Margining Overview for London Stock Exchange Derivatives Market Equities

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Document History

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05 Jan 2010	0.2	Que Anh Trinh	Updated with comments from David Randall
01 May 2010	1.0	Dhanesh Patel	Updated with name change from EDX London to Turquoise Derivatives market
Mar 2012	1.1	Jenny Hodges	Updates and amendments
Oct 2013	1.2	Louise Searle	Updated with name change from Turquoise Derivatives to London Stock Exchange Derivatives Market

Contents

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

1. Introduction

London Stock Exchange Derivatives Market Global Holdings Limited (London Stock Exchange Derivatives Market) offers members the opportunity to trade a wide range of derivatives products available on underlying from Russian and Nordic markets.

London Stock Exchange Derivatives Market equity contracts are a set of products traded on the London Stock Exchange Derivatives Market exchange, and as such, are cleared by LCH.Clearnet Limited (LCH.C). In order to protect itself against the risks assumed as a central counterparty, LCH.C establishes margin requirements for each contract.

One of the main components in calculating the level of initial margin required by LCH.C is PC London SPAN. SPAN looks at a member's portfolio and takes into account any inter-month, inter-commodity or strategy spreads held by the member.

This document will use several examples to explain how (LCH.C) margins on London Stock Exchange Derivatives Market equities products.

Margining

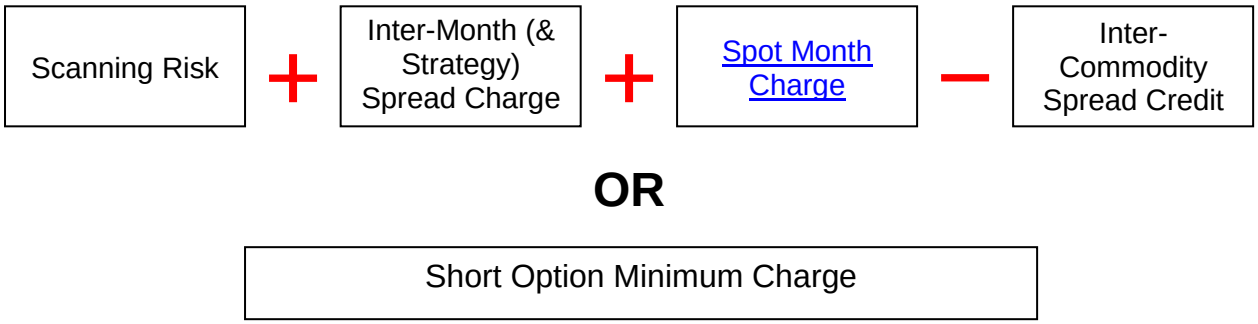
As central counterparty to its members' trades, LCH.C is at risk from the default of a member. To limit and cover such potential loss in the event of a default, LCH.C collects margin on all open positions and recalculates members' margin liabilities on a daily basis. There are two major types, **Initial Margin** (IM) is the deposit required on all net positions and is returned by LCH.C to members when positions are closed, **Variation Margin** (VM) is members' profits or losses that are calculated daily from the market-to-market close value of their open position.

PC London SPAN

PC London SPAN is a portfolio based margining system that incorporates both futures and options, and calculates the net initial margin requirement. There are three major inputs to the PC London SPAN margin calculation - Positions, Prices and Parameters (determined by LCH.C and reviewed on a continual basis). A change to any one of these will result in a change to the margin requirement.

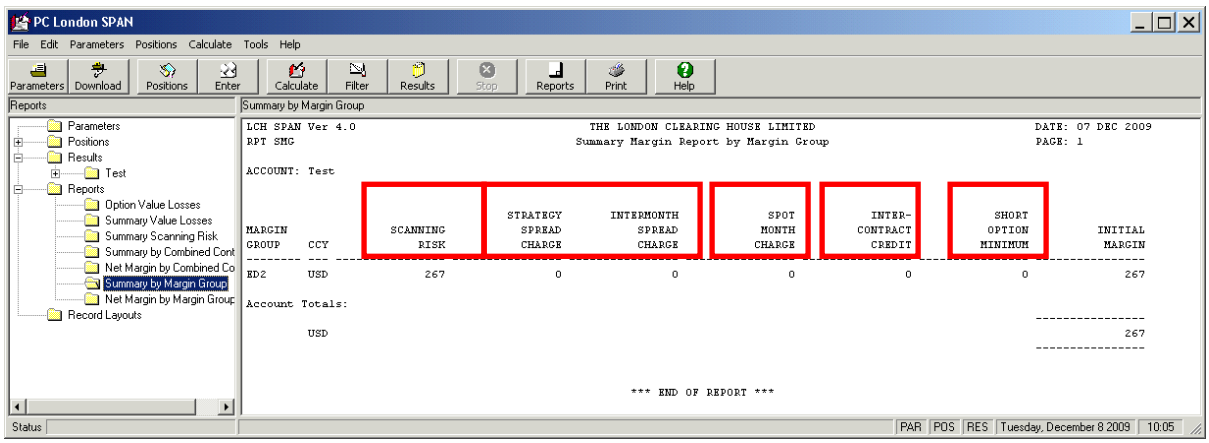
Initial Margin Calculation

PC London SPAN uses the following calculation to work out the initial margin requirements, it is the maximum of:



(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

This can be seen on the following SPAN screen:



This document will provide more detail about the various sections of the initial margin calculation, with examples to help explain how SPAN evaluates portfolios to establish the required margin amount.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

2. Margin for London Stock Exchange Derivatives Market Equities

SPAN margining methodology for London Stock Exchange Derivatives Market Equities mainly consists of two components:

- Scanning Risk, which is the initial margin required for individual position (per lot) calculated based upon the scanning range parameter set for each equity.

- Inter-month Spread charge, which is the additional margin applied to a portfolio with long and short positions in the same contract but different expiries.

The following section will explain how these two components are calculated by PC London SPAN.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

3. Scanning Risk

SPAN divides contracts into groups of futures and options relating to a single underlying asset (e.g. Gazprom futures and options). At the first stage of calculation, PC London SPAN simulates how the value of a 'Portfolio' would react to the changing market conditions defined in the initial margin parameters. This is done by adopting a series of market scenarios and evaluating the portfolio under these conditions.

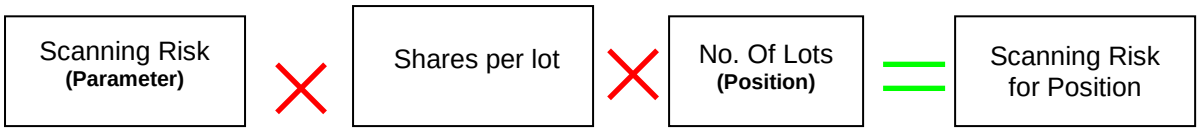
By valuing each net position (future or option) with the appropriate array (sixteen scenarios) consisting of increasing or decreasing the base implied volatilities by specified shift (i.e. 10% shift of 25% implied volatility will give an up and down volatility of 27.5% and 22.5%) and futures prices increasing or decreasing by proportions of the futures scanning range). Then by combining the arrays, PC London SPAN determines the worst loss scenario for the portfolio. This is referred to as the scanning risk.

Example 1: Scanning Risk of Simple Futures Position

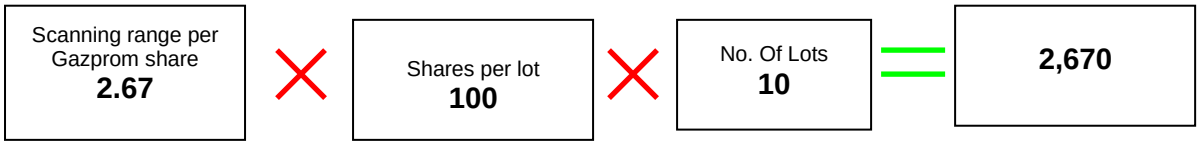
For this example a Long 10 Gazprom Future's (GAU) position will be used. The following parameters for this position need to be entered into SPAN.

Note: *Lot size for London Stock Exchange Derivatives Market equities is 100 shares*

Calculating the initial margin for a single futures position is relatively straightforward, the scanning risk is multiplied by the number of lots:



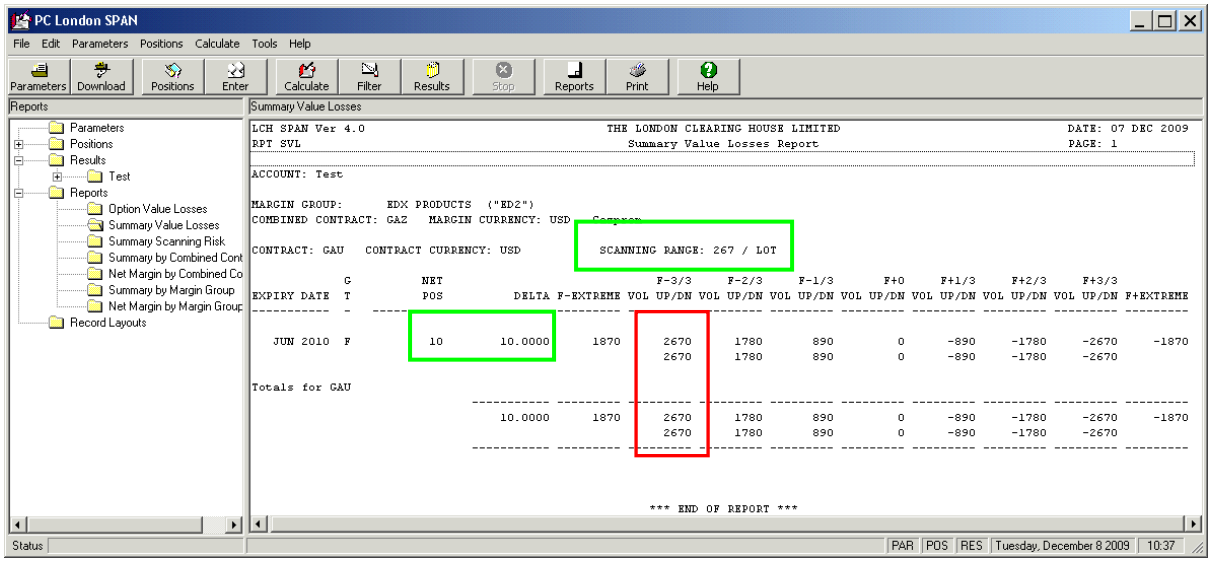
So:



These figures can be found on the *Summary Value Losses* report (below), where the scanning risk for the position (2,670) is the worst possible scenario from the risk array. This means that in the worst possible scenario, this is the furthest the contract price is expected to move under normal market conditions.

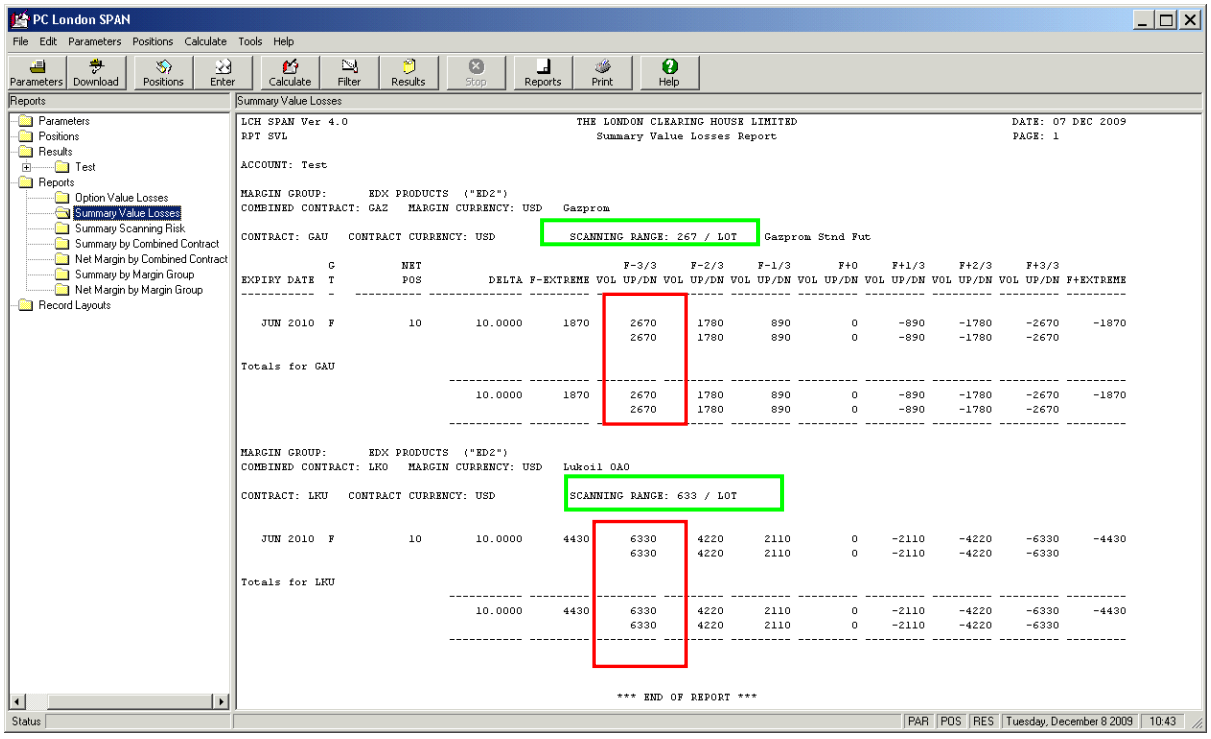
As this example uses only one simple future position, the initial margin required is the scanning risk for the position, in this case 2,670.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)



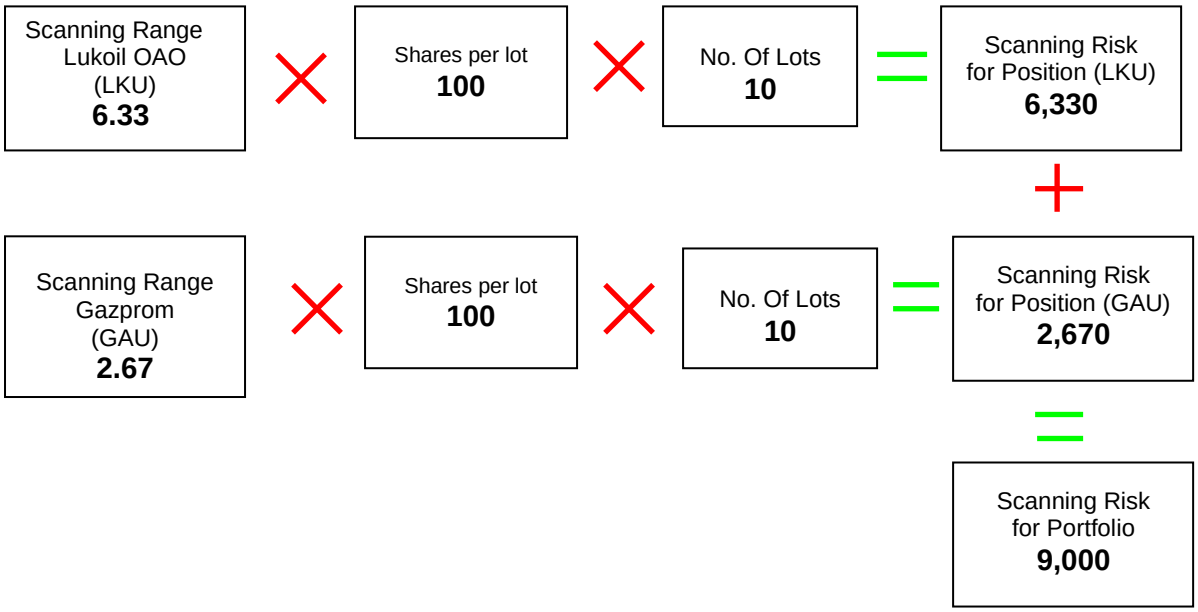
Example 2: Scanning Risk of Multiple Futures Positions in the Same Currency

In this example two positions are now held, 10 Long Gazprom (GAU) Futures, and 10 Long LUKOIL OAO (LKU) Futures, this can be seen on the SPAN screen below:

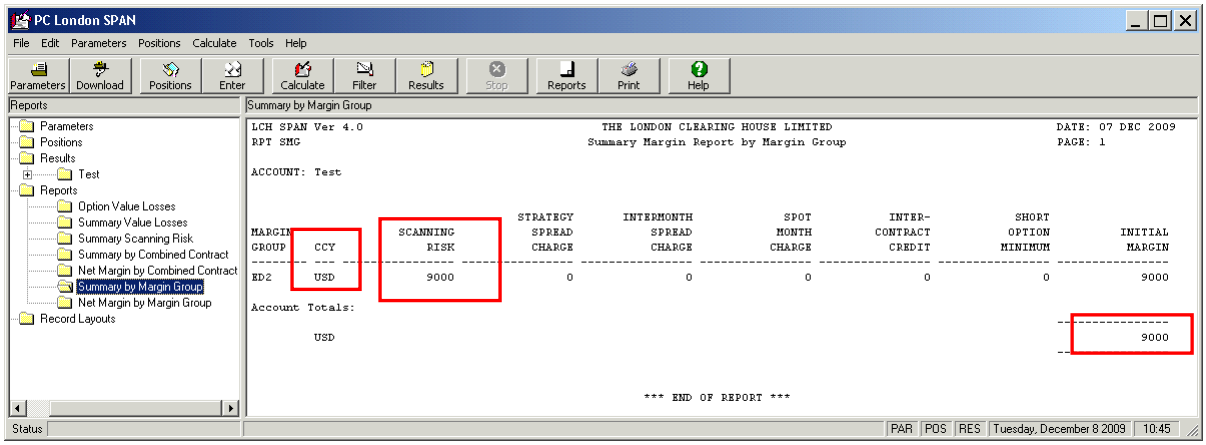


(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

As the two contracts trade in the same currency (USD), SPAN calculates the total scanning risk, from the combination of the two scanning risk calculations:



The scanning risk for the two positions combined can be found on the *Summary by Margin Group* report.



Example 3: Scanning Risk of Multiple Futures Positions in Different Currencies

In this example two positions in different currencies are now held, 10 long GAZPROM (GAU) futures, and 10 long CARLSBERG B (CAH) Futures.

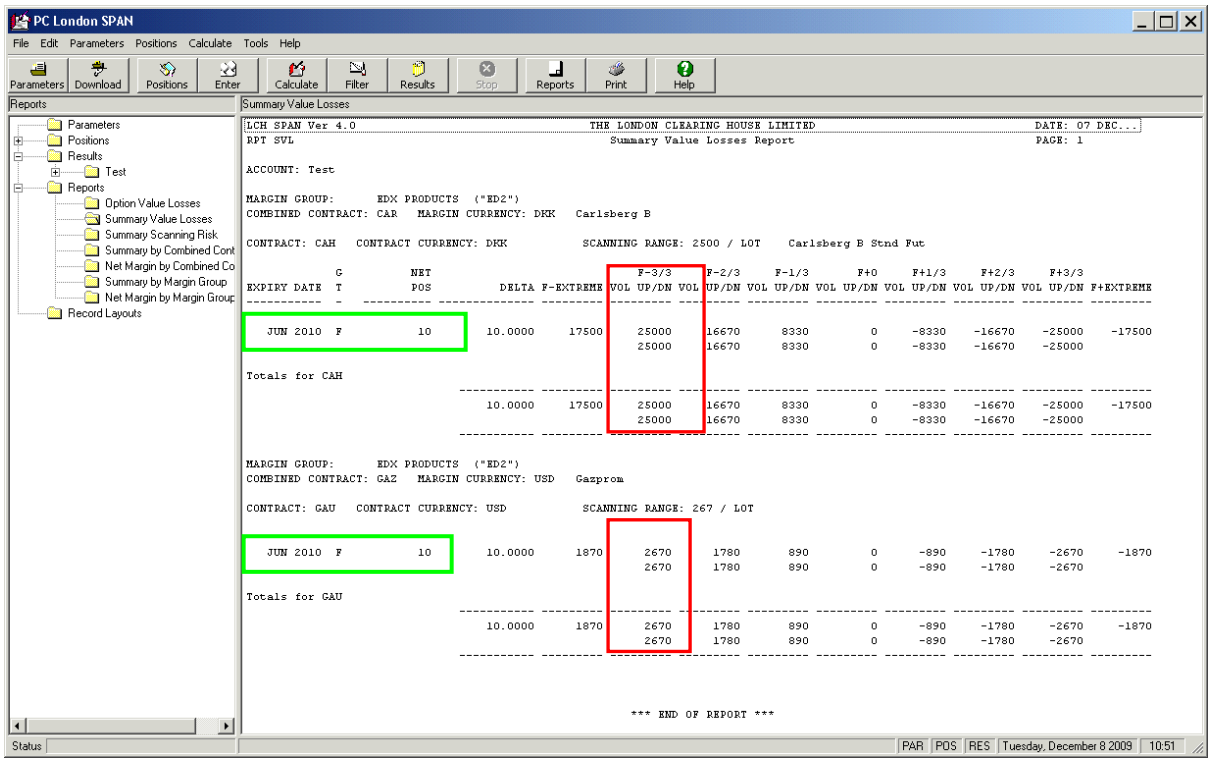
However, as the contracts trade in different currencies, SPAN is unable to produce the scanning risk for the entire portfolio, instead two figures are produced, the scanning risk for contracts traded in USD, and the scanning risk for the contracts traded in DKK. The user should convert one of the figures into the other currency to produce the total initial margin requirement.

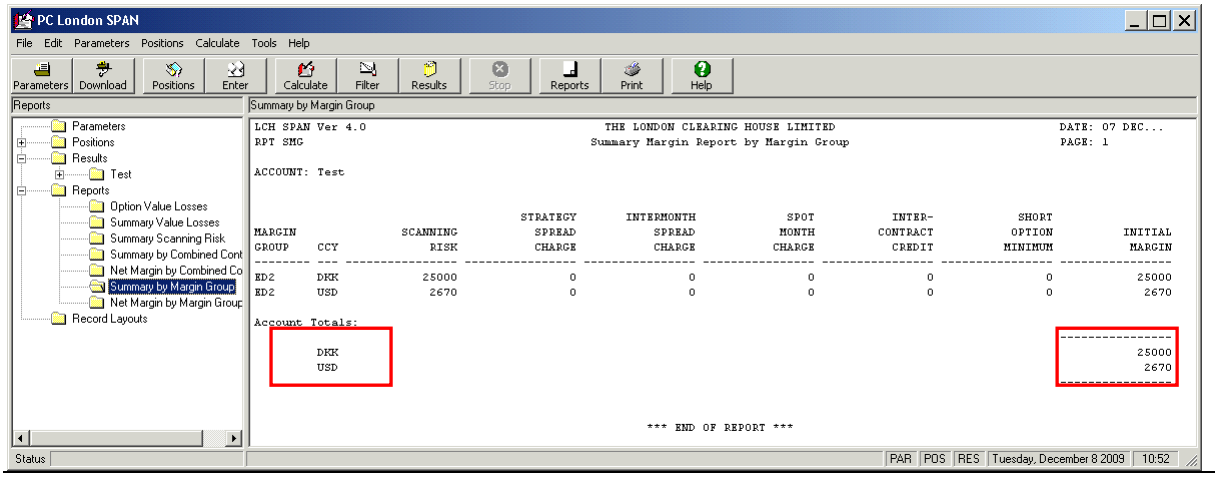
(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

The calculations for this example are as follows:

Scanning Range Gazprom **USD 2.67**	×	**100** (Shares per lot)	×	No. Of Lots **10**	=	Scanning Risk for Position (GAU) **USD 2,670**
Scanning Risk Carlsberg B **DKK 25**	×	**100** (Shares per lot)	×	No. Of Lots **10**	=	Scanning Risk for Position (CAH) **DKK 25,000**

These resultant figures can be seen on the *Summary by Value Losses* SPAN report, and the initial margin requirements in their specific currencies, can be found on the *Summary by Margin Group report,* both below.





(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

Example 4: Scanning Risk of Options Positions

Options margining involves more calculations. This example we will hold three long GAZPROM (GAZ) positions:

- One in-the-money (ITM) call
- One at-the-money (ATM) call
- One out-of-the-money (OTM) call

The total delta for these positions is seen in the calculation below:

Delta for ITM Position **0.7773**	+	Delta for ATM Position **0.5594**	+	Delta for OTM Position **0.0774**	=	Total Delta for Positions **1.4141**

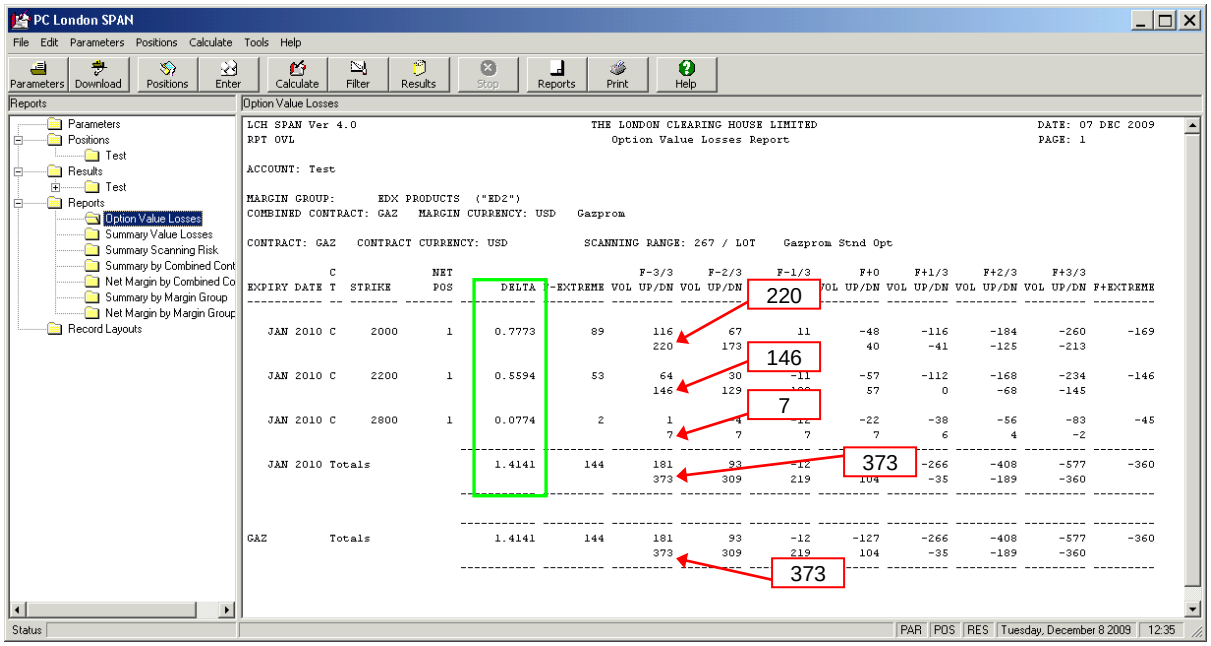
The initial margin for each position will then vary depending on how 'in' or 'out' of the money it is.

INITIAL MARGIN for ITM Position **220**	+	INITIAL MARGIN for ATM Position **146**	+	INITIAL MARGIN for OTM Position **7**	=	Total INITIAL MARGIN for Positions **373**

In this example the 'in the money' position will behave almost the same as a future and this is reflected in the delta converging to 1, with the initial margin requirement being almost the same as that for a future position, 220. The 'out of the money' position has a delta of 0.0774, and a very small initial margin requirement of 7. The 'at the money' position has a delta close to 0.5 (for this example, delta is 0.5594), indicating it will move by 0.5p for every 1p move of the underlying asset and as such, attracts a margin requirement of approximately half the scanning risk.

NB: The Delta is drawn from the theoretical options pricing model and it shows the rate of change in an option premium, with respect to a change in the underlying asset or security.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)



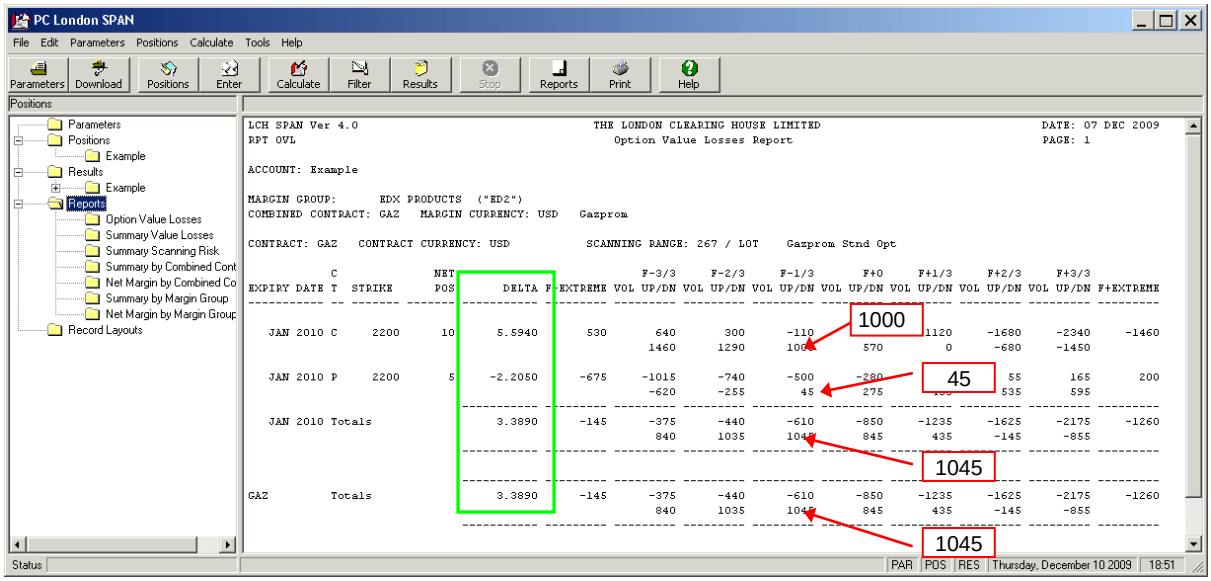
The initial margin requirement then is the sum of initial margins for each position. This can be seen on the *Option Value Losses* report, where the initial margin for each position is the worst-case scenario indicated, and the sum of these is the total initial margin.

Example 5: Scanning Risk of Offsetting Options Positions

When two offsetting options are held, SPAN calculates the overall delta and the total initial margin requirement. If 10 Gazprom (GAZ) long Calls and 5 Gazprom (GAZ) long Puts are held, the delta is 3.3890: 5.5940 for the call, and – 2.2050 for the put (which can be seen in the green box on the diagram below).

Delta for ATM Call **5.5940**	—	Delta for ATM Put **-2.2050**	=	Total Delta Positions **3.3890**	INITIAL MARGIN for Total Position **1,045**

The initial margin required for holding the two positions is the worst-case loss when the two risk arrays are combined, which in this case is 1,045 (i.e. the highest positive value). This can be seen below on the O*ption Value Losses* report.



(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

4. Intermonth Spread Charge

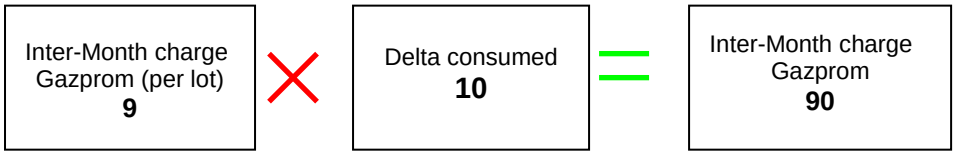
When calculating the scanning risk, PC London SPAN assumes that the futures prices move by exactly the same amount across all contracts months. Therefore, a long position in one month exactly offsets a short position in another month.

Since futures prices do not correlate exactly across contract months, long and short positions in the same contract with different expiries cannot completely offset each other. LCH.C requires additional margin, called inter-month spread charge, to cover this differential in prices.

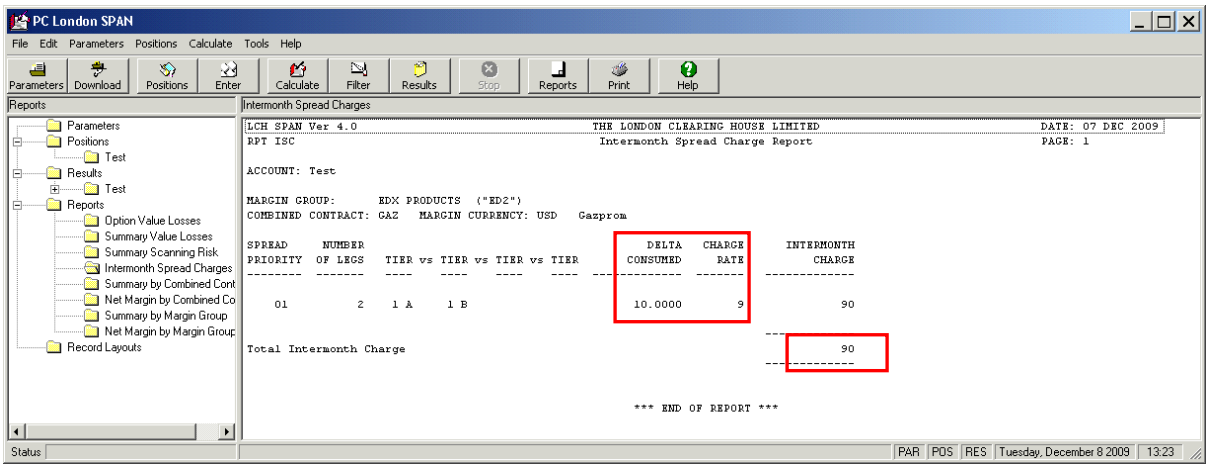
Example of Inter-month Spread Charge Calculation

In this example two positions are now held, 10 Long Gazprom (GAU) Future positions expiring in June 2010, and 15 Short Gazprom (GAU) Future positions expiring February 2010.

SPAN will consider 10 long positions offsetting 10 shorts positions and the inter-month spread charge will be calculated as below:



Example of SPAN Inter-month Spread Charge Calculation



There will be no inter-month charge for the remaining 5 short positions GAU expiring February 2009 but they will be charged at the full Scanning risk.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

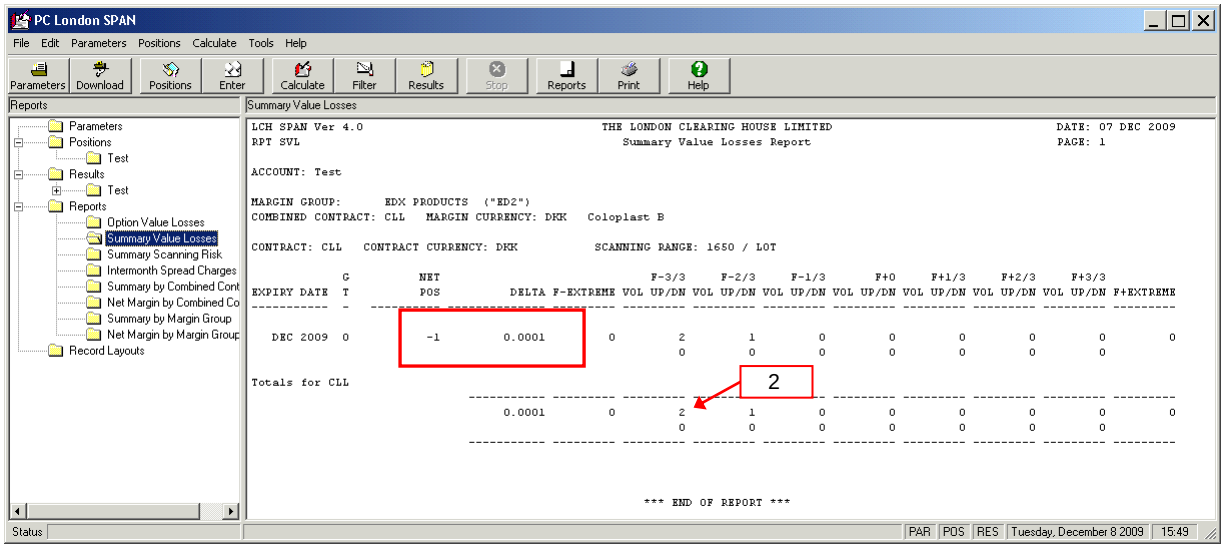
5. Short Option Minimum Charge

Certain option 'portfolios' may show zero or minimal risk when assessed using SPAN. In these cases, SPAN requires a minimum charge for each net short option. The charge sets an absolute minimum margin for the portfolio. If the short option minimum charge is lower than the total initial margin calculated, it is ignored.

Short option minimum charge = net short position x short option minimum charge.

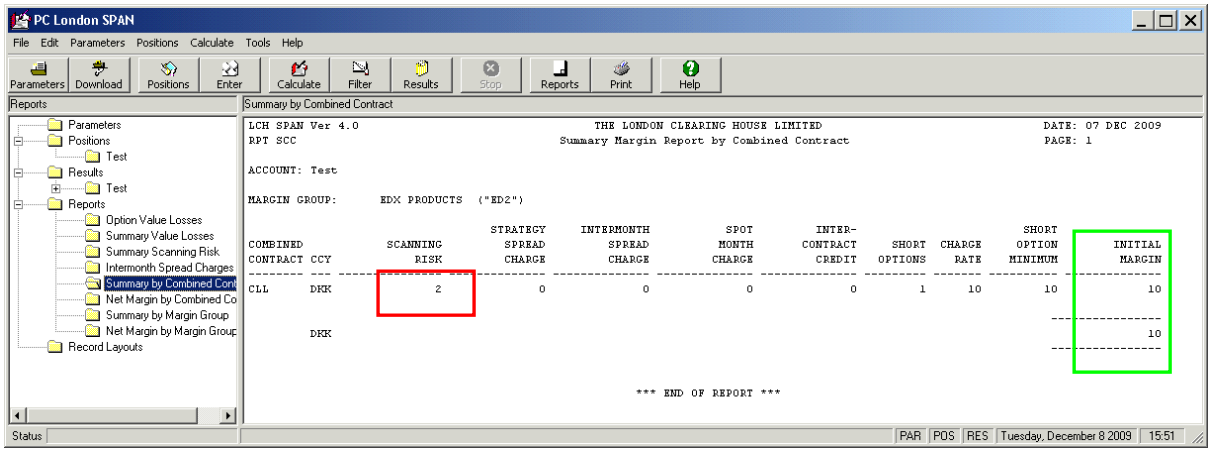
Short Option Minimum Charge Example

In this example 1 deep out of the money Short Put are held. The delta value for the position is 0.0001:



When looking at the *Summary Value losses* report, the total delta is 0.0001, with the worst-case loss being 2. So, Initial Margin of 2 required on this position, as there appears to be very little risk. However, SPAN levies the short option minimum charge of 10 (10 X 1 short options held) to cover any potential losses. This can be seen below in the *Summary by Margin Group* report.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)



As can be seen, the Scanning Risk is less than the Short Option Minimum charge, so, SPAN charges 10 for the 1 short option held, instead of the Scanning Risk 2.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

6. Net Liquidation Value

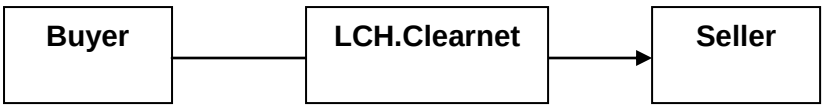
Options on London Stock Exchange Derivatives Market Equities use the concept of Net Liquidation Value (NLV) to enable LCH.C to close out a position in the event of a default. The Net Liquidation Value by its very nature is the cost to close out the position or the current price of the option.

Net Liquidation Value = *Price of option x Contract Size x Number of lots*

The simplest way to look at these options is to look separately from the point of view of a buyer and seller. We will start by looking from the buyer's perspective.

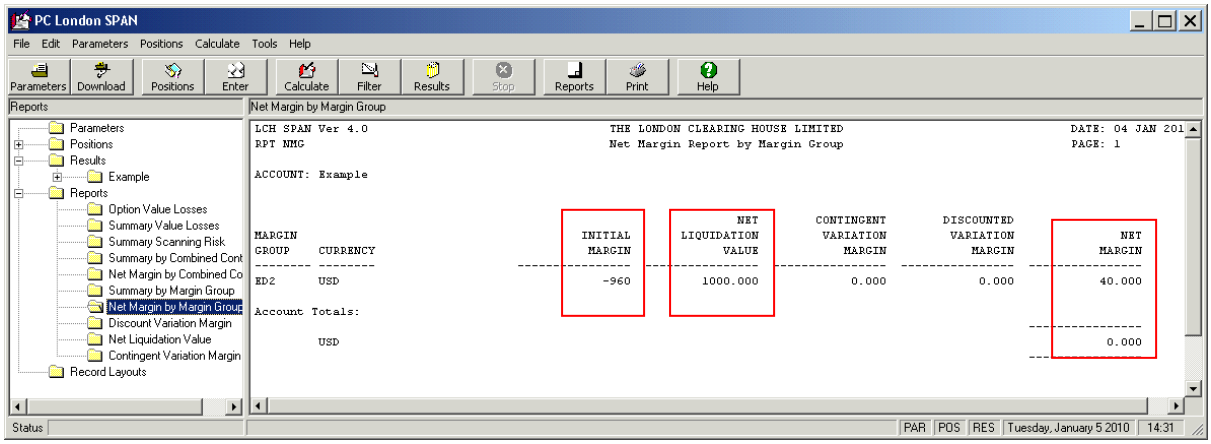
Buyer (On trade date)

- Buys an Option.
- Premium is paid to the seller via LCH.C.



- Initial Margin (IM) is calculated using PC London Span and paid to LCH.C.
- A credit NLV is received. This credit is paid as the option is considered an asset that could be used in the event of default to offset any other losses the buyer may have. The NLV represents the current value of this asset.

Note: The credit NLV received will nearly always cover any initial margin requirement resulting from the trade. Any excess credit NLV can be used to offset any debit NLV and initial margin across positions in the same contract family. This can be seen using the *Net Margin Report by Combined Contract* for 10 March 2010 (GAZ) call option.



INITIAL MARGIN requirement **- 960**	+	Credited NLV **1,000**	=	Net **Credit** Margin **40**

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

The resultant net margin after covering the initial margin requirement will remain as credit on the members' account; it is this amount that can be used to offset any other debit NLV or Initial Margin requirements.

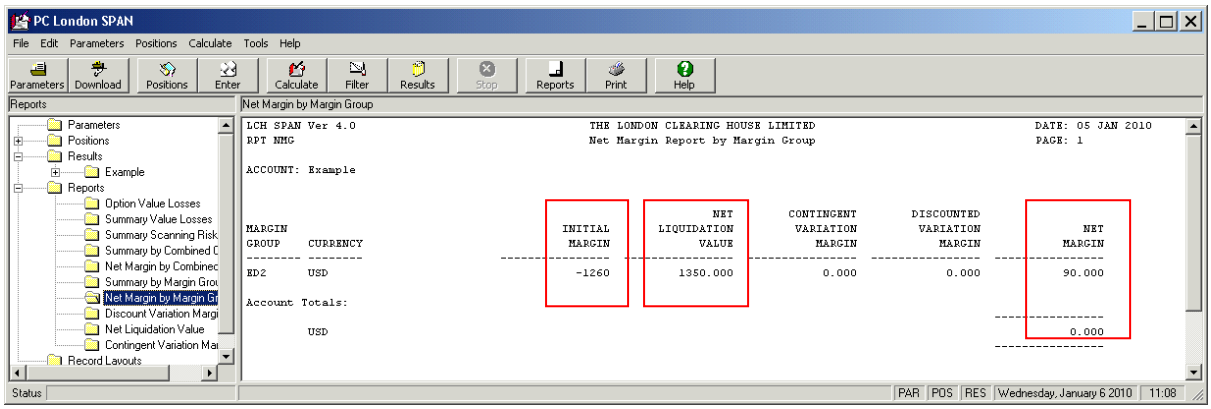
Buyer (Day 2)

- The price for the option goes up.
- Again initial margin will be paid to LCH.C. Initial margin is re-valued on a daily basis through PC London SPAN to account for change in options price and time to expiry. Any increases in initial margin will need to be paid, whilst decreases in initial margin will be returned to the buyer or held on the buyers account
- NLV will be re valued using the following formula:

  NLV = Price of Option x Contract size x Number of lots.

  Since the option price has increased, buyers' credit NLV will increase.

This can be seen below on the *Net Margin Report by Combined Contract*. The delta has moved further into the money so the GAZ call option value has increased and hence increasing the Margin requirement.



Initial Margin requirement **-1,260**	+	Credited NLV **1,350**	=	Net **Credit** Margin **90**

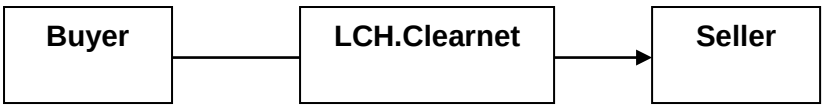
Buyer (At expiry)

- If the option finishes 'in the money', the buyer will choose to exercise and receive the asset at the strike price. The remaining NLV on the Buyers account will become the Variation Margin (VM) on the futures position.
- Initial Margin will now be charged on the resulting futures position.
- Credit NLV will be at zero as the option has expired.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

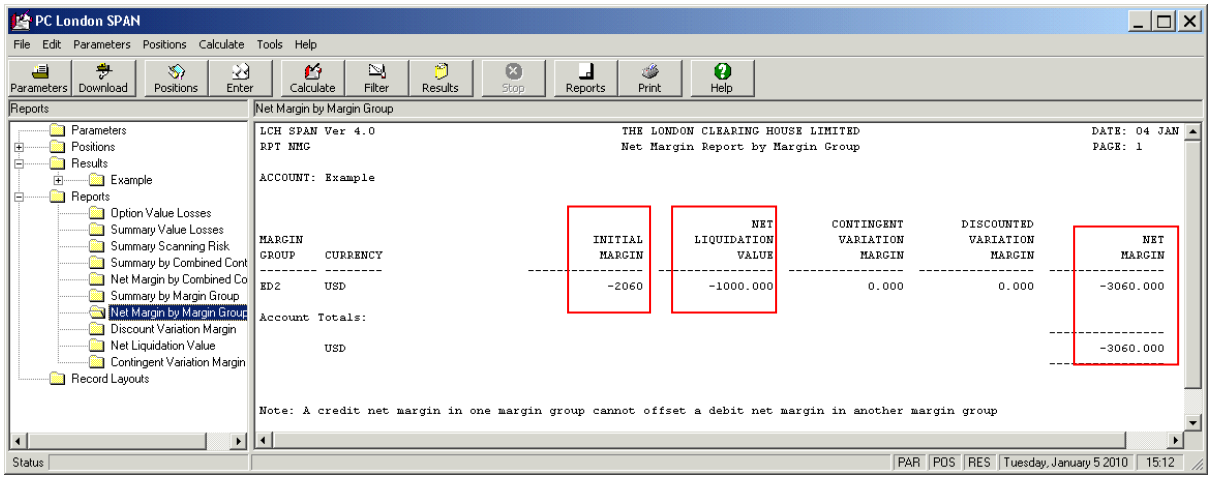
Seller (On trade date)

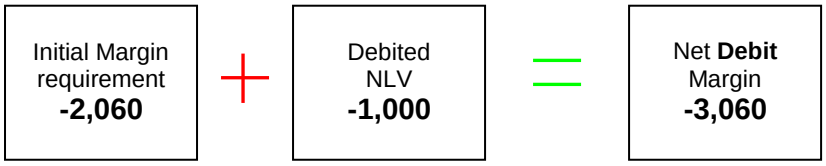
- Sells call options
- Premium is paid to the seller via LCH.C.



- Initial Margin (IM) is paid to LCH.C and is calculated using PC London SPAN.
- Debit Net Liquidation Value is paid to LCH.C. This debit is paid as if the seller were to default then LCH.C would need to close out the option by buying it back in the open market. LCH.C must therefore recognise the seller's liability under the options contract. To recognise this liability NLV is used to measure the current value of the options contract. Debit NLV can be covered with either cash or acceptable non cash collateral. (See Acceptable Collateral list on the LCH.C website)

This can be seen using the *Net Margin Report by Combined Contract* as seen below.





Seller (Day 2)

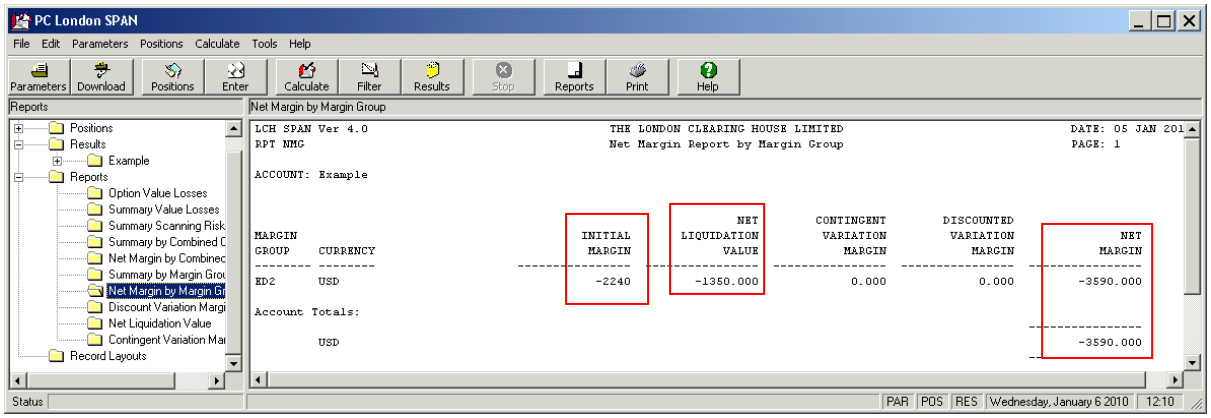
- The price for the option goes up.
- Again initial margin will be paid to LCH.C. Initial margin is re-valued on a daily basis through PC London SPAN to account for change in options price and time to expiry. Any increases in initial margin will need to be paid, whilst decreases in initial margin will be returned to the seller or held on the sellers account.
- NLV will be re valued using the following formula:

  NLV = Price of Option x Contract size x Number of lots.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

Since the option price has risen the seller's debit NLV will increase. Additional funds or collateral will therefore need to be lodged with LCH.C to cover this increase.

This can be seen using the *Net Margin Report by Combined Contract.*



Initial Margin requirement **-2,240**	+	Debited NLV **-1,350**	=	Net Margin **-3,590**

As the underlying price increases so the call option is moving further in the money so LCH.C will require more margin from the seller.

Seller (At expiry)

- If the option finishes 'in the money', the buyer will choose to exercise and receive the futures at the strike price. The remaining NLV on the Sellers account will become the Variation Margin (VM) on the futures position.
- Initial margin will now be charged on the resulting futures position.
- Debit NLV will be at zero as the option has expired.

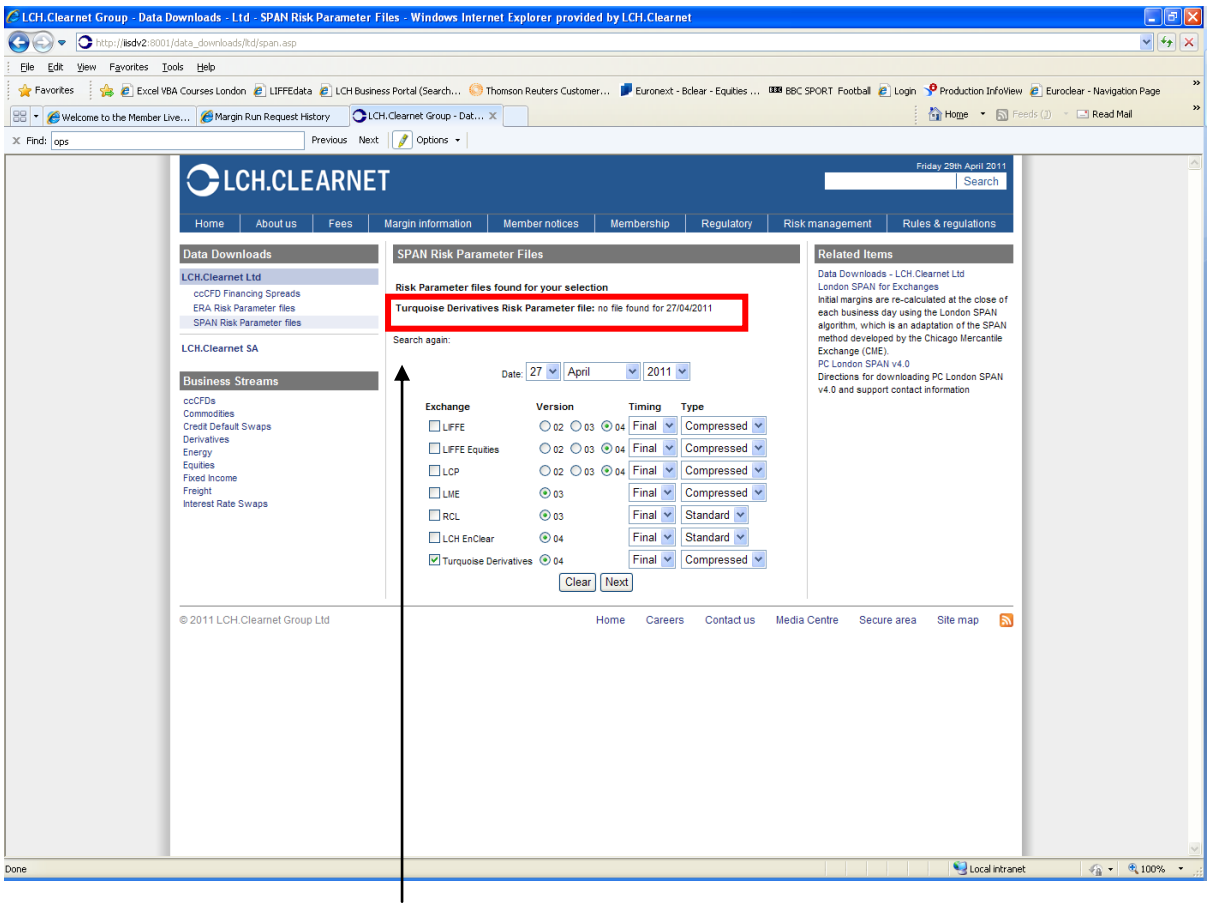
7. PC London SPAN Parameter File

Accessing the Parameter File

This file contains all the prices for Futures and Strike for Options needed to enter positions in PC London SPAN. It is available on the LCH.C website at:

http://www.lchclearnet.com/data_downloads/ltd/span.asp

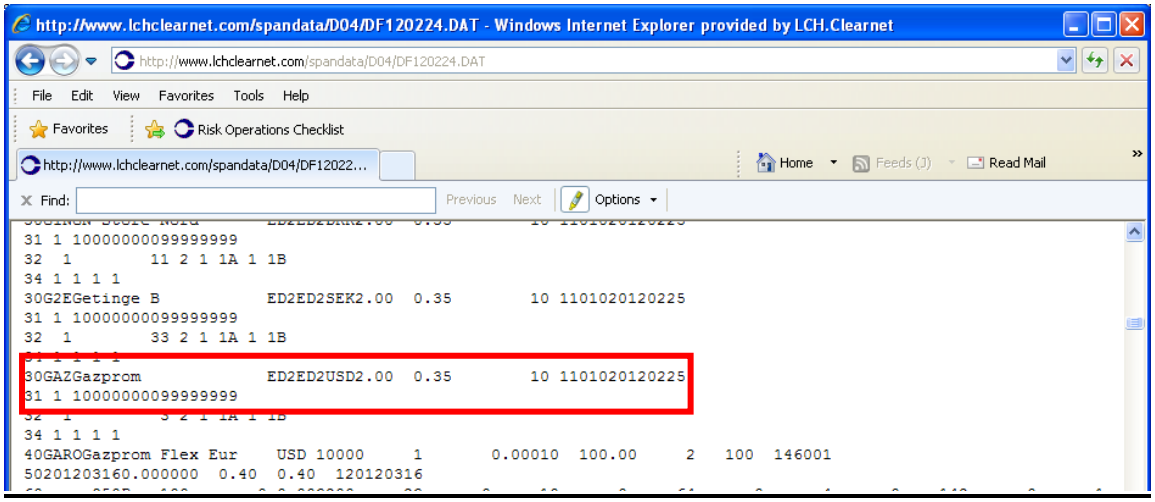
Then select London Stock Exchange Derivatives Market, change the date to the previous working day, change the drop down from compressed to standard and click next. The following screen should appear.

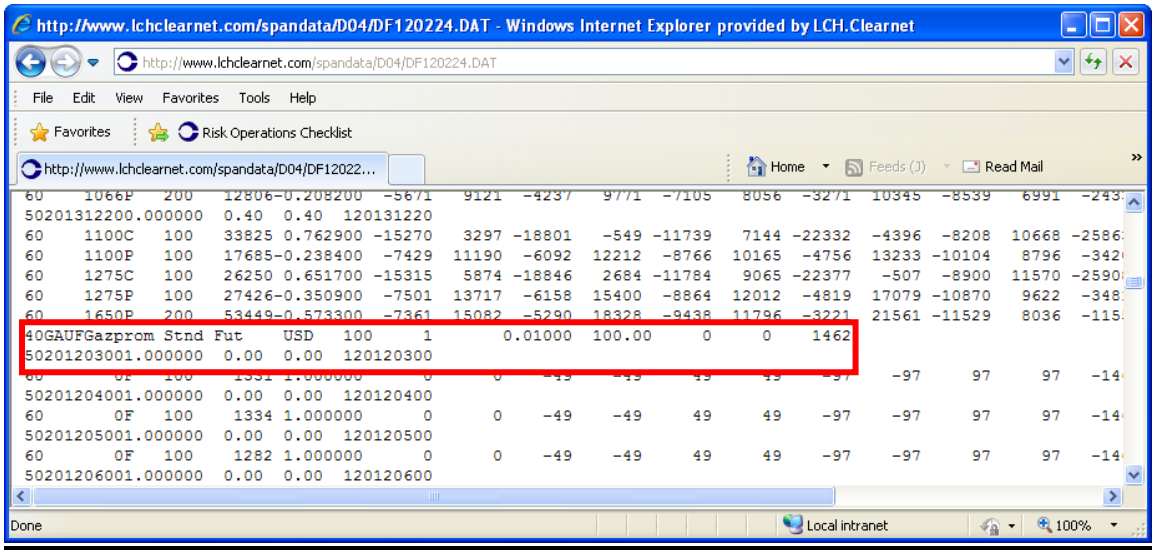


Clicking on the .DAT file link will display the parameter file.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

Navigating the Parameter File

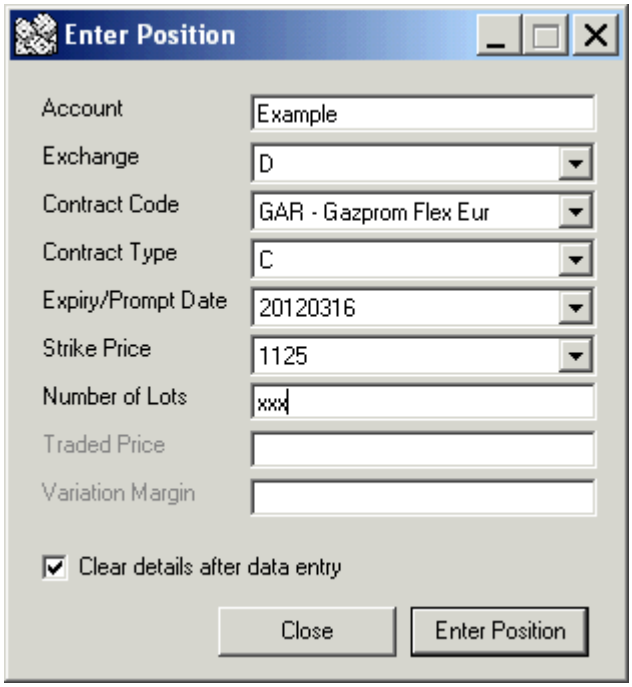




Above is an example of the parameter file. The contract code and name are displayed at the top. The expiry, price and number of lots of each future are displayed below this.

The future highlighted would be entered into PC London Span the following way

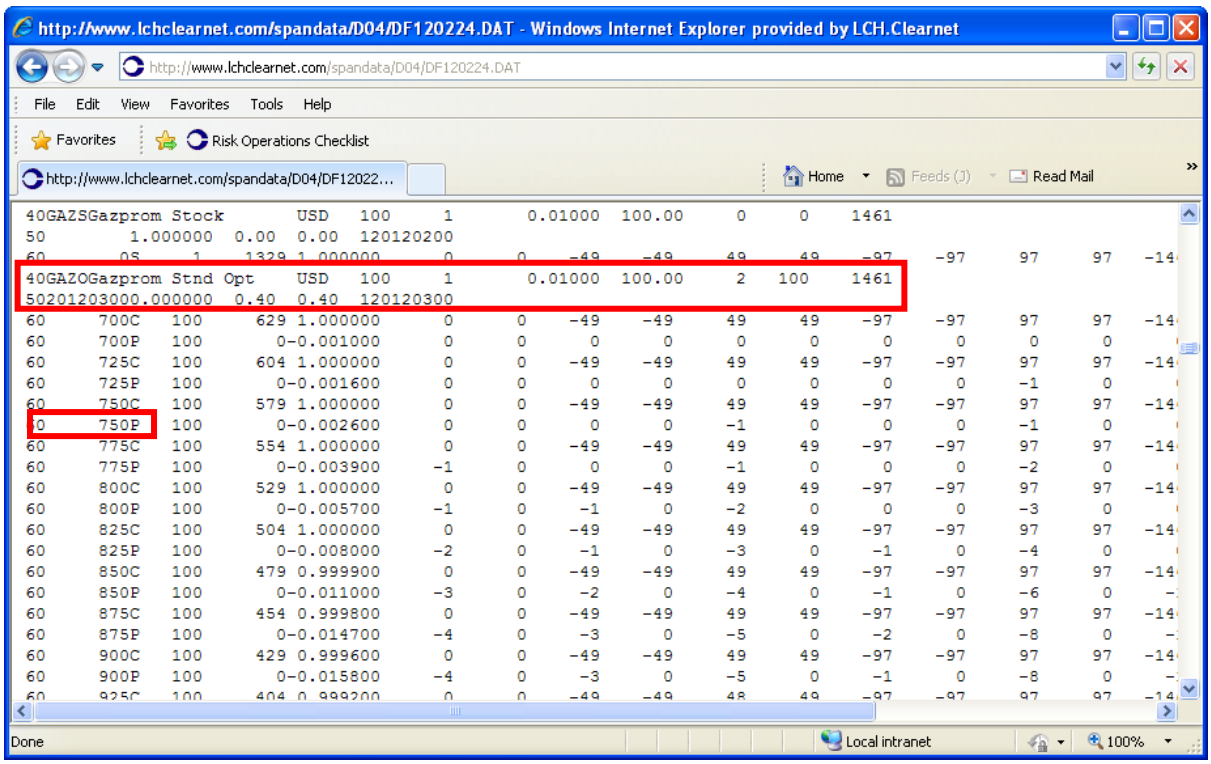
(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)



If you wish to construct your own SPAN parameter file, please see the below link for details.

http://www.lchclearnet.com/risk_management/ltd/margining/london_span_for_exchanges/technical_specifications/default.asp

Below is an example of how options are displayed in the parameter file:



(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

The contract code and name are again displayed at the top on the futures example. The date of the expiry of the option is also shown at the top. The lists of strike prices for this expiry are shown below this. The P or C represents whether the option is a Put or a Call.
The 750 strike put highlighted in the above example would be entered into PC London SPAN.

NB: All positions entered into PC London SPAN have to be genuine futures prices or option strike prices otherwise PC London SPAN will not be able to calculate the initial margin requirement.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

8. Glossary of Terms

At-the-money

An option or warrant where the exercise price is equal to the current market price of the underlying asset. For example, a call option with an exercise price of 100p on a share with a share price of 100p is at-the-money.

More generally, however, an at-the-money option is an option whose exercise price is nearest to that of the underlying asset. For example, where an option has strike prices at intervals of 10p, e.g. 90p, 100p, 110p etc, if the underlying asset has a price of 97p, the at-the-money option is the 100p strike, which is the nearest strike price to the underlying price. See also In-the-Money.
Back

Call Option

An option that gives the holder the right, but not the obligation, to buy an asset at a given price on or before a given date. See also Option.
Back

Delta

Drawn from the theoretical options pricing model (e.g. Black Scholes), the delta of an option shows the rate of change in an option premium with respect to a change in price of the underlying asset or security. For example, the premium on an option with a delta of 0.5 will move by 0.5p for every 1p move in the price of the underlying. Delta can also be defined as either (i) the probability that the option will expire in-the-money, or (ii) the theoretical number of futures contracts of which the holder is either long (with a call option) or short (put option).
Back

Futures Contract

A legal agreement to buy or sell a standard quantity of a specified asset for delivery at a fixed future date at a price agreed today. Futures are traded on futures exchanges, such as NYSE Liffe (London market), London Stock Exchange Derivatives Market or the London Metal Exchange. They are available in a range of assets, such as wheat and copper and also on indices, such as the FTSE 100.
Back

In-the-Money

A call option where the exercise price is below the asset price is in-the-money. For example, a call option on a share with an exercise price of 100p when the share price is 110p is in-the-money. A put option is in-the-money when the asset price is below the exercise price. For example, a put option on a share with an exercise price of 100p when the share price is 90p is in-the-money. See also out-of-the-money and at-the-money.

Back

Initial Margin

The returnable deposit paid to the LCH.C by the clearing member when entering into transactions on the cleared markets. The purpose of initial margin allows the LCH.C to hold sufficient funds on behalf of each clearing member to offset any losses incurred between the last payment of margin and the close out of clearing member's positions should the clearing member default. Initial margin is usually calculated by taking the worst probable loss that the position could sustain over a fixed amount of time, and can be paid in either cash or non-cash collateral.
Back

Initial Margin Requirement

The size of deposit a member must lodge with LCH.C to cover potential losses to LCH.C in closing out the open positions in the event of a member defaulting.
Back

Intermonth Spread Charge

A charge to cover the basis risk that prices of contracts (with the same underlying asset) in different delivery (prompt) months will move independently of one another.
Back

Inter Commodity Spread Saving

In certain cases, offsets or margin liabilities in respect of different contracts are allowed across "portfolios". The inter-commodity spread credits recognise cases where offsetting positions in price-related but discrete contracts reduce overall portfolio risk. The offset reduces the amount of margin required on the spread position.

Details of spreads allowed are available from the LCH.C Risk Management department or from frequently distributed LCH.C and exchange circulars. LCH.C and the exchanges decide where it is justifiable, on risk assessment criteria, to allow intercontract margin offsets and set the corresponding spread credit rates. Delta spreads are calculated and then used with these parameters to calculate the inter-commodity spread credits. The calculation of inter-commodity spread credits is explained in detail in the PC London SPAN Technical Information Package (TIP).
Back

PC London SPAN

Standard Portfolio Analysis of Risk, a margining system used by LCH.C to calculate initial margins due from and to its clearing members for NYSE Liffe (London market), LME, London Stock Exchange Derivatives Market, LCH EnClear and RepoClear positions. SPAN is a computerised system which calculates the effect of a range of possible changes in price and volatility on portfolios of derivatives. The worst probable loss calculated by the system is then used as the initial margin requirement.

(For more information on downloading and using SPAN, please see the user guides on the LCH.Clearnet website.)

Back

Long Position

Any position which has been purchased. For example, a long futures position means that you have bought a future. Contrast with Short.
Back

Lot

Another term for a contract.
Back

Option

A contract which gives the holder the right, but not the obligation to buy or sell a specified asset at an agreed price on or before an agreed date in the future. The right to buy an asset is referred to as a call option. The right to sell is referred to as a put option.
Back

Out-of-the-Money

A call option or warrant where the exercise price exceeds the asset price is out-of-the-money. For example, a call option on a share with an exercise price of 100p when the share price is 90p is out-of-the-money. A put option is out-of-the-money when the asset price exceeds the exercise price. For example, a put option on a share with an exercise price of 100p when the share price is 110p is out-of-the-money. See also In-The-Money and At-The-Money.
Back

Portfolio

The current open positions held in any futures or options contracts. If all the contracts held are based on the same underlying asset then the portfolio is more correctly known as a contract family.
Back

Position

A long or short market commitment, an obligation, or right, to make or take delivery.
Back

Put Option

A contract which confers upon the holder the right, but not the obligation, to sell an asset at a given price on or before a given date.
Back

Short Position

A term used to describe an open sold futures or options position. Also used to describe someone who sells a cash asset not previously owned. Contrast with Long (Position).
Back

Spot Month Charge

Volatility can increase when a contract approaches the last day of trading or the day of delivery of the underlying instrument. The LCH.C covers this risk by building an additional spot month charge into PC London SPAN.
Back