RMB = 0.8152,

Margin credit in RMB = HKD 865 x 0.8152 = RMB 705.15

⇒ Total Margin Requirement after cross-currency margin credit offset
= RMB 1,365 – RMB 705.15
= RMB 659.85