LME Clear
An HKEX Company

SPAN Methodology

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1 SPAN Initial Margin Calculation

SPAN[1] utilises the margin parameters to calculate the Initial Margin. The margin parameters are available on the LME Clear website;

https://www.lme.com/LME-Clear/Risk-management/Margin-Parameter-files

SPAN splits the Initial Margin calculation into four components;

- **Scanning Risk**
  The Scanning Risk is a worst-case portfolio loss based on the net position. Scanning Ranges, Volatility Shifts and Inter-currency Shifts are all part of the Scanning Risk calculation
- **Inter-prompt Spread**
- SPAN Scanning Risk assumes that forward prices move by identical amounts across all prompt dates. The Inter-prompt Spread utilises the Inter-prompt Spread Charge to calculate the margin requirement to cover the differences in price moves between prompt dates.
- **Inter-contract Credit**
  SPAN provides a credit to recognise cases where offsetting positions in related contracts reduce overall portfolio risk. This is calculated using the inter-contract spread credit.
- **Short Option Minimum Charge**
  This covers the cost of closing out deeply out-of-the-money options which have very small intrinsic value. It therefore calculates a floor to the margin requirement for short option positions.

For LME Clear SPAN uses these components to calculate the Initial Margin requirements, being the maximum of;

Scanning Risk *plus* Inter-prompt Spread *minus* Inter-contract Credit

Or

Short Option Minimum Charge

1.1 Inputs to the Initial margin calculation

As well as the SPAN margin parameters, to calculate Initial Margin the risk arrays are generated and the correct positions need to be calculated, in the form of the net delta.

1.1.1 Risk Arrays

For the benefit of the IM calculation, the Scanning Risk risk arrays are calculated for every commodity based on current prices (closing prices at end of day). Risk arrays contain value losses and deltas. All risk arrays have the same general structure. The value losses of a risk array summarise how a contract reacts to various scenarios of changing market conditions.

To construct these scenarios, SPAN changes the price of the underlying contract and implied volatility over given ranges for "n" days forward (used to capture the time decay of options), where n

[1] *'SPAN' is a registered trademark of Chicago Mercantile Exchange Inc., used herein under license. Chicago Mercantile Exchange Inc. assumes no liability in connection with the use of SPAN by any person or entity*

is the liquidation period. The forward contract value losses are discounted to present value by applying discount factors. This is because IM is set to cover VM losses, which are discounted.

As a standard SPAN considers a total of 16 risk scenarios by using a Scanning Range and a volatility shift defined for each combined commodity. These represent various stand-alone and simultaneous movements in these key risk factors. Various scenarios are specifically required to capture the risk on option positions and do so by shifting the Scanning Range up and down by various fractions and simultaneously shifting the volatility up and down. Table 3 shows the scenarios are used by LME SPAN:

Table 3: SPAN scenarios

1	Underlying unchanged, volatility up
2	Underlying unchanged, volatility down
3	Underlying up 1/3 range, volatility up
4	Underlying up 1/3 range, volatility down
5	Underlying down 1/3 range, volatility up
6	Underlying down 1/3 range, volatility down
7	Underlying up 2/3 range, volatility up
8	Underlying up 2/3 range, volatility down
9	Underlying down 2/3 range, volatility up
10	Underlying down 2/3 range, volatility down
11	Underlying up 3/3 range, volatility up
12	Underlying up 3/3 range, volatility down
13	Underlying down 3/3 range, volatility up
14	Underlying down 3/3 range, volatility down
15	Underlying up extreme (cover 35% of loss) 2 times
16	Underlying down extreme (cover 35% of loss) 2 times

The extreme scenarios calculate the change in value when the futures moves several times the margin, but only a fraction of the resulting change in value is covered. The purpose of the extreme move is to capture a broader range of potential losses of (specifically) short option positions that are of a strike that is outside the chosen scanning range. The result is then scaled to reflect the fact that this would otherwise simply increase the scanning range. The extreme move is set to twice the Scanning Range, the scaling factor set to 35% of that value.

A positive number shows a loss

A negative number shows a gain

The LME Clear clearing system will create a SPAN parameter file. This file will contain the risk arrays, for all 16 scenarios, for every contract. These are used to calculate the Scanning Risk.

A discounted array will be created for each forward contract prompt date, in each currency. Options and futures are not discounted. For options risk arrays will be created for every traded strike.

1.1.2 Calculation of Position for the contract

For the calculation of Scanning Range you need the position for each prompt date for each contract. This is the position for each contract type, so options are kept separate to forwards as their risk arrays will be different. The mini contracts are scaled as their contract size is 1/5 of the forward. Options are matched to the 3rd Wednesday of the month as they expire into the forward of that prompt date.

1.1.3 Combined Commodity

The combined commodity is a portfolio of forwards and options over various contracts. The purpose of the combined commodity is to group multiple contracts which refer to the same underlying and which are treated as one for the purpose of margin calculations. Any number of individual contract codes and generic contract types (future/option) can be specified as belonging to the combined commodity. The fact that individual contract or contracts belong to a combined commodity is known from its position in the risk parameter file, being separate record 40s under the main commodity record 30.

As part of the SPAN implementation for LME Clear, LME 'mini' contracts have been included in the same combined commodity as the parent contracts since they are based off of the same underlying but have a different contract size, i.e. can be traded in smaller volume sizes. The ratio is included in the SPAN algorithm to ensure that the risk arrays for the mini contracts are sized appropriately with regard to the standard contracts. This will not impact the Scanning Risk calculation as the different lot size is already taken into account. It will impact the delta to be used for the margining of spread positions.

The ratio is implemented by altering the Delta Divisor within record 40, for example;

```
30AH ALUMINIUM              LMELMEUSD2.00  0.35       125101020120430
40AHDFALUMINIUM USD          USD 100   1        0.25000    1.00   0 100  136003
40MADFMA PRIM ALUMINUM USDUSD 100   1        0.05000    5.00   0 100  136003
```

The Scanning Risk is not impacted as the different lot sizes are already included as the Tick Value is used from record 40. For example;

```
40MADFMA PRIM ALUMINUM USDUSD 100   1       0.05000    5.00   0 100  136003
50201205160.999912  0.00  0.00  120120516
60       OF     1    9675 1.000000      0      0  -4533  -4533   4533   4533  -9067  -9067   9067   9067 -13600 -13600  13600  13600  -9520   9520
50201206200.999643  0.00  0.00  120120620
60       OF     1    9675 1.000000      0      0  -4533  -4533   4533   4533  -9067  -9067   9067   9067 -13600 -13600  13600  13600  -9520   9520

40AHDFALUMINIUM USD         USD 100   1       0.25000    1.00   0 100  136003
50201205160.999912  0.00  0.00  120120516
60       OF     1  205019 0.999912      0      0  -4533  -4533   4533   4533  -9066  -9066   9066   9066 -13599 -13599  13599  13599  -9519   9519
50201206200.999643  0.00  0.00  120120620
60       OF     1  205019 0.999643      0      0  -4532  -4532   4532   4532  -9063  -9063   9063   9063 -13595 -13595  13595  13595  -9517   9517
```

The sixteen loss values for the Mini and Forward contracts only differ due to the discounting that is performed on the Forward losses. The loss values are multiplied by the Tick Value to calculate the Scanning Risk. In this example for 1 lot MAD (Mini) the largest loss of 13600 is multiplied by 0.05

and for 1 lot AHD (Forward) the largest loss of 13599 is multiplied by 0.25. The total Scanning Risk for this portfolio will be the sum of these calculations.

MARGIN GROUP: LME PRODUCTS ("LME")
COMBINED CONTRACT: AH MARGIN CURRENCY: USD ALUMINIUM

CONTRACT: AHD CONTRACT CURRENCY: USD SCANNING RANGE: 3400 / LOT

EXPIRY DATE / DIS. FACT.	G T	NET POS	DELTA	F-EXTREME	F-3/3 VOL UP/DN	F-2/3 VOL UP/DN	F-1/3 VOL UP/DN	F+0 VOL UP/DN	F+1/3 VOL UP/DN	F+2/3 VOL UP/DN	F+3/3 VOL UP/DN	F+EXTREME
20 JUN 2012	F	1	0.9996	2379	3399	2266	1133	0	-1133	-2266	-3399	-2379
0.999643					3399	2266	1133	0	-1133	-2266	-3399	
Totals for AHD												
			0.9996	2379	3399	2266	1133	0	-1133	-2266	-3399	-2379
					3399	2266	1133	0	-1133	-2266	-3399	

CONTRACT: MAD CONTRACT CURRENCY: USD SCANNING RANGE: 3400 / LOT

EXPIRY DATE / DIS. FACT.	G T	NET POS	DELTA	F-EXTREME	F-3/3 VOL UP/DN	F-2/3 VOL UP/DN	F-1/3 VOL UP/DN	F+0 VOL UP/DN	F+1/3 VOL UP/DN	F+2/3 VOL UP/DN	F+3/3 VOL UP/DN	F+EXTREME
20 JUN 2012	F	1	0.2000	476	680	453	227	0	-227	-453	-680	-476
0.999643					680	453	227	0	-227	-453	-680	
Totals for MAD												
			0.2000	476	680	453	227	0	-227	-453	-680	-476
					680	453	227	0	-227	-453	-680	

This allows LME Clear to automatically offset a spread position between the Forward and Mini of the same prompt date. Spread positions in different prompt dates will be margined through inter-prompt spread charges.

1.2 Calculating Scanning Risk

Scanning Risk is SPAN's most basic portfolio risk calculation. It is a worst-case portfolio loss i.e. it cannot ever be a portfolio gain. All contracts for the same underlying will be margined under the same combined commodity. The risk arrays, calculated by the clearing system, are used as these provide the loss values for all possible positions. The loss is calculated for each position across the SPAN scenarios (16) and then the losses are summed for each scenario across all positions. From the sixteen total scenario losses the highest loss is selected as the Scanning Risk.

For a contract:

Step 1: Select the arrays where this portfolio has positions. The arrays will include any discounting, where applicable.

Step 2: Multiply each value on each selected array by the corresponding position. This step yields 16 different value losses. These values should be rounded to the nearest currency unit.

Step 3: For each scenario, add across value losses. This step yields 16 different total losses. Ignore any differences between prompt dates or expiries. Scanning risk equals the largest total loss for the contract. If all the total losses are negative (i.e. they are all gains, which may occur in certain exceptional portfolios) then the Scanning Risk is set to zero.

Example

For a simple 5 long Forward position where the Scanning Range is $520 per tonne, $13000 per lot based on a contract size of 25 tonnes. Forwards use the discount factor, to match the calculation done on the contingent variation margin is calculated to cover, which is included in the risk arrays in the SPAN parameter file.

Scenario	Scanning Range	Discount factor	Array Value	Position	Scanning Loss
1	13000	0.999287	-	5	-
2	13000	0.999287	-	5	-
3	13000	0.999287	- 4,330.24	5	-21,651.22
4	13000	0.999287	- 4,330.24	5	-21,651.22
5	13000	0.999287	4,330.24	5	21,651.22
6	13000	0.999287	4,330.24	5	21,651.22
7	13000	0.999287	- 8,660.49	5	-43,302.44
8	13000	0.999287	- 8,660.49	5	-43,302.44
9	13000	0.999287	8,660.49	5	43,302.44
10	13000	0.999287	8,660.49	5	43,302.44
11	13000	0.999287	-12,990.73	5	-64,953.66
12	13000	0.999287	-12,990.73	5	-64,953.66
13	13000	0.999287	12,990.73	5	64,953.66
14	13000	0.999287	12,990.73	5	64,953.66
15	13000	0.999287	- 9,093.51	5	-45,467.56
16	13000	0.999287	9,093.51	5	45,467.56
				Largest Loss	-64,953.66

When calculating the SPAN Initial Margin, LME Clear will not round the results of individual scanning losses to the nearest dollar. This will only be performed at the overall Scanning Loss level, per commodity. At a position level the following rounding rules will apply;

Currency	Rounding rules	Number of decimals
USD	half up	2
EUR	half up	2
GBP	half up	2
JPY	half up	0

For example;

In the example below there are two positions. To calculate the Initial Margin on the positions these loss values are multiplied by the Tick Value in the file (0.2) and then by the position.

	Loss Value	Tick Value	Position	Loss
Prompt Date 1	13399	0.2	3	8039.40
Prompt Date 2	13398	0.2	2	5359.20

Total	13398.60
Initial Margin	13399

1.2.1 Inter-currency risk

SPAN allows contracts based on the same metal but in different currencies to be treated as a single combined commodity. The resultant initial margin will then be calculated in the margin currency.

The 16 total losses for a contract may be calculated in any of the currencies in which contracts are traded. Contracts having the same combined commodity require a consistent Scanning Range to produce risk arrays. The Scanning Range will be set by LME Clear for a combined commodity in the margin currency. Scanning Ranges in the other currencies are necessary as intermediate stages of calculation. They are derived from the margin currency Scanning Range by using appropriate currency exchange rates for each day.

For a given combined commodity, SPAN uses the total losses based risk arrays for contracts within the combined commodity, together with adjusted SPOT FX rates, to derive total losses in the margin currency for each combined commodity. Total losses for a combined commodity are calculated in the margin currency, which is currently designated by LME as US Dollars.

To cater for the potential for FX rates to change after the losses are converted, LME Clear determines adjustment percentages, the inter-currency shift, that are applied to spot currency exchange rates to allow for their potential to change.

When combining the scenario losses for each currency, by converting the values to USD, SPAN shifts the values up and down by the inter-currency shift. The total losses in the two sets are compared, scenario by scenario, and the larger of each scenario is selected to form a new set of total losses for scenarios 1 to 16 which are worst cases.

Example

A portfolio of Copper (CA) USD and EUR positions;

EUR/USD FX Rate = 1.36000

FX Shift = 3.0%

Scenario	EUR Position Loss	EUR Loss in USD	EUR Loss in USD up FX shift	EUR Loss in USD down FX shift	USD Position Loss	USD loss plus EUR FX up	USD loss plus EUR FX down	Total Loss
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-17,320.00	- 23,555.20	- 24,261.86	- 22,848.54	- 21,651.00	- 45,912.86	- 44,499.54	- 45,912.86
4	-17,320.00	- 23,555.20	- 24,261.86	- 22,848.54	- 21,651.00	- 45,912.86	- 44,499.54	- 45,912.86
5	17,320.00	23,555.20	24,261.86	22,848.54	21,651.00	45,912.86	44,499.54	44,499.54
6	17,320.00	23,555.20	24,261.86	22,848.54	21,651.00	45,912.86	44,499.54	44,499.54
7	-34,640.00	- 47,110.40	- 48,523.71	- 45,697.09	- 43,302.00	- 91,825.71	- 88,999.09	- 91,825.71
8	-34,640.00	- 47,110.40	- 48,523.71	- 45,697.09	- 43,302.00	- 91,825.71	- 88,999.09	- 91,825.71
9	34,640.00	47,110.40	48,523.71	45,697.09	43,302.00	91,825.71	88,999.09	88,999.09
10	34,640.00	47,110.40	48,523.71	45,697.09	43,302.00	91,825.71	88,999.09	88,999.09
11	-51,960.00	- 70,665.60	- 72,785.57	- 68,545.63	- 64,953.00	- 137,738.57	- 133,498.63	-137,738.57
12	-51,960.00	- 70,665.60	- 72,785.57	- 68,545.63	- 64,953.00	- 137,738.57	- 133,498.63	-137,738.57
13	51,960.00	70,665.60	72,785.57	68,545.63	64,953.00	137,738.57	133,498.63	133,498.63
14	51,960.00	70,665.60	72,785.57	68,545.63	64,953.00	137,738.57	133,498.63	133,498.63
15	-36,372.00	- 49,465.92	- 50,949.90	- 47,981.94	- 45,467.10	- 96,417.00	- 93,449.04	- 96,417.00
16	36,372.00	49,465.92	50,949.90	47,981.94	45,467.10	96,417.00	93,449.04	93,449.04
							Largest Loss	-137,738.57

1.3 Calculating Inter-prompt Spread

SPAN Scanning Risk assumes that forward prices move by identical amounts across all prompt dates i.e. ignoring spread risk. Since forward returns do not correlate perfectly across prompt dates, value gains at one prompt date do not exactly offset value losses in another. Portfolios can therefore face considerable inter-prompt spread risk.

SPAN calculates an inter-prompt spread charge to cover this risk. SPAN first finds how many inter-prompt spreads were implicitly formed during the Scanning Risk calculation and then applies a charge for each spread. Wherever possible, SPAN minimises the spread charge.

LME SPAN uses the "Multi-Tier" Inter-prompt Spread method. This means that expiries are grouped into different key buckets and spread charges are set between and within tiers of buckets.

The following steps are required to calculate inter-prompt spreads:

Step 1: Retrieve the delta positions for each prompt date. These should not be rounded.

Step 2: For each tier of prompt dates ascertain the sum of the net delta positions where the delta is positive and the sum where the delta is negative.

Step 3: For each tier combination the total number of spreads formed is multiplied by the inter-prompt spread charge rate, giving the total required charge.

Step 4: The total inter-prompt spread charge is the sum of the charges for each spread.

1.3.1 Position Delta for Average Contracts

TAPOS and Average Price Forwards are not related to a single forward contract with a specific prompt date, but are options or forwards on an average price. Position delta relating to a particular expiry must be apportioned to designated dates in order to perform the Inter-prompt Charge calculations.

The apportionment of position delta will be performed according to the expiry groups supplied in the risk arrays, see record 50. Each expiry group is a particular date and margin calculations are

performed by dividing the delta for the TAPO or Average Price Forward expiry equally among the expiry groups. Where there is only one expiry group, all the delta is allocated to it. The sum of the allocated deltas across the expiry groups must equal the total TAPO or Average Price Forward delta for that expiry and to avoid rounding error the delta allocated to the last expiry group will contain any rounding difference.

- For every expiry except the front expiry the expiry group is defined as the 3rd Wednesday.
- For the front expiry (current month) the definition is dependent on the date. If you are still in the previous month (e.g. on the 31st October when the front month would be November) then the expiry group would still be the 3rd Wednesday. Once you are in the expiry month there would be multiple expiry groups – one for each business day of the expiry month and the first 2 business days of the following month. The delta is then apportioned between these expiry groups. As the month progresses the number of expiry groups is reduced until on the day before expiry it is equal to the first 2 business days of the following month.

1.3.2 Composite Delta

The composite delta is used in Inter-prompt charge. There is one composite delta attached to each array (each individual forward/future/option that can be traded). For standard options the calculation is based on the Black76 model delta after applying each shock represented by the first 14 scenarios, which are then weighted by their probability. The probability is based on normal distribution and for an upward and downward movement in the forward price. It is calculated by moving from the mean of the normal distribution to one standard deviation from the mean, two standard deviations from the mean and three standard deviations from the mean. Therefore the sum of the weights is 100%.

For options it is calculated as:

The sum of (δ * W) for the elements in the contract series' array

Where;

δ is the call delta if the contract series is a call, or the put delta if the contract series is a put.

W is a weight factor, as detailed above, for the delta based on the probability of the underlying price moving up or down by the scenario modifier values (i.e. +/- 1/3, 2/3, 3/3). These weights and scenarios are supplied as detailed in table 4.

Table 4: weight factors

1	Forward price unchanged	0.16667362
2	Forward price unchanged	0.16667362
3	Forward price up 1/3	0.11777963
4	Forward price up 1/3	0.11777963
5	Forward price down 1/3	0.11777963
6	Forward price down 1/3	0.11777963
7	Forward price up 2/3	0.04156044

8	Forward price up 2/3	0.04156044
9	Forward price down 2/3	0.04156044
10	Forward price down 2/3	0.04156044
11	Forward price up 3/3	0.00732313
12	Forward price up 3/3	0.00732313
13	Forward price down 3/3	0.00732313
14	Forward price down 3/3	0.00732313
15	Forward price up extreme	0
16	Forward price down extreme	0

1.3.3 Example 1 - One tier, spreading within a Tier

This is the simplest case: a combined commodity in which all prompt dates are contained within one tier, and where one required spread is defined. In this case, as there is only one tier, there is no need to work out the priority order.

This is the portfolio:

Tier	Prompt Date	Delta Position
1	Date 1	50
1	Date 2	-20
1	Date 3	10
1	Date 4	-70

The inter-prompt spread charge rate for the tier is $10 per lot

The calculation steps are as follows:

Step 1: In this case the net deltas are given in the table above

Step 2: Calculate total positive and negative deltas for the tier:

Total positive delta = *60*

Total negative delta = *-90*

Total to be spread = *60*

Step 3: Calculate the spread charges

Total charge for the required spread:

Spread delta * spread charge (per lot)

*60 * $10 = $600.*

In this example, since there are no other required spreads, this is also the total inter-prompt charge for the combined commodity (step 4).

1.3.4 Example 2 - Two Tiers, Spreading Within and Between the Tiers

This case represents the next level of complexity: there are two tiers.

This is the portfolio:

Tier	Prompt Date	Delta
1	Date 1	50
1	Date 2	-20
2	Date 3	10
2	Date 4	-70

The spread charges are as follows:

Spread Priority	Inter-prompt Charge Rate (per lot)	Leg	Tier
1	8	1	2
1		2	2
2	10	1	1
2		2	1
3	12	1	1
3		2	2

So the cheapest spread is within Tier 2, then Tier 1 and then finally between Tier 1 and Tier 2.

The calculation steps are as follows:

Step 1: In this case the net deltas are given in the table above

Step 2: Calculate total positive and negative deltas for each tier:

Tier 1 positive delta = *50*

negative delta = *-20*

Tier 2 positive delta = *10*

negative delta = *-70*

This means that between Tier 2 v 2 there is a spread of 10, between Tier 1 v 1 there is a spread of 20, Tier 1 v 2 there is a spread of 30

Step 3: Calculate the spread charges

Spread 1 – Tier 2 v 2

Total charge for required spread 1: 10 * 8 = 80

Spread 2 – Tier 1 v 1

Total charge for required spread 2: 20 * 10 = 200

Spread 3 – Tier 1 v 2

Total charge for required spread 3: 30 * 12 = 360

Step 4: Calculate the total inter-prompt charge for the combined commodity

80 + 200 + 360 = 640

1.4 Calculating Inter-contract Credit

SPAN offers credits for allowable inter-contract spreads. These credits recognise cases where offsetting positions in related contracts reduce overall portfolio risk. These spread credits will therefore reduce the amount of margin required.

LME Clear determines the spread credit rates and then sets the priorities. SPAN uses the priorities to form the most favourable spreads first.

To calculate the Inter-contract Credit SPAN isolates the underlying risk, known as the weighted forward price risk. Since SPAN Inter-contract Spreads are based on deltas and reactions to forward price changes, these spreads adjust only the Forward Price Risk. Delta values and the resulting spreads do not directly relate either to Volatility Risk or to Time Risk. Therefore SPAN Inter-contract Spreads do not adjust either Volatility Risk or Time Risk and the first part of the calculation is to isolate the weighted forward price risk.

1.4.1 Weighted Forward Price Risk

The first part is the calculation for isolating the forward price risk. From that you can then calculate the weighted forward price risk.

Step 1: Isolate the Forward Price Risk.

Scanning Risk = Forward Price Risk + Volatility Risk + Time Risk

a Select a combined commodity. Select this combined commodity only if it is part of one or more allowable inter-contract spreads.

b Calculate Time Risk. To do this average this contract's Total Loss for scenario 1 and its Total Loss for scenario 2.

Total Loss scenarios 1 and 2 show portfolio losses in one contract when:

- Volatility is shifted up and down
- The forward price remains unchanged
- The time risk is taken into account

Since the forward price remains unchanged, there is no Forward Price Risk. Averaging the losses for these two scenarios averages out Volatility Risk, leaving only Time Risk.

Example:

Assume these AH Total Loss values:

Scenario 1: -640

Scenario 2: +680

Time Risk for AH = +40 / 2 = +20

Time Risk could be a negative value e.g., if scenario 1 = +640, scenario 2 = -680.

c Complete the calculation by Identifying the Scanning Risk scenario and its paired scenario.

Identify the array scenario where this contract faces the largest Total Loss. This largest Total Loss became the Scanning Risk.

Use this table to identify the Paired Scenario:

If Scanning Risk is Scenario:	The Paired Scenario is:
1 2	2 1
3 4	4 3
5 6	6 5
7 8	8 7
9 10	10 9
11 12	12 11
13 14	14 13

15	15 (not 16)
16	16 (not 15)

Scanning Risk shows the worst Total Loss over the range of forward returns and volatility moves for a given forward return and volatility move over two days (the assumed liquidation period).

The Scanning Risk Scenario reflects:

- A given volatility move in one direction
- A given forward return
- The two day liquidation period.

The Paired Scenario reflects:

- The same volatility move in the opposite direction
- The same forward return
- The same two day liquidation period.

Averaging the losses for the Scanning Risk Scenario and the Paired Scenario removes Volatility Risk. Subtracting previously calculated Time Risk leaves Forward Price Risk.

If Forward Price Risk is less than zero, set Forward Price Risk equal to zero.

Example:

Assume these values for AH:

Scanning Risk:		1760
Paired Scenario Total Loss:		1120
Time Risk:		20
Forward Price Risk	=	((1760 + 1120)/2) - 20
for AH	=	1420

Negative Time Risk would add on e.g., -(-20) becomes +20.

d Repeat steps for each contract in the combined commodity.

Step 2: Calculate Weighted Forward Price Risk

a Select a combined commodity that forms inter-contract spreads for this portfolio.

b Divide the Forward Price Risk by the absolute value of its total net delta and round to whole currency units. Use the full delta value that includes all delta in spreads. The result is the Weighted Forward Price Risk for this combined commodity.

c Repeat steps a) and b) for each commodity that forms inter-contract spreads for this portfolio.

Examples:

For a portfolio, SPAN uses AH delta to form inter-contract spreads:

Forward Price Risk for AH	=	1420
Absolute value of net delta	=	3.33

Weighted Forward Price Risk = 1420/3.33 = 426

For a portfolio, SPAN uses AA delta to form inter-contract spreads:

Assuming the value for Forward Price Risk:

Forward Price Risk for AA = 1380

Absolute value of net delta = 16.32

Weighted Forward Price Risk = 1380/16.32 = 85

1.4.2 Calculate the Inter-contract Spread Credit

From the inputs, any spread credits can be calculated.

Step 1: For a Combined Commodity calculate the net delta by adding the prompt date net deltas.

Step 2: Form spreads between net long and net short positions on different commodities.

a Identify the highest priority spread.

b Identify the Delta/Spread Ratio for this combined commodity and this spread type.

The Delta/Spread ratio shows how much delta a given combined commodity must contribute to form one spread of a given type. In most cases, the ratio is one-to-one. SPAN generally spreads one long delta against one short delta.

c Identify what this type of spread contains. Calculate how many deltas of each of the two combined commodities can be in one spread. In each case, long delta spreads against short delta. The number of spreads is the smallest of the results for each combined commodity taking into account the delta ratio.

d Remove the delta used for this spread type from the pool of available delta for each commodity.

e Repeat steps (a) to (d) for the remaining allowable spreads. Work through the allowable spreads, going from the highest priority to the lowest priority. Stop once no more spreads are possible.

Step 3: Select a spread type formed from this portfolio's positions e.g. spread type is AH spread against AA.

Step 4: Identify the Spread Credit Rate for this spread type.

Step 5: Identify the first combined commodity in this spread type and the number of spreads formed for this spread type.

Step 6: Multiply together the results with Weighted Forward Price for this combined commodity. This result is the Spread Credit.

Step 7: Repeat steps for the second combined commodity in this spread type.

Step 8: Repeat steps for all spreads types where this portfolio forms spreads.

Step 9: Add the Spread Credits by combined commodity for all spread types. These yield the Spread Credits for each combined commodity.

Example:

Contract	Delta

AA	50
NA	-20

Weighted Forward Price Risk for AA = 395

Weighted Forward Price Risk for NA = 85

Delta Ratio = 1:1

Spread Credit Rate = 75%

Select the AA - NA spread

Number of AA - NA spreads = 20

Spread Credit for AA in this spread = 75% x 395 x 1 x 20

= 5925

Spread Credit for NA in this spread = 75% x 85 x 1 x 20

= 1275

1.5 Margining for average based contracts

The Initial Margin calculation for average contracts within their expiring month is adjusted based on the total number of remaining good business days compared to the total number of good business days in the expiring month. This adjustment occurs daily until the last business day of the month.

The adjustment factor is determined to establish the point in time in the expiring month and is calculated using the following formula:

- **Adjustment Factor** = (Number good business days remaining in expiring month / Total number of good business days in expiring month)

Good business days represents the days in which the LME is open, so UK bank holidays would not be included in the business day count, demonstrated in example below in Table 1. The adjustment calculation used would be the same for new trades and exiting positions which fall in the expiring month.

The day counter for the number of business days left in expiring month will change once the daily Monthly Moving Average Price (MMAP) has been published at 13:30. There is no further adjustment on the last business day of the expiring month when Monthly Average Settlement Prices (MASPs) are published, i.e. if 20 good business days in a month, the adjustment factor on the last business day would be 1/20.

Table 1: Adjustment factor example for August 2015

Date	Before – MMAP Published	Adjustment Factor	After– MMAP Published	Adjustment Factor
03/08/2015	20/20	1	19/20	0.95
04/08/2015	19/20	0.95	18/20	0.9
05/08/2015	18/20	0.9	17/20	0.85
06/08/2015	17/20	0.85	16/20	0.8
07/08/2015	16/20	0.8	15/20	0.75
10/08/2015	15/20	0.75	14/20	0.7
11/08/2015	14/20	0.7	13/20	0.65
12/08/2015	13/20	0.65	12/20	0.6
13/08/2015	12/20	0.6	11/20	0.55
14/08/2015	11/20	0.55	10/20	0.5
17/08/2015	10/20	0.5	9/20	0.45
18/08/2015	9/20	0.45	8/20	0.4
19/08/2015	8/20	0.4	7/20	0.35
20/08/2015	7/20	0.35	6/20	0.3
21/08/2015	6/20	0.3	5/20	0.25
24/08/2015	5/20	0.25	4/20	0.2
25/08/2015	4/20	0.2	3/20	0.15
26/08/2015	3/20	0.15	2/20	0.1
27/08/2015	2/20	0.1	1/20	0.05
28/08/2015*	1/20	0.05	1/20*	0.05
31/08/2015	-	-	-	-

*Monthly Average Settlement Price (MASP) published on 28/08/2015 as 31/08/2015 is a UK bank holiday i.e. not a good business day.

The impact of the adjustment factor on initial margin gradually becomes higher as you move closer to the end of the expiring month to represent the reduced impact of a price move on the final settlement price as you progress in the expiring month. Hence, initial margin will be lower as you progress towards settlement.

The adjustment factor is then applied to the following for the calculation of scanning risk:

- **Scanning Range * Adjustment Factor**
- **Delta * Adjustment Factor**

The adjustment factor is applied to the scanning range and delta for positions which fall within the expiring month. The first adjustment applied to the scanning range will reflect the reduced volatility of average contacts on outright positions (scanning risk in SPAN) and the second adjustment on delta will reflect this reduced delta for calculating margin for a spread position which includes a front month expiry (inter-prompt and inter-commodity spreads in SPAN).

2 SPAN rounding definitions

Within the LME Clear clearing system the following rounding definitions are defined;

- Position deltas: 6 decimals. This the unit in which SPAN sees the positions, which is in the six decimal places notation. It's also the number of decimals used to express options

positions when calculating portfolio scanning risk (delta for ordinary options and composite delta for TAPOs).

- Scanning loss will be rounded to the nearest dollar at a contract level not at a position level, see example below. At a position level the following rounding rules will apply.

Currency	Rounding rules	Number of decimals
USD	half up	2
EUR	half up	2
GBP	half up	2
JPY	half up	0

- Period deltas, Intra-tier deltas, Inter-tier deltas, Intra-commodity spreads: 4 decimals,
- Inter-commodity spreads: 4 decimals, we are using the same setting here as for intra-commodity spreading
- Time and volatility risks: 0 decimals
- Weighted price risk: 2 decimals

Rounding Step	Places
Position deltas	6
Period deltas	4
Intra-tier deltas	4
Inter-tier deltas	4
Intra-commodity spreads	4
Inter-commodity spreads	4
Time and Volatility Risks	0
Weighted Price Risk	2

3 Tiered Margining in SPAN

3.1 Tiered Volatility Shifts

LME Clear set volatility shifts in accordance with the set tier structure, consistent with that used for the inter-prompt spread charges. LME Clear can also assign different up and down shifts for volatility moves affecting the initial margin for option portfolios.

For example;

Metal	Tenor Range	Volatility down	Volatility up
AH	CASH – 1W	0.09	0.16
AH	1W plus 1day -1M	0.09	0.16
AH	1M plus 1day – 2M	0.08	0.14
AH	2M plus 1day – 3M	0.07	0.12
AH	3M plus 1day – 9M	0.07	0.12
AH	9M plus 1day – 27M	0.08	0.1
AH	27M plus 1day – 63M	0.09	0.11
AH	63M plus 1day – 123M	0.09	0.11

For options at various prompt dates, record 50 will show the different volatility shifts, which will be used in the calculation of the risk arrays.

```
40AHDOALUMINIUM USD       USD 100   1       0.25000    1.00    0 100   81001
502012071 80.999816  0.14  0.08  120120718
60    1600C     1   35693 0.999714    -1      0  -2700  -2700   2699   2699  -5399  -5399   5397   5398  -8099  -8099   8094   8097  -5669   5657
502013112 00.997473  0.10  0.08  120131120
60    1850C     1   36231 0.744680   -171    171  -2099  -1764   1718   2067  -4065  -3737   3567   3922  -6066  -5746   5374   5734  -4241   3748
```

3.2 Tiered Scanning Ranges

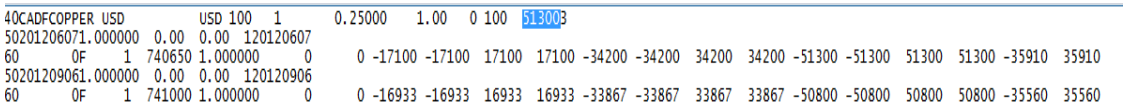
LME Clear has the ability to set Scanning Ranges for different points in the curve, which will be set-up in accordance with the set tier structure, consistent with that used for the inter-prompt spread charges.

For example;

Metal	Tenor	Scanning Range
CA	CASH	513
CA	1W	512

CA	1M	511
CA	2M	509
CA	3M	508
CA	9M	506
CA	27M	506
CA	63M	505
CA	123M	505

The different Scanning Ranges can be used in the calculations of the risk arrays. However record 40 will continue to show a single Scanning Range, set as the largest across all tiers.



4 Delivery margin

4.1 LME Base

Delivery positions are subject to specific margin requriements based on their instrument type. For LME Base physical delivery forwards:

- When viewed across all currencies, net long delivery positions are excluded from margin calculations.
- When viewed across all currencies, net short delivery positions are viewed together with trade positions for margin calculations.

4.2 LMEprecious

Precious futures in delivery are margined separately from their respective same-commodity trade positions:

- Scanning loss will be calculated separtely for delivery and trade positions and added together.
- Intermonth charge will not be calculated for the delivery portfolio.
- Intercommodity credit will not be calcuated for delivery positions.

5 Contingent Variation Margin

For the purpose of calculating discounted variation margin at an overall account level LME Clear will round at the individual position level, based on the rules below.

Currency	Rounding	Number of

	rules	decimals
USD	half up	2
EUR	half up	2
GBP	half up	2
JPY*	half up	0

**Once the JPY values are converted to USD they will follow the USD convention*

For example;

Example 1

Forwards Position Report

Position Account	Underlying Metal	Currency	Prompt Date	Bought Position	Sold Position	Trade Price	Valuation Price	Variation Margin
AAA_H_1	FM	USD	02/06/2014	0	60	396	392.7	12869.46
AAA_H_1	FM	USD	02/06/2014	0	51	400	392.7	24198.48
							Total	37067.94
AAA_H_1	FM	USD	03/06/2014	0	60	396	393.7	8969.46
AAA_H_1	FM	USD	03/06/2014	0	100	396	393.7	14949.1
							Total	23918.56
AAA_H_1	FM	USD	04/06/2014	0	30	405	395.7	18133.22

Forwards Position Summary Report

Position Account	Underlying Metal	Currency	Prompt Date	Total Bought Position	Total Sold Position	Valuation Price	Total Variation Margin per commodity per prompt per Account
AAA_H_1	FM	USD	02/06/2014	0	111	392.7	37067.94
AAA_H_1	FM	USD	03/06/2014	0	160	393.7	23918.56
AAA_H_1	FM	USD	04/06/2014	0	30	395.7	18133.22
						Total	79119.72

Summary Margins

MEMBER	ACCOUNT	UNDERLYING	CURRENCY	INITIAL_MARGIN	NLV	VARIATION_MARGIN	DCVM
AAA	AAA_H_1	FM	USD	1000000	0	0	79119.72

Example 2

Forwards Position Report / Forwards Position Summary Report

Position Account	Underlying Metal	Currency	Prompt Date	Bought Position	Sold Position	Trade Price	Valuation Price	Variation Margin
BBB_H_1	PB	EUR	17/12/2014	21	0	1607.39	1642.52	18437.29
BBB_H_1	PB	USD	20/08/2014	23	0	2168.5	2192.81	13977.23
BBB_H_1	PB	USD	21/08/2014	15	0	2168.81	2192.85	9014.32
BBB_H_1	PB	USD	22/08/2014	23	0	2169.13	2192.88	13655.18
BBB_H_1	PB	USD	27/08/2014	16	0	2170.69	2193.06	8947.19
BBB_H_1	PB	USD	03/09/2014	0	36	2172.88	2194.73	-19662.88
BBB_H_1	PB	USD	04/09/2014	26	0	2173.19	2194.96	14148.94
BBB_H_1	PB	USD	05/09/2014	20	0	2173.5	2195.2	10848.77
BBB_H_1	PB	USD	11/09/2014	13	0	2175.38	2196.63	6905.37
BBB_H_1	PB	USD	17/09/2014	43	0	2177.25	2198.06	22367.55
BBB_H_1	PB	USD	19/09/2014	0	119	2177.08	2198.06	-62406.26
BBB_H_1	PB	USD	23/09/2014	0	74	2177	2198.06	-38954.81
BBB_H_1	PB	USD	19/11/2014	62	0	2185	2208.31	36118.32
BBB_H_1	PB	USD	17/12/2014	0	26	2188.25	2213.81	-16607.04
							Total	-1648.12

NLV and Variation Margin Report

Account	Contract	Currency	NLV/Variation Margin/DCVM/CCVM	NLV/Variation Margin/DCVM/CCVM (USD)
BBB_H_1	PB Forwards	USD	-1648.12	-1648.12
BBB_H_1	PB Forwards	EUR	18437.29	24836.87
			Total	23188.75

Summary Margins

MEMBER	ACCOUNT	UNDERLYING	CURRENCY	INITIAL_MARGIN	NLV	VARIATION_MARGIN	DCVM
BBB	BBB_H_1	PB	USD	6000000	0	0	23188.75

Example 3

Forwards Position Report

Position Account	Underlying Metal	Currency	Prompt Date	Bought Position	Sold Position	Trade Price	Valuation Price	Variation Margin
CCC_H_1	AH	JPY	01/07/2014	80	0	145000	194491	98981109
CCC_H_1	AH	JPY	01/07/2014	8	0	118061	194491	15285862
CCC_H_1	AH	JPY	01/07/2014	1	0	118368	194491	1903058
CCC_H_1	AH	JPY	01/07/2014	8	0	112798	194491	16338453
CCC_H_1	AH	JPY	01/07/2014	15	0	145050	194491	18540208
CCC_H_1	AH	JPY	01/07/2014	5	0	145180	194491	6163820
CCC_H_1	AH	JPY	01/07/2014	0	20	187600	194491	-3445469
CCC_H_1	AH	JPY	01/07/2014	40	0	187600	194491	6890938
CCC_H_1	AH	JPY	01/07/2014	40	0	185300	194491	9190917
CCC_H_1	AH	JPY	01/07/2014	0	20	185300	194491	-4595459
CCC_H_1	AH	JPY	01/07/2014	60	0	171500	194491	34486190
CCC_H_1	AH	JPY	01/07/2014	0	60	171500	194491	-34486190
CCC_H_1	AH	JPY	01/07/2014	0	40	162400	194491	-32090711
CCC_H_1	AH	JPY	01/07/2014	40	0	162400	194491	32090711
CCC_H_1	AH	JPY	01/07/2014	60	0	171500	194491	34486190
CCC_H_1	AH	JPY	01/07/2014	60	0	179600	194491	22336299
CCC_H_1	AH	JPY	01/07/2014	0	60	179600	194491	-22336299
CCC_H_1	AH	JPY	01/07/2014	60	0	179600	194491	22336299
CCC_H_1	AH	JPY	01/07/2014	0	4	176622	194491	-1786884
CCC_H_1	AH	JPY	01/07/2014	4	0	176622	194491	1786884
CCC_H_1	AH	JPY	01/07/2014	0	4	176622	194491	-1786884
							Total	220289042

Forwards Position Summary Report

Position Account	Underlying Metal	Currency	Prompt Date	Total Bought Position	Total Sold Position	Valuation Price	Total Variation Margin per commodity per prompt per Account
CCC_H_1	AH	JPY	01/07/2014	481	208	194491	220289042

NLV and Variation Margin Report

Account	Contract	Currency	NLV/Variation Margin/DCVM/CCVM	NLV/Variation Margin/DCVM/CCVM (USD)
CCC_H_1	AH Forwards	JPY	220289042	2173812.27

6 Parameter File

The SPAN risk parameter file is generated daily, both intra-day and at end-of-day. It contains risk array records and other margin calculation parameters. These records contain all the data values required to calculate SPAN Initial Margin.

6.1 SPAN File Records

The tables on the following pages describe the contents of each record type in detail.

For each field, the following information is given:

- Length
- Beginning ("from") and Ending ("to") positions on the record
- Field Type.
- Optional indicator (a "Y" means the field is optional).
- Field name and description.

The field types are as follows:

AN Alphanumeric

N Integer number

Real Floating point number

Date Date in format YYYYMMDD - DD = 00 for month values

Time Time in format HHMMSS

6.1.1 Record Type 10: SPAN File Header Record

Length	From	To	Type	Optional	Description

2	1	2	N		Record Type - Always 10
1	3	3	AN		File Type
2	4	5	N		Format Version
8	6	13	Date		Business Date
2	14	15	AN		File Identifier
8	16	23	Date		Creation Date
6	24	29	Time		Creation Time
3	30	32	N		Number of Scenarios

- The File Type will always be risk array data ("R").
- Format version is currently 3.
- Business Date indicates the date to which the file pertains.
- The creation date and time indicate exactly when the file was created.
- The number of scenarios is currently set to 16.

6.1.2 Record Type 11: Contract Type Mapping Record

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 11
2	3	4	AN		Contract Type
1	5	5	AN		Generic Contract Type
20	6	25	AN		Contract Type Description

Examples of valid combinations are as follows:

Generic Contract Type	Contract Type	Description
F	F	Future/Forward
O	C, P	Option
A	CA, PA	TAPO

6.1.3 Record Type 12: Currency Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 12
3	3	5	AN		Currency Code
20	6	25	AN		Currency Description
2	26	27	N		Currency Exponent

The currency exponent is a scaling factor, which, for example, can apply to contracts priced in Japanese Yen, where values for a contract are too large for reasonable reporting. The currency exponent is used to achieve correct scaling for all the charge rates and the value losses in margin reports for contracts in the relevant currencies.

The current currency codes, together with their exponent values, are given below:

Currency	Currency Code	Currency Exponent
US Dollars	USD	0
Euro	EUR	0
British Pounds	GBP	0
Japanese Yen	JPY	2

6.1.4 Record Type 13: Currency Conversion Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 13
3	3	5	AN		Contract Currency
3	6	8	AN		Margin Currency
10	9	18	Real		FX Rate
6	19	24	Real		Percentage FX Shift Up
6	25	30	Real		Percentage FX Shift Down

The purpose of this record is to provide currency exchange rates.

In LME SPAN the "margin currency code" of the combined contract is USD, so before the scenario loss values for the four contracts can be accumulated at the combined contract level they must be converted to the margin currency.

6.1.5 Record Type 14: Inter-contract Spread Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 14
3	3	5	AN		Contract Group
3	6	8	N		Spread Priority
2	9	10	N		Spread Method Code (01/02)
6	11	16	Real		Spread Credit Rate (%)
7	17	23	N		Offset Rate
2	24	25	N		Number of Legs
3	26	28	AN		Exchange Code 1
3	29	31	AN		Combined Contract 1
1	32	32	AN		Spread Side 1
2	33	34	N		Delta/Spread Ratio 1
3	35	37	AN		Exchange Code 2
3	38	40	AN		Combined Contract 2
1	41	41	AN		Spread Side 2
2	42	43	N		Delta/Spread Ratio 2
3	44	46	AN	Y	Exchange Code 3
3	47	49	AN	Y	Combined Contract 3
1	50	50	AN	Y	Spread Side 3
2	51	52	N	Y	Delta/Spread Ratio 3
3	53	55	AN	Y	Exchange Code 4
3	56	58	AN	Y	Combined Contract 4
1	59	59	AN	Y	Spread Side 4
2	60	61	N	Y	Delta/Spread Ratio 4

A separate record is provided for each allowable spread credit. The allowable spread credits records are sorted in order by spread priority.

For each such spread, there are a minimum of two, and a maximum of four legs to the spread. Each group of four fields, Exchange Code, Combined Contract Code, Delta/Spread Ratio and Spread Side, pertains to a single leg.

For each leg, the Delta/Spread Ratio indicates the amount of delta for that leg consumed by each spread. For example, a typical two-legged spread might be a 1:1 spread.

For each leg, the Spread Side indicates on which side of the spread that leg must be. The possible values for the spread side are "A" or "B".

This value indicates only that certain legs of the spread must be on opposite sides from each other, and not that a particular leg must be net long or short.

6.1.6 Record Type 15: Scenario Descriptions

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 15
3	3	5	N		Scenario Number
15	6	20	AN		Scenario Description
3	21	23	N		Paired Scenario Number

The purpose of this record is to detail any parameters associated with the SPAN scenarios.

6.1.7 Record Type 16: Margin Group Descriptions

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 16
3	3	5	AN		Initial Margin Group
25	6	30	AN		Initial Margin Group Description

The only margin group currently used by LME Clear is LME Contracts - “LME”

6.1.8 Record Type 20: Exchange Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 20
3	3	5	AN		Exchange Code
8	6	13	AN		Exchange Short Name
2	14	15	AN		File Identifier

Currently for LME Clear the only exchange code used is M - LME

6.1.9 Record Type 30: Combined Contract Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 30
3	3	5	AN		Combined Contract Code
20	6	25	AN		Combined Contract Name

3	26	28	AN		Contract Group
3	29	31	AN		Initial Margin Group
3	32	34	AN		Margin Currency Code
4	35	38	Real		Extreme Price Shift
6	39	44	Real		Loss Covered (%)
10	45	54	N		Short Option Minimum Charge Rate
2	55	56	N		Intermonth Spread Method Code
2	57	58	N		Spot Month Method Code
8	59	66	Date		End of Risk Period

Records 31 to 60 relate to the combined contract given in this record, until superseded by another combined contract record.

The contract group field indicates to which contract group this contract belongs for inter-contract spreading purpose.

The initial margin group field indicates to which initial margin group this contract belongs for net margin calculation purposes.

The margin currency code indicates to which currency the loss values for contracts belonging to this combined contract should be converted.

The loss covered field is a percentage and is held as a decimal number, e.g. 35% is held as 0.35.

The intermonth spread method will be 10 (multi-tier approach). Records 31 and 32 detail the tiers and leg spreads to use in the multi-tier spread calculation.

The spot month method will be 10 (multi-tier approach).

6.1.10 Record Type 31: Month Tier Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 31
2	3	4	N		Number of Tiers
2	5	6	N		Tier Number 1
8	7	14	Date		Starting Expiry Group 1
8	15	22	Date		Ending Expiry Group 1
2	23	24	N	Y	Tier Number 2
8	25	32	Date	Y	Starting Expiry Group 2
8	33	40	Date	Y	Ending Expiry Group 2
2	41	42	N	Y	Tier Number 3
8	43	50	Date	Y	Starting Expiry Group 3
8	51	58	Date	Y	Ending Expiry Group 3

2	59	60	N	Y	Tier Number 4
8	61	68	Date	Y	Starting Expiry Group 4
8	69	76	Date	Y	Ending Expiry Group 4
2	77	78	N	Y	Tier Number 5
8	79	86	Date	Y	Starting Expiry Group 5
8	87	94	Date	Y	Ending Expiry Group 5
2	95	96	N	Y	Tier Number 6
8	97	104	Date	Y	Starting Expiry Group 6
8	105	112	Date	Y	Ending Expiry Group 6
2	113	114	N	Y	Tier Number 7
8	115	122	Date	Y	Starting Expiry Group 7
8	123	130	Date	Y	Ending Expiry Group 7
2	131	132	N	Y	Tier Number 8
8	133	140	Date	Y	Starting Expiry Group 8
8	141	148	Date	Y	Ending Expiry Group 8

This record details the tiers to be used for the intermonth spread calculation.

Where more than eight tiers are required, there will be more than one record 31.

All LME commodities will be set-up with the eight inter-prompt tiers.

6.1.11 Record Type 32: Leg Spread Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 32
3	3	5	N		Intermonth Spread Priority
10	6	15	N		Spread Charge Rate
2	16	17	N		Number of Legs
2	18	19	N		Tier Number 1
2	20	21	N		Delta Spread Ratio 1
1	22	22	AN		Market Side 1
2	23	24	N		Tier Number 2
2	25	26	N		Delta Spread Ratio 2
1	27	27	AN		Market Side 2
2	28	29	N	Y	Tier Number 3
2	30	31	N	Y	Delta Spread Ratio 3
1	32	32	AN	Y	Market Side 3
2	33	34	N	Y	Tier Number 4
2	35	36	N	Y	Delta Spread Ratio 4

1	37	37	AN	Y	Market Side 4

Each leg consists of three fields, the tier number for the leg, the delta spread ratio and the market side of the leg ("A" or "B").

Each spread must have at least two legs. Currently for LME Clear spreads are for two legs only.

There may be many spread records, ordered by spread priority.

All LME commodities will be set-up with the 36 spreads covering all tier combinations from the 8 tiers. Where contracts are not currently set-up for all tiers you will see zero spread charges.

6.1.12 Record Type 33: Spot Month Charge Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 33
2	3	4	N		Number of Spot Months
8	5	12	Date		Spot Month 1
10	13	22	N		Spread Charge 1
10	23	32	N		Outright Charge 1
1	33	33	AN		Delta Sign 1
8	34	41	Date	Y	Spot Month 2
10	42	51	N	Y	Spread Charge 2
10	52	61	N	Y	Outright Charge 2
1	62	62	AN	Y	Delta Sign 2
8	63	70	Date	Y	Spot Month 3
10	71	80	N	Y	Spread Charge 3
10	81	90	N	Y	Outright Charge 3
1	91	91	AN	Y	Delta Sign 3
8	92	99	Date	Y	Spot Month 4
10	100	109	N	Y	Spread Charge 4
10	110	119	N	Y	Outright Charge 4
1	120	120	AN	Y	Delta Sign 4

Each spot month has associated with it a spread charge, an outright charge and a delta sign.

The delta sign can be "L" (apply charges only if remaining delta for the spot date is long), "S" (apply charges only if remaining delta for the spot date is short), or "B" (apply charges whether delta is long or short).

Currently this functionality is not used for LME contracts.

6.1.13 Record Type 40: Contract Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 40

3	3	5	AN		Contract Code
1	6	6	AN		Generic Contract Type
20	7	26	AN		Contract Description
3	27	29	AN		Contract Currency
4	30	33	N		Tick Denominator
4	34	37	N		Minimum Price Fluctuation (in ticks)
14	38	51	Real		Tick Value
8	52	59	Real		Delta Divisor
4	60	63	N		Decimal Locator
4	64	67	N		Strike Denominator
7	68	74	N		Scanning Range (in ticks)
1	75	75	N		Settlement Style Method

The purpose of this record is to detail parameters associated with a contract.

The following records 50 and 60 relate to the contract given in this record, until superseded by another contract record.

The contract currency field indicates the currency of the values in the risk arrays for this contract.

The tick value field is held to five decimal places.

The delta divisor is used to scale a contract's delta, e.g. in intermonth spreading where combined contracts have varying contract sizes.

The decimal locator and strike denominator fields are used to convert the strike price on record 60, which is in display format, into a decimal value.

The settlements style field has the following values:

1 - Premium paid-up-front options

2 - Futures style (futures and futures style options)

3 - Forwards

6.1.14 Record Type 50: Contract Expiry Details

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 50
8	3	10	Date		Expiry Date
8	11	18	Real		Discount Factor
6	19	24	Real		Volatility Shift Up (%)
6	25	30	Real		Volatility Shift Down (%)
3	31	33	N		Number of Expiry Groups
8	34	41	Date		Expiry Group 1

8	42	49	Date	Y	Expiry Group 2
8	50	57	Date	Y	Expiry Group 3
8	58	65	Date	Y	Expiry Group 4
8	66	73	Date	Y	Expiry Group 5
8	74	81	Date	Y	Expiry Group 6
8	82	89	Date	Y	Expiry Group 7
8	90	97	Date	Y	Expiry Group 8
8	98	105	Date	Y	Expiry Group 9
8	106	113	Date	Y	Expiry Group 10
8	114	121	Date	Y	Expiry Group 11
8	122	129	Date	Y	Expiry Group 12
8	130	137	Date	Y	Expiry Group 13
8	138	145	Date	Y	Expiry Group 14
8	146	153	Date	Y	Expiry Group 15
8	154	161	Date	Y	Expiry Group 16
8	162	169	Date	Y	Expiry Group 17
8	170	177	Date	Y	Expiry Group 18
8	178	185	Date	Y	Expiry Group 19
8	186	193	Date	Y	Expiry Group 20
8	194	201	Date	Y	Expiry Group 21
8	202	209	Date	Y	Expiry Group 22
8	210	217	Date	Y	Expiry Group 23
8	218	225	Date	Y	Expiry Group 24
8	226	233	Date	Y	Expiry Group 25
8	234	241	Date	Y	Expiry Group 26
8	242	249	Date	Y	Expiry Group 27
8	250	257	Date	Y	Expiry Group 28
8	258	265	Date	Y	Expiry Group 29
8	266	273	Date	Y	Expiry Group 30
8	274	281	Date	Y	Expiry Group 31
8	282	289	Date	Y	Expiry Group 32

The purpose of this record is to detail any parameters associated with a contract expiry.

For ordinary futures and options, there will be one expiry group.

For LME TAPO contracts, there may be many expiry groups.

In either case, as a precursor to the intermonth spread calculation, it is necessary to apportion the delta for a particular expiry date to all the expiry groups listed. In other words, divide the delta by the number of expiry groups, and allocate this divided delta to the given expiry groups.

The volatility shift up and volatility shift down fields are percentages and are held as decimal numbers, e.g. 15% is held as 0.15.

6.1.15 Record Type 60: Series Details (Risk Array Record)

Length	From	To	Type	Opt	Description
2	1	2	N		Record Type - Always 60
8	3	10	N		Strike Price
2	11	12	AN		Contract Type
5	13	17	N		Lot Size
8	18	25	N		Settlement Price
9	26	34	Real		Composite Delta
7	35	41	N		Loss Value 1
7	42	48	N		Loss Value 2
7	49	55	N		Loss Value 3
7	56	62	N		Loss Value 4
7	63	69	N		Loss Value 5
7	70	76	N		Loss Value 6
7	77	83	N		Loss Value 7
7	84	90	N		Loss Value 8
7	91	97	N		Loss Value 9
7	98	104	N		Loss Value 10
7	105	111	N		Loss Value 11
7	112	118	N		Loss Value 12
7	119	125	N		Loss Value 13
7	126	132	N		Loss Value 14
7	133	139	N		Loss Value 15
7	140	146	N		Loss Value 16

The risk array values are given in a whole number of ticks.

Each value represents the loss (gain) per single long position. Here "long" refers to long futures, long puts and long calls.