

EQUITY EQUITY DER - MARGIN SYSTEM MANUAL (MARS)

Manual

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CC&G

A EURONEXT COMPANY

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INTRODUCTION

This document is written for Members of Cassa di Compensazione e Garanzia and will allow Clearing Members to calculate margin requirements for contracts which are traded on the Italian equity and derivatives markets and which are cleared by CC&G. Section 1 contains an overview of the Margining System (MARS) methodology. Section 2 identifies the set of data required to calculate margin requirements using the MARS methodology. Section 3 provides a detailed discussion of the steps required to calculate margin requirements using MARS. The Appendix explains how to retrieve the record layouts for the risk arrays (theoretical values) and the class file (underlying information) which are distributed by CC&G on a daily basis, as well as the data which are used to calculate margins for the sample portfolio.

OVERVIEW OF MARS MARGIN CALCULATIONS



MARS system (Margining System) begins by organizing all securities contracts - equities, warrants, convertible bonds, rights issues and shares of Closed-End Funds (CEF) and of Exchange Traded Funds (ETF) - and derivatives contracts - futures and options - relating to the same underlying asset into "class groups". Where the underlying assets for two or more class groups exhibit close price correlation, those class groups are organized into larger "product groups". The positions comprising class groups and product groups are margined as integrated portfolios. Class group and product group parameters are contained in the data distributed by CC&G on a daily basis.

The daily margin requirement for a class group or a product group has four components: "futures spread margin" which covers futures positions which have been spread, "Mark to Market margin" which covers, for futures, any stock futures positions which have been expired and have not yet been settled and, for securities, the cost to liquidate securities positions at current market value, "premium margin" which covers the cost to liquidate option positions at current market prices and "additional margin" (risk margin) which covers the additional projected cost of liquidating all securities positions, option positions and non-spread futures positions in the event of an assumed worst case change in the price of the underlying. In addition, if the risk margin component of a particular product group is less than a calculated minimum margin for the product group, then the minimum margin will be taken as the risk margin.

The first step in calculating margin requirements is to net long and short positions in the same series of options or futures for each class group. Only the net long or short position in each series of options (symbol, put or call, expiry month and strike price) or contract month of futures is counted for margin purposes. Net short call positions and net short futures positions are further reduced where underlying stocks have been deposited to cover the short positions. The number of contracts covered is determined by dividing the number of shares deposited by the contracts size or multiplier.

For the securities contracts the net position (long or short) is maintained together with the corresponding "Delivery Versus Payment Amount" (or "DVP Amount"), calculated summing up the market countervalue (debit or credit) of each trade executed.

The next step is to calculate futures spread margin for the net futures positions in the class group. Net long futures positions in a contract month will be automatically spread against net short futures positions in other contract months. A spot or regular (non-spot) margin rate may be charged depending on whether the spread contract involves the spot month.

The next step is to calculate Mark to Market margin for any net expired unsettled Stock futures contract in the class group. Mark to Market margin is calculated by multiplying the net delivery position by the contract size and by the difference between the current market price of the underlying and the "delivery price" of the expired position. Presuming it is positive, mark to market margin is a credit for the holder of long stock future position and a debit for the holder of short stock future position.

The next step is to calculate the Mark to Market Margin for all securities contracts in the class group. Assuming a market price increase of the security, MTM margin represents the proceeds from selling the long position if it was liquidated at the current (higher)

market price. It represents as well the cost to buy back the short position if, likewise, it were to be liquidated at the current (higher) market price

MTM margin is calculated for each series of securities subtracting the Current Market Value Amount (that is the securities' countervalue at current market prices) from the Delivery Versus Payment Amount.

The next step is to calculate premium margin for all options in the class group. For these option positions, premium margin is a credit for the holder of the long position as it represents the proceeds from selling the long position if it were liquidated at the current market price. Premium margin is a debit or requirement for the holder of the short position as it represents the cost to buy back the short position if, likewise, it were to be liquidated at the current market price. Premium margin is calculated for each series of options by multiplying the net long or short contract quantity by the contract size by the closing price of the options series.

For exercised and assigned positions, premium margin is a credit for the exercised long position (presuming it is In-The-Money) and a debit for the corresponding assigned short position. Premium margin for exercised and assigned positions is calculated by multiplying the net exercised or assigned contract quantity times the contract size times the difference between the strike price of the exercised position and the current market price of the underlying.

Premium margin for both open positions and exercised and assigned positions is summed algebraically at class group level to arrive at a total class group premium margin debit or credit.

The final step is to calculate additional or risk margin for the class group. Analysis of historical volatility is used to determine the maximum one day move in the price of the underlying (the margin interval) against which the clearing house wishes to be protected. Using an options pricing model with implied volatility for each series of options, the clearing house forecasts the potential gain or loss on the portfolio of positions assuming a maximum upwards and a maximum downwards movement in the price of the underlying as well as at a number of intermediate price points. For exercised and assigned positions, potential gain or loss is equal to the difference between the strike price of the exercised or assigned position and the price of the underlying at each projected underlying price. To provide additional protection, the value of deep out-of-the-money short call positions at the maximum upside and deep out-of-the-money short put positions at the maximum downside is presumed to be at least a fixed percentage of the margin interval (as determined by CC&G).

These values are provided on a daily basis by CC&G for each series of securities and derivatives which are eligible for trading.

The foregoing will produce ten projected values for the class group which are saved for use in further calculations. If an upside or downside variation reflects an increase in liquidating cost or a decrease in liquidating value, that variation is considered to be a

debit for margin calculation purposes (signifying a margin requirement). If an upside or downside variation reflects a decrease in liquidating cost or an increase in liquidating value, that variation is considered to be a margin credit. In most instances, if the upside variation is a debit, the downside variation will be a credit and vice versa. However certain combinations of positions could result in both variations being either debits or credits.

If the class group is not part of a larger product group, additional margin for the class group is an amount equal to the largest debit of the ten projected values calculated in the previous step. In the unlikely case that the additional margin is less than the calculated minimum margin, the additional margin requirement would be equal to the minimum margin. The total margin requirement for the class group is an amount equal to the algebraic sum of the futures spread margin for the class group, the premium margin, the MTM margin and the additional margin requirement for all securities, options and non- spread futures in the class group.

If the class group is part of a larger product group, premium margin, MTM margin, additional margin and total margin are determined at the product group level. Premium margins for all class groups in the product group are summed algebraically to arrive at a single premium margin requirement for the product group. MTM margins for all class groups in the product group are summed algebraically to arrive at a single MTM margin requirement for the product group. Any class group upside or downside variations which are credits are reduced by a predetermined percentage (the product group offset). The purpose of this reduction is to compensate for the lack of perfect correlation in price movements among the class groups comprising the product group. The amount of the offset is based on an analysis of historical prices which identifies the degree of observed correlation among various class groups.

Next, the variation at each recalculation point of the class group is added algebraically to the corresponding variation of each class group in the product group to arrive at ten product group variations. The largest debit of the ten upside and downside variations would constitute the additional margin requirement for the product group. In the unlikely case that all projected values are credits, the additional margin requirement for the product group would be equal to the minimum margin. The total margin requirement (or credit) for the product group as a whole is an amount equal to the sum of the futures spread margin for each class group in the product group, the total premium margin for the product group, the total MTM margin for the product group, and the total product group additional margin. The total margin requirement for the account is the algebraic sum of all of the product group total margin requirements. In the case that the total is a credit, the margin requirement for the account is presumed to be zero.

Fail positions are margined separately from ordinary positions using the same procedure described above. Margins on fail positions (if debit) are summed up to the margins on ordinary position and the grand total of margin requirement for the account is thus obtained.

2. DATA REQUIREMENTS



There are three files of data required to calculate MARS margins; the file of risk arrays (theoretical values) which is provided by CC&G on a daily basis, the class file (underlying information) which is also provided by CC&G on a daily basis, and the file of positions for which margin is to be calculated which is provided by the clearing member or user. The following identifies the data which are contained on the various files. For detailed record layouts see Appendix A.

Contact CC&G for further information regarding receipt of these files on a daily basis.

1. Risk Array (theoretical values)

- *Class type (F = futures, O = options, C = equities, rights issues or shares of CEF and ETF, V =convertible bonds, W = warrants)*
- *Symbol*
- *Expiration year*
- *Expiration month*
- *Strike price*
- *Put or call*
- *ISIN code*
- *Closing price*
- *Theoretical value array (10 values)*
- *Short option adjustment*

2. Class file (underlying information)

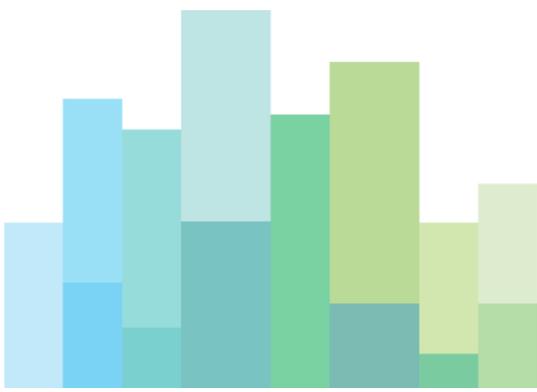
- *Symbol*
- *Class group*
- *Product group*
- *Class type (F = futures, O = options, C = equities, rights issues or shares of CEF and ETF, V =convertible bonds, W = warrants)*
- *Product type (I = index, E = equities, B = bond, S = securities)*
- *Offset percentage*
- *Spot spread rate*
- *Regular spread rate*
- *Delivery margin rate*
- *Contract multiplier*
- *Options or futures style*
- *Underlying price*
- *Margin interval*
- *Currency*
- *Exchange rate*
- *Currency haircut*
- *Options minimum margin rate*
- *Futures minimum margin rate*
- *Interest rate*
- *Dividend date*
- *Dividend amount*

3. Positions

- *Account id*

- *Class type (F = futures, O = options, C = equities, rights issues or shares of CEF and ETF, V =convertible bonds, W = warrants)*
- *Symbol*
- *Expiration year*
- *Expiration month*
- *Strike price*
- *Put or call*
- *Long position*
- *Short position*
- *DVP date*
- *DVP amount*

3. PROCEDURE REQUIRED TO CALCULATE MARGIN



3.1 Update position records with underlying information

Step 1

All three of the files identified in section 2 may be combined to produce a single file with all the data necessary to perform margin calculations. Initially however, the class file must be used to acquire the Class Group and Product group for each position record by matching on the "Symbol" field. Once positions have been updated with the Class Group and Product Group, they must be sorted in the following sequence for further processing: account ID, product group, class group, futures, options, securities.

*Note: Regarding several futures contracts, included in the same **Class Group** (same underlying asset), in which the multiplier of one is an integer multiple of the other, the full offset for the initial margins calculation purpose may be allowed.*

The positions of the Class with the greater multiplier will be adjusted (using the ratio of the two classes multipliers as adjustment factor), in a corresponding positions number of the Class with the smaller multiplier.

Example #1

Original positions

Acnt	P. Grp	C. Group	Class	Long	Short	Net	Mult.
ABC	IDX	FTMIB	FTMIB	1	0	-1	5
ABC	IDX	FTMIB	MINI	0	5	5	1

Conversion factor $\frac{5}{1} = 5$

$$P_n = P_v * K$$

where:

P_n = number of new positions;

P_v = number of old positions;

K = Conversion factor;



Converted positions

Acnt	P. Grp	C. Group	Class	Long	Short	Net	Mult.
ABC	IDX	FTMIB	MINI	5	0	-5	1

Sum to the long and short and create new net positions

New net positions

Acnt	P. Grp	C. Group	Class	Long	Short	Net	Mult.
ABC	IDX	FTMIB	MINI	5	5	0	1

Example #2

Original positions

Acnt	P. Grp	C. Group	Class	Long	Short	Net	Mult.
ABC	IDX	FTMIB	FTMIB	3	0	-3	5
ABC	IDX	FTMIB	MINI	0	7	7	1

Conversion factor $\frac{5}{1} = 5$

$$P_n = P_v * K$$

where:

P_n = number of new positions;

P_v = number of old positions;

K = Conversion factor;

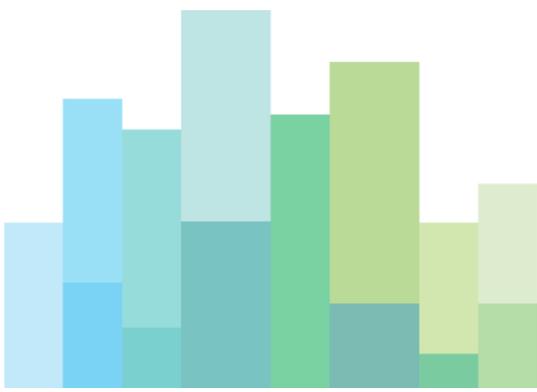
Converted positions

Acnt	P. Grp	C. Group	Class	Long	Short	Net	Mult.
ABC	IDX	FTMIB	MINI	15	0	-15	1

Sum to the long and short and create new net positions



Acnt	P. Grp	C. Group	Class	Long	Short	Net	Mult.
ABC	IDX	FTMIB	MINI	15	7	-8	1



3.2 Calculate Futures Spread Margin

Step 2

- A. Calculate the total spread long quantity and total spread short quantity for the class.
1. Sum the total of all net long futures positions in the class and the total of all net short futures positions in the class.
 2. The total spread quantity for the class (both long and short) equals the lesser of the total net long or total net short contract quantity for the class.
 - a. If the total net long quantity is greater than or equal to the total net short quantity, then the total spread long quantity and the total spread short quantity for the class equals the total net short quantity.
 - b. If the total net short quantity is greater than the total net long quantity, then the total class spread long quantity and the total class group spread short quantity equals the total net long quantity.
 - c. Save the total class spread long and spread short quantities for use in the subsequent steps.

Note: Net short stock futures positions may be reduced where deposits of underlying stock have been made (stock futures coverage must have been specified in the deposit order). Divide the number of underlying shares by the contract size found on the class file to determine the number of positions which are covered by the deposit (truncated to the smaller integer). Where the total number of short positions (both net short stock futures positions and unsettled short stock futures positions) is greater than the number of contracts covered, the reduction is applied beginning with the series with the largest number of positions (in case of equal number of positions to the further expiry).



3. Example

Contract	Net Long	Net Short
March future		15
June future	14	
September future	19	
December future		13
Total net position	33	28

Total class spread long quantity	=	28
Total class spread short quantity	=	28

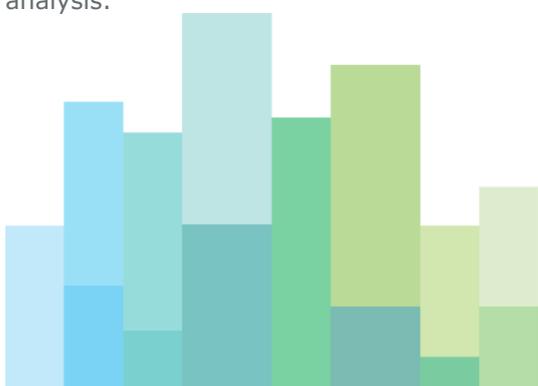
- B. Calculate the spot month spread contract quantity for the class.
1. Compare the net position in the current contract month¹ to the total class spread long or spread short quantity.

- a. *If the spot month is a net long position:*
If the long position is less than or equal to the class spread long quantity, set the spot month spread contract quantity equal to the long position.

If the long position is greater than the class spread long quantity, set the spot month spread contract quantity equal to the class spread long quantity.

- b. *If the spot month is a net short position:*
If the short position is less than or equal to the class spread short quantity, set the spot month spread contract quantity equal to the short position.

¹ given an underlying symbol, this is the first future maturity available in the specific portfolio under analysis.



If the short position is greater than the class spread short quantity, set the spot month spread contract quantity equal to the class spread short quantity.

Contract	Net Long	Net Short
March future		15
June future	14	
September future	19	
December future		13
Total	33	28

For the March (spot month) futures position:

Net short position	=	15
Class spread short quantity	=	28
<i>Class spread short > net short position</i>		
Spot month spread quantity for the class	=	15

C. Calculate non spot spread contract quantity for the class.

1. Calculate the total spread contract quantity for the class by adding the class spread long contract quantity to the class spread short quantity.

$$\textbf{Total class spread quantity} = \text{Total spread long} + \text{total spread short}$$

2. Calculate the total class non spot spread contract quantity by subtracting the spot month spread contract quantity from the total spread contract quantity for the class.

$$\textbf{Non spot spread contract quantity} = \text{Total spread quantity} - \text{spot month spread quantity}$$



3. Example

Total class spread long quantity		28
Total class spread short quantity	+	<u>28</u>
Total class spread quantity	=	56
Spot month spread contract quantity	-	<u>15</u>
Total non spot spread quantity	=	41

D. Calculate spread margin for the class.

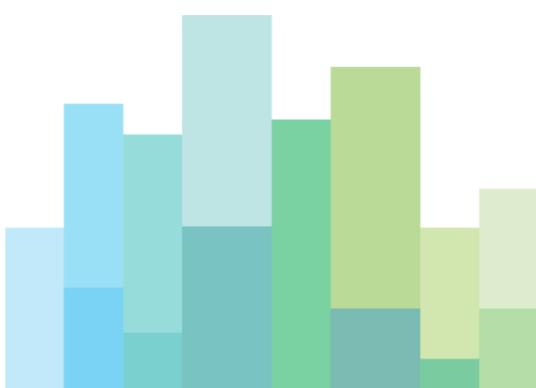
1. The class file contains two spread rates for each class; a spot spread rate and a non-spot or regular spread rate.
2. The spot month spread margin requirement for the class is calculated by multiplying the spot spread rate times the spot month spread contract quantity for the class (calculated in step B above).
3. The non spot spread margin requirement for the class is calculated by multiplying the non spot spread rate times the non spot spread contract quantity for the class (calculated in step C above).
4. The total spread margin for the class is calculated by adding the spot spread margin requirement and the non spot margin requirement for the class.

5. Example

<i>Spot spread rate</i>	=	300,00
<i>Non-spot spread rate</i>	=	200,00

	Qty	Rate	Total
Spot month spread margin requirement	= 15 *	300,00 =	4.500,0
Non spot spread margin requirement	= 41 *	200,00 =	8.200,0

Total class spread margin requirement = 12.700,00



- E. Calculate the total non spread contract quantity for the class.
1. Calculate the non spread contract quantity for the class by subtracting the total long position for the class from the total short position for the class.

$$\text{Non spread quantity} = \text{Total class short} - \text{total class long}$$

2. Example

Contract	Net Long	Net Short
March future		15
June future	14	
September future	19	
December future		13
Total	33	28

$$\text{Class non spread contract quantity} = 28 - 33 = -5$$

3. A negative non spread quantity indicates that the class is net long whereas a positive non spread quantity indicates a net short position for the class.
4. The non spread contract quantity is saved for use in the calculation of additional margin for futures.



3.3 Calculate Mark to Market Margin for unsettled stock futures contracts

Step 3

- A. Unsettled Stock futures positions are expired positions which have not been settled yet.

Note: Use the Product type field in the class file (underlying information) to select the future type.

- B. Calculate Mark to Market Margin for each expired position in the class group.

1. Calculate the *Mark to Market amount* for expired position subtracting the delivery price from the underlying price.

Mark to Market amount = Underlying price - Delivery price

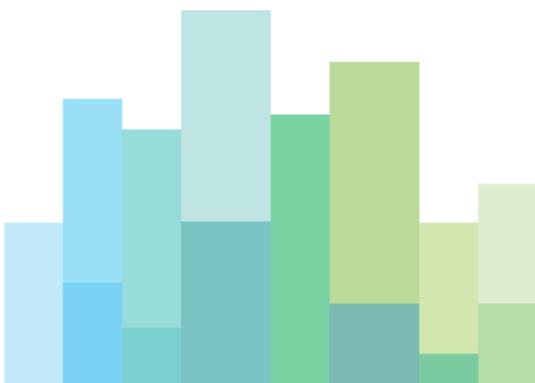
2. Multiply the expired net contract quantity times the contract size times the Mark to Market amount.

Mark to Market margin = MtM amount * Contract quantity * Multiplier

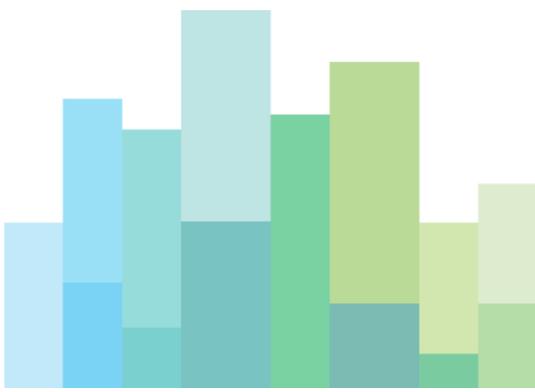
Contract quantity = Short Contract quantity - Long Contract quantity

Note 1: Unsettled short stock futures positions may be reduced where deposits of underlying stock have been made (stock futures coverage must have been specified in the deposit order). Divide the number of underlying shares by the contract size found on the class file to determine the number of positions which are covered by the deposit (truncated to the smaller integer). Where the total number of short positions (both net short stock futures positions and unsettled short stock futures positions) is greater than the number of contracts covered, the reduction is applied beginning with the series with the largest number of positions (in case of equal number of positions to the further expiry).

Note 2: A negative mark to market margin is a margin credit and a positive mark to market margin is a margin requirement.



Note 3: Unsettled Stock futures positions are included in the calculation of additional margin.



3.4 Calculate Premium Margin

Step 4

A. Definition

Premium margin represents the cost to liquidate a portfolio of positions at current market prices.

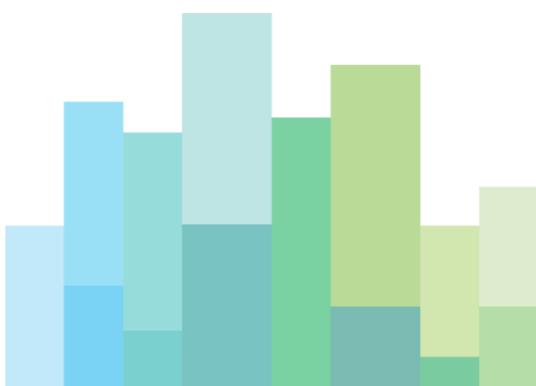
Note: Premium margin is a credit for the holder of the long position as it represents the proceeds from selling the long position if it were liquidated at the current market price. Premium margin is also a credit for the holder of an exercised position (assuming it is In-The-Money) as it represents the profit which would be derived from acquiring the underlying at the exercise price and selling it at the current market price. Premium margin is a debit or requirement for the holder of the short position as it represents the cost to buy back the short position if, likewise, it were to be liquidated at the current market price. Premium margin is also a debit or requirement for the holder of an assigned position as it represents the loss which would occur if the underlying were to be acquired at the current market price and delivered at the exercise price.

B. Calculate the net open position and the net exercised and assigned position for each series of options in the class group by subtracting long (exercised) quantity from short (assigned) quantity.

Net open position = Short Contract quantity - Long Contract quantity

Net E/A quantity = Assigned Contract quantity - Exercised Contract quantity

Note: Both net short open call positions and net assigned call positions may be further reduced where deposits of underlying stock have been made to cover the short or assigned position. Divide the number of underlying shares by the contract size found on the class file to determine the number of short calls which are covered by the deposit (truncated to the smaller integer). Where the total number of short and assigned call positions is greater than the number of contracts covered, net short positions are reduced by the available cover beginning with the position with the highest mark price (In-The-Money amount for assigned positions).



1. Example

Series	DVP	Long Exercised	Short Assigned	Net Cov	Net Open	Net E/A
O C ENI 5,1125		7	6	-1	0	-1
O P ENI 5,1125		1	5	4	0	4
O C ENI 5,3681		3	10	7	1	6
O C ENI 5,1125	DDMMYYYY	3	1	-2	0	-2
O P ENI 5,3681	DDMMYYYY	2	4	2	0	2

C. Calculate the premium margin for each ordinary position in the class group.

1. Multiply the net long or short contract quantity by the contract size by the closing price of the options series.

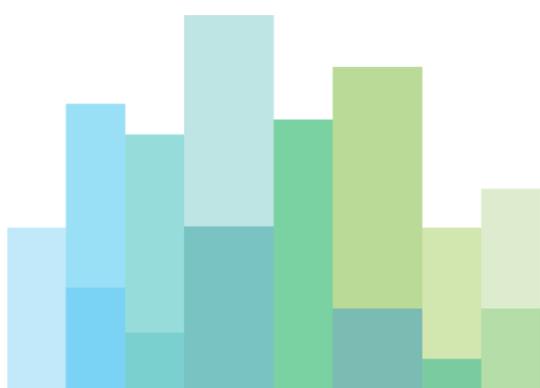
$$\text{Premium margin} = \text{Closing price} * \text{Contract Quantity} * \text{Multiplier}$$

2. Example

Series	Net Open	Closing price	Contract Multiplier	Premium margin
O C ENI 5,1125	-1	0,2163	5.000	-1.081,50
O P ENI 5,1125	4	0,0383	5.000	766,00
O C ENI 5,3681	6	0,0767	5.000	2.301,00

D. Calculate the premium margin for each exercised and assigned position in the class group.

1. Calculate the in-the-money amount for **calls** subtracting the strike price from the underlying price.



In-the-money amount (calls) = Underlying Price - Strike price

2. Example

Series	DVP Date	Current Price	Strike Price	In-the-money amount
O C ENI 5,1125	DDMMYYYY	5,2689	- 5,1125	= 0,1564

3. Calculate the in-the-money amount for **puts** subtracting the underlying price from the strike price of the option.

In-the-money amount (puts) = Strike Price - Underlying Price

4. Example

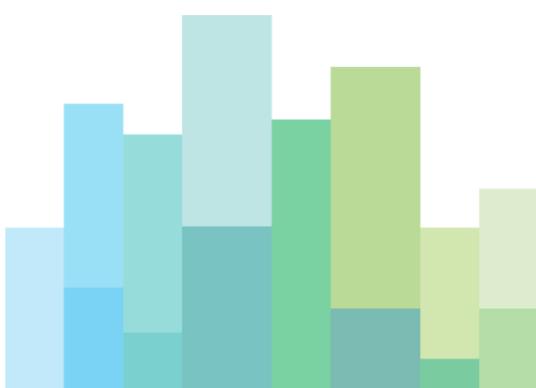
Series	DVP Date	Current Price	Strike Price	In-the-money amount
O P ENI 5,3681	DDMMYYYY	5,3681	- 5,2689	= 0,0992

5. Multiply the E/A quantity times the contract size times the in-the-money amount.

Premium margin = In-the-money amount * Contract quantity * Multiplier

6. Example

Series	DVP Date	Net E/A	In-the-money amount	Contract Multiplier	E/A Premium margin
O C ENI 5,1125	DDMMYYYY	-2	0,1564	5.000	-1564,00
O P ENI 5,3681	DDMMYYYY	2	0,0992	5.000	992,00



- E. Calculate the total class group premium margin by summing the premium margin credits and debits for each series in the class group.

Total class group premium margin = Sum (Series ¹ premium margin + Series ² premium margin + Series ⁿ premium margin)

1. Example

Series	Premium margin
O C ENI 5,1125	-1.081,50
O P ENI 5,1125	766,00
O C ENI 5,3681	2.301,00
O C ENI 5,1125	-1564,00
O P ENI 5,3681	992,00

Total premium margin **1.413,50**

Note: A negative premium total is a margin credit and a positive premium total is a margin requirement.



3.5 Calculate MTM Margin for Securities

Step 5

A. Definition

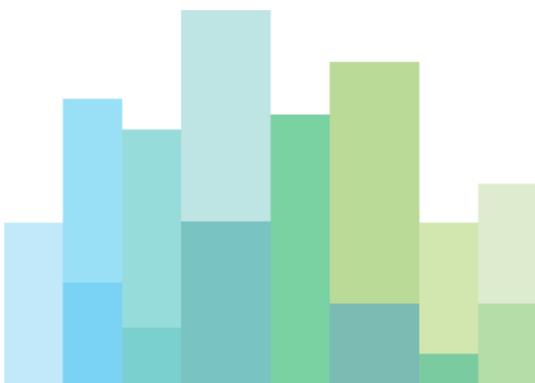
MTM margin represents the cost to liquidate a portfolio of securities positions at current market price. To calculate the MTM margin the DVP amount and CMV amount are used. The DVP amount is the cash amount to be paid/collected in the settlement system; the CMV amount is the theoretical countervalue of the positions, if they were to be liquidated at the current market value.

Note: MTM margin is a credit for the holder of a long position (presuming the CMV amount is greater than the DVP amount, i.e. the security's market price is increasing) as it represents the profit which would be derived from acquiring the security at the DVP amount and selling it at the CMV amount. MTM margin is also a debit or requirement for the holder of a short position as it represents the loss which would occur if the security were to be acquired at the CMV amount and delivered at the DVP amount.

To the opposite MTM margin is a debit or requirement for the holder of a long position (presuming the CMV amount is smaller than the DVP amount, i.e. the security's market price is decreasing) as it represents the loss which would occur from acquiring the security at the DVP amount and selling it at the CMV amount. MTM margin is also a credit for the holder of a short position as it represents the profit which would be derived if the security were to be acquired at the CMV amount and delivered at the DVP amount.

- B. Calculate the net DVP quantity for each series of securities or rights issues in the class group by subtracting long (to be collected) quantity from short (to be delivered) quantity.

$$\text{Net DVP quantity} = \text{Short Contract quantity} - \text{Long Contract quantity}$$



C. Calculate the MTM margin for each series of securities or rights issues in the class group.

1. Calculate the CMV amount for securities or rights issues multiplying net DVP quantity times contract multiplier times CMV value.

$$\mathbf{CMV\ amount} = \mathbf{CMV\ value} * \mathbf{Net\ positions} * \mathbf{Multiplier}$$

2. Example

Series	CM Value	Net positions	Contract Multiplier	CMV Amount
E G D D M M Y Y Y	40,00	-200	1	-8.000,00

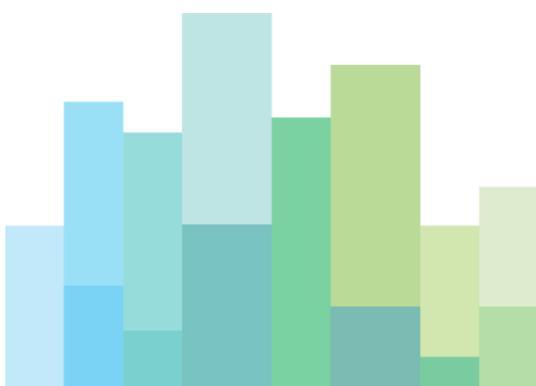
Note: Convertible Bonds are traded in basis points, while in margin calculations the Euro contervalue must be considered. Therefore the reference price (and the theoretical values) must be divided by 100 and multiplied by the quantity, which is expressed in Euro, in order to include to the nominal value of the convertible bond.

3. Calculate the MTM amount for securities or rights issues subtracting the DVP amount from CMV amount.

$$\mathbf{MTM\ amount} = \mathbf{CMV\ amount} - \mathbf{DVP\ amount}$$

3. Example

Series	CM Amount		DVP Amount	=	MTM Amount
E G D D M M Y Y Y	-8.000,00	-	-8.150,00	=	150,00



- D. Calculate the total class group MTM margin by summing the MTM margin credits and debits for each series in the class group.

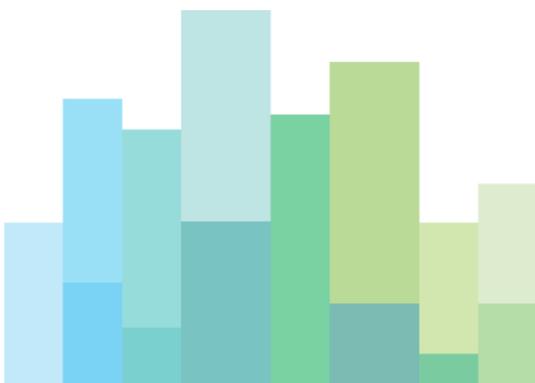
Total class group MTM margin = *Sum (Series¹ MTM margin + Series² MTM margin + Seriesⁿ MTM margin)*

5. Example

Series	MTM margin
E G DDMMYYYY	150,00
E G DDMMYYYY	-450,00
E G DDMMYYYY	50,00

Total MTM margin = -250,00

Note: A negative MTM margin is a margin credit and a positive MTM margin is a margin requirement.



3.6 Calculate Additional Margin for Individual positions

Step 6

A. Definition

Additional Margin is the incremental cost of liquidating a portfolio in the event of a worst case change in the price of the underlying and is calculated for all options, futures, rights issues and securities in the same class group.

B. Data requirements

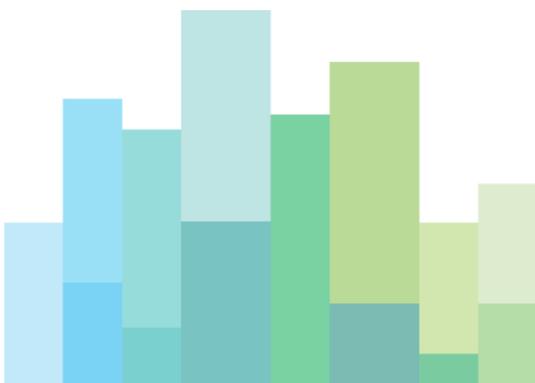
1. The theoretical values file contains:

- ten values which represent the gain or loss on the option, rights issues or future position based on 5 increasing underlying prices (upside risk) and five decreasing underlying prices (downside risk).
- ten projected underlying values at each point of the margin interval for each class which are used in the calculation of gain or loss for exercised and assigned positions.
- ten projected values at each point of the margin interval for each class which determine the gain or loss for securities positions.

2. The short option adjustment contained on the theoretical values file is used to insure that a minimal margin is charged for deep Out-of-The-Money short positions.

3. The class file contains a contract multiplier for the class group which is used to determine the total gain or loss of each position.

C. Calculate the net open position and the net exercised and assigned position for each series of options in the class group by subtracting long (exercised) quantity from short (assigned) quantity.



Net open position = short contract quantity - long contract quantity

Net E/A quantity = assigned contract quantity - exercised contract quantity

Note: a) Both net short open call positions and net assigned call positions may be further reduced where deposits of underlying stock have been made to cover the short or assigned position. Divide the number of underlying shares by the contract size found on the class file to determine the number of short calls which are covered by the deposit (truncated to the smaller integer). Where the total number of short and assigned call positions is greater than the number of contracts covered, net short positions are reduced by the available cover beginning with the position with the highest mark price (In- The-Money amount for assigned positions).
b) Net short stock futures positions and unsettled short stock futures positions may be reduced where deposits of underlying stock have been made. Divide the number of underlying shares by the contract size found on the class file to determine the number of positions which are covered by the deposit (truncated to the smaller integer). Where the total number of short positions (both net short stock futures positions and unsettled short stock futures positions) is greater than the number of contracts covered, the reduction is applied beginning with the series with the largest number of positions (in case of equal number of positions to the further expiry).

Option a) is the default one in the deposit order. Participants have the possibility to utilize the underlying shares to cover short stock futures positions by indicating it in the deposit order.

Possible excess of deposited underlying stocks dedicated to one of the two instruments (options or futures) do not automatically cover the other.

- D. Calculate the net DVP quantity for each series of securities in the class group by subtracting long (to be collected) quantity from short (to be delivered) quantity.

Net DVP quantity = Short Contract quantity - Long contract quantity

- E. The non spread futures quantity from step 2E is included in the calculation of additional margin for the class group.

Note: A negative net contract quantity indicates a net long position whereas a positive net contract quantity indicates a net short position for the option series.

- F. Calculate the additional margin for each ordinary options rights issues and futures position.



1. Calculate the total gain or loss for each option, rights issues and futures position for each of the five downside values (D5, D4, D3, D2, D1) and for each of the five upside values (U1, U2, U3, U4, U5) found on the theoretical values file as follows:

$\text{Additional MarginD5} = \text{Net contract quantity} * \text{Theoretical ValueD5} * \text{Multiplier}$
 $\text{Additional MarginD4} = \text{Net contract quantity} * \text{Theoretical ValueD4} * \text{Multiplier}$
 $\text{Additional MarginD3} = \text{Net contract quantity} * \text{Theoretical ValueD3} * \text{Multiplier}$
 $\text{Additional MarginD2} = \text{Net contract quantity} * \text{Theoretical ValueD2} * \text{Multiplier}$
 $\text{Additional MarginD1} = \text{Net contract quantity} * \text{Theoretical ValueD1} * \text{Multiplier}$
 $\text{Additional MarginU1} = \text{Net contract quantity} * \text{Theoretical ValueU1} * \text{Multiplier}$
 $\text{Additional MarginU2} = \text{Net contract quantity} * \text{Theoretical ValueU2} * \text{Multiplier}$
 $\text{Additional MarginU3} = \text{Net contract quantity} * \text{Theoretical ValueU3} * \text{Multiplier}$
 $\text{Additional MarginU4} = \text{Net contract quantity} * \text{Theoretical ValueU4} * \text{Multiplier}$
 $\text{Additional MarginU5} = \text{Net contract quantity} * \text{Theoretical ValueU5} * \text{Multiplier}$

2. For Out-of-The-Money short call positions, if the short option adjustment value is greater than the highest upside theoretical value (Upside 5), then the short option adjustment replaces the Upside 5 theoretical value in the calculation of additional margin.

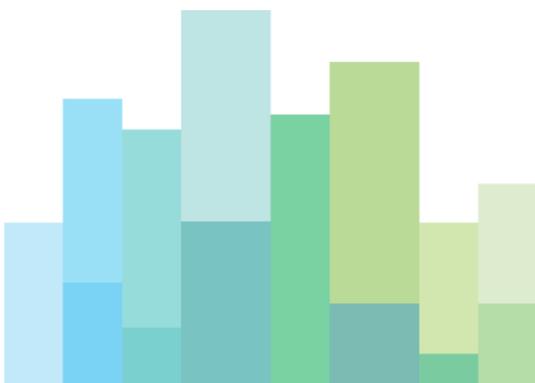
If position is a **call** and the short option adjustment is **greater** than the value in **Upside 5**:

Additional Margin U5 = Net contract quantity * Short Option Adjustment * Multiplier

3. For Out-of-The-Money short put positions, if the short option adjustment value is greater than the lowest downside theoretical value (Downside 5), then the short option adjustment replaces the Downside 5 theoretical value in the calculation of additional margin.

If position is a **put** and the short option adjustment is **greater** than the value in **Downside 5**:

Additional Margin D5 = Net contract quantity * Short Option Adjustment * Multiplier

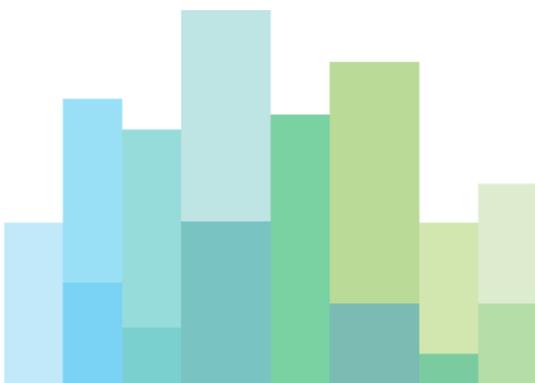


4. Example

Position:	
Class Type	O
Symbol	BTP
Expiration	YYMM
Put/Call	C
Product Type	B
Strike Price	117,00
Underlying Price	117,30
Multiplier	1.000,00
Net Position	-5
DVP Date	-

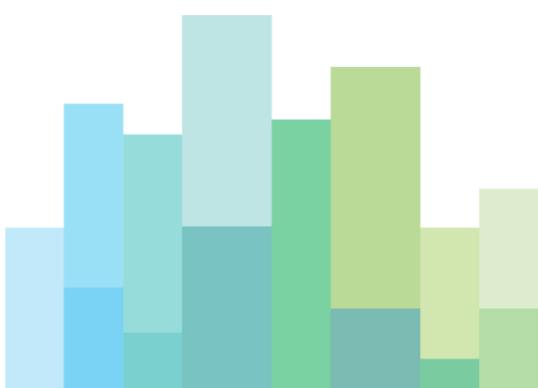
Theoretical values:

Scenario	Gain/Loss
1. Downside 5	-0,555993
2. Downside 4	-0,543499
3. Downside 3	-0,507245
4. Downside 2	-0,423542
5. Downside 1	-0,257676
6. Upside 1	0,358338
7. Upside 2	0,783467
8. Upside 3	1,253572
9. Upside 4	1,743475
10. Upside 5	1,253572



Additional margin calculation:

Scenario	Gain/Loss	Position	Contract Multiplier	Additional Margin
1. Downside 5	= 0,555993	* -5 *	1.000,00	= 2.779,96
2. Downside 4	= 0,543499	* -5 *	1.000,00	= 2.717,49
3. Downside 3	= 0,507245	* -5 *	1.000,00	= 2.536,23
4. Downside 2	= 0,423542	* -5 *	1.000,00	= 2.117,71
5. Downside 1	= 0,257676	* -5 *	1.000,00	= 1.288,38
6. Upside 1	= 0,358338	* -5 *	1.000,00	= -1.791,69
7. Upside 2	= 0,783467	* -5 *	1.000,00	= -3.917,34
8. Upside 3	= 1,253572	* -5 *	1.000,00	= -6.267,86
9. Upside 4	= 1,743475	* -5 *	1.000,00	= -8.717,38
10. Upside 5	= 1,253572	* -5 *	1.000,00	= -11.203,36



G. Calculate the additional margin for each exercised or assigned option position.

1. Calculate the E/A theoretical value for each exercised and assigned position at each of the five downside underlying prices (D5, D4, D3, D2, D1) and at each of the five upside underlying prices (U1, U2, U3, U4, U5) found on the theoretical values file as follows:

For **calls**: The E/A theoretical value for **calls** is equal to the difference between the projected underlying price and the strike price of the option.

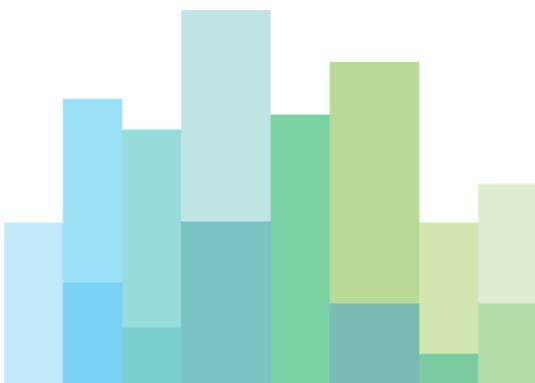
$$E/A \text{ theoretical value}^n = \text{Underlying price}^n - \text{Strike Price}$$

For **puts**: The E/A theoretical value for **puts** is equal to the difference between the strike price of the option and the projected underlying price.

$$E/A \text{ theoretical value}^n = \text{Strike Price} - \text{Underlying price}^n$$

2. Calculate the projected gain or loss for each exercised or assigned option position at each of the five downside underlying price (D5, D4, D3, D2, D1) and at each of the five upside underlying prices (U1, U2, U3, U4, U5) as follows:

$$E/A \text{ gain/loss}^n = E/A \text{ theoretical value}^n - \text{In-the-money amount (from step 4D)}$$



3. Calculate the additional margin for each exercised or assigned option position at each of the five downside values (D5, D4, D3, D2, D1) and at each of the five upside values (U1, U2, U3, U4, U5) as follows:

Additional Margin D5	=	Net E/A quantity	*	E/A Gain/Loss D5	*	Multiplier
Additional Margin D4	=	Net E/A quantity	*	E/A Gain/Loss D4	*	Multiplier
Additional Margin D3	=	Net E/A quantity	*	E/A Gain/Loss D3	*	Multiplier
Additional Margin D2	=	Net E/A quantity	*	E/A Gain/Loss D2	*	Multiplier
Additional Margin D1	=	Net E/A quantity	*	E/A Gain/Loss D1	*	Multiplier
Additional Margin U1	=	Net E/A quantity	*	E/A Gain/Loss U1	*	Multiplier
Additional Margin U2	=	Net E/A quantity	*	E/A Gain/Loss U2	*	Multiplier
Additional Margin U3	=	Net E/A quantity	*	E/A Gain/Loss U3	*	Multiplier
Additional Margin U4	=	Net E/A quantity	*	E/A Gain/Loss U4	*	Multiplier
Additional Margin U5	=	Net E/A quantity	*	E/A Gain/Loss U5	*	Multiplier

4. Example

Position:	
Class Type	O
Symbol	ENI
Expiration	YYMM
Put/Call	C
Product Type	E
Strike Price	5,1125
Underlying Price	5,2689
Multiplier	5.000,00
Net Position	-2
DVP Date	DDMMYYYY

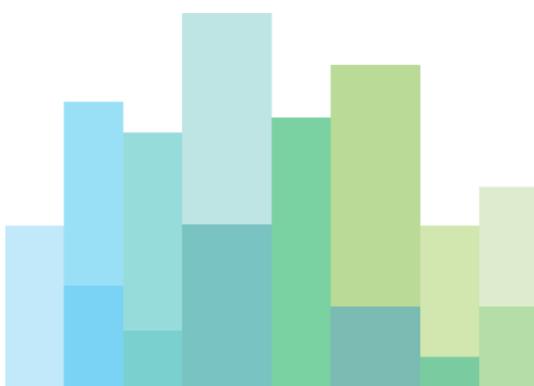


E/A Theoretical Values:

Scenario		Underlying Price		Strike Price		E/A Theoretical
1. Downside 5	=	4,9001	-	5,1125	=	-0,2124
2. Downside 4	=	4,9738	-	5,1125	=	-0,1387
3. Downside 3	=	5,0476	-	5,1125	=	-0,0649
4. Downside 2	=	5,1214	-	5,1125	=	0,0089
5. Downside 1	=	5,1951	-	5,1125	=	0,0826
6. Upside 1	=	5,3427	-	5,1125	=	0,2302
7. Upside 2	=	5,4164	-	5,1125	=	0,3039
8. Upside 3	=	5,4902	-	5,1125	=	0,3777
9. Upside 4	=	5,5640	-	5,1125	=	0,4515
10. Upside 5	=	5,6377	-	5,1125	=	0,5252

E/A Gain/Loss:

Scenario	E/A Theoretical Price		In-the-money Amount		E/A Theoretical
1. Downside 5	-0,2124	-	0,1564	=	-0,3688
2. Downside 4	-0,1387	-	0,1564	=	-0,2951
3. Downside 3	-0,0649	-	0,1564	=	-0,2213
4. Downside 2	0,0089	-	0,1564	=	-0,1475
5. Downside 1	0,0826	-	0,1564	=	-0,0738
6. Upside 1	0,2302	-	0,1564	=	0,0738
7. Upside 2	0,3039	-	0,1564	=	0,1475
8. Upside 3	0,3777	-	0,1564	=	0,2213
9. Upside 4	0,4515	-	0,1564	=	0,2951
10. Upside 5	0,5252	-	0,1564	=	0,3688



Additional Margin calculation:

Scenario	E/A Gain/Loss	*	E/A Quantity	*	Strike Price	=	E/A Theoretical
1. Downside 5	-0,3688	*	-2	*	5.000	=	3.688,00
2. Downside 4	-0,2951	*	-2	*	5.000	=	2.951,00
3. Downside 3	-0,2213	*	-2	*	5.000	=	2.213,00
4. Downside 2	-0,1475	*	-2	*	5.000	=	1.475,00
5. Downside 1	-0,0738	*	-2	*	5.000	=	738,00
6. Upside 1	0,0738	*	-2	*	5.000	=	-738,00
7. Upside 2	0,1475	*	-2	*	5.000	=	-1.475,00
8. Upside 3	0,2213	*	-2	*	5.000	=	-2.213,00
9. Upside 4	0,2951	*	-2	*	5.000	=	-2.951,00
10. Upside 5	0,3688	*	-2	*	5.000	=	-3.688,00

H. Calculate the additional margin for each securities position.

1. Calculate the projected securities gain or loss for each equity, or warrant position at each of the five downside CMV prices (D5, D4, D3, D2, D1) and at each of the five upside CMV prices (U1, U2, U3, U4, U5) as follows:

$$\text{Securities Gain/loss}^n = \text{CMV theoretical value}^n - \text{CMV price}$$

2. Calculate the additional margin for each equity or warrant position at each of the five downside values (D5, D4, D3, D2, D1) and at each of the five upside values (U1, U2, U3, U4, U5) found on the theoretical values file as follows:

Additional MarginD5	=	Net DVP quantity	*	Gain/LossD5	*	Multiplier
Additional MarginD4	=	Net DVP quantity	*	Gain/LossD4	*	Multiplier
Additional MarginD3	=	Net DVP quantity	*	Gain/LossD3	*	Multiplier
Additional MarginD2	=	Net DVP quantity	*	Gain/LossD2	*	Multiplier
Additional MarginD1	=	Net DVP quantity	*	Gain/LossD1	*	Multiplier
Additional MarginU1	=	Net DVP quantity	*	Gain/LossU1	*	Multiplier
Additional MarginU2	=	Net DVP quantity	*	Gain/LossU2	*	Multiplier
Additional MarginU3	=	Net DVP quantity	*	Gain/LossU3	*	Multiplier
Additional MarginU4	=	Net DVP quantity	*	Gain/LossU4	*	Multiplier
Additional MarginU5	=	Net DVP quantity	*	Gain/LossU5	*	Multiplier



3. Example

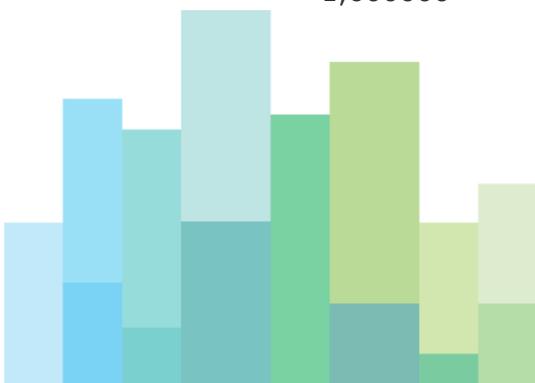
Position:	
Class Type	C
Symbol	G
Expiration	
Put/Call	
Product Type	S
Strike Price	
Underlying Price	40,00
Multiplier	1
Net Position	-200
DVP Date	DDMMYYYY

Securities Gain/Loss:

Scenario	Theoretical Value	Current Market Value	Gain/Loss
1. Downside 5	= 36,000000	- 40,00	= -4,000000
2. Downside 4	= 36,800000	- 40,00	= -3,200000
3. Downside 3	= 37,600000	- 40,00	= -2,400000
4. Downside 2	= 38,400000	- 40,00	= -1,600000
5. Downside 1	= 39,200000	- 40,00	= -0,800000
6. Upside 1	= 40,800000	- 40,00	= 0,800000
7. Upside 2	= 41,600000	- 40,00	= 1,600000
8. Upside 3	= 42,400000	- 40,00	= 2,400000
9. Upside 4	= 43,200000	- 40,00	= 3,200000
10. Upside 5	= 44,000000	- 40,00	= 4,000000

Additional margin calculation:

Scenario	Gain/Loss	Net DVP Quantity	Contract Multiplier	Additional Margin
1. Downside 5	= -4,000000 *	-200 *	1	= 800,00
2. Downside 4	= -3,200000 *	-200 *	1	= 640,00
3. Downside 3	= -2,400000 *	-200 *	1	= 480,00
4. Downside 2	= -1,600000 *	-200 *	1	= 320,00



5. Downside 1	=	0,800000	*	-200	*	1	=	160,00
6. Upside 1	=	0,800000	*	-200	*	1	=	-160,00
7. Upside 2	=	1,600000	*	-200	*	1	=	-320,00
8. Upside 3	=	2,400000	*	-200	*	1	=	-480,00
9. Upside 4	=	3,200000	*	-200	*	1	=	-640,00
10. Upside 5	=	4,000000	*	-200	*	1	=	-800,00

I. When completed, this step will produce a table of ten additional margin amounts for each position in the class group.



3.7 Calculate the total Additional Margin for the class group

Step 7

- A. Calculate total additional margin amounts for the class group by adding the additional margin amounts calculated for each position in the class group at their respective upside and downside points. For example all Downside 5 additional margin amounts are added together, followed by all Downside 4 additional margin amounts and so on until there are 10 total additional margin amounts for the class group.

$$\text{Total additional margin } D5 = \text{Sum (Position } 1 \text{ additional margin } D5 + \text{Position } 2 \text{ additional margin } D5 + \text{Position } n \text{ additional margin } D5)$$

B. Example

	D5	D4	D3	D2	D1	U1	U2	U3	U4	U5
Position 1	-2000	-800	-600	-400	-200	200	400	600	800	1000
Position 2	-1000	-700	-600	-500	-400	100	200	300	400	500
Position 3	<u>5000</u>	<u>4000</u>	<u>3000</u>	<u>2000</u>	<u>1000</u>	<u>-1000</u>	<u>-2000</u>	<u>-3000</u>	<u>-4000</u>	<u>-5000</u>
Totals	2000	2500	1800	1100	400	-700	-1400	-2100	-2800	-3500

Note: A negative margin total is a margin credit and a positive margin total is a margin requirement.

- C. If the class group is not part of a larger product group, the additional margin requirement for the class group is the largest debit of the ten values above or zero in the unlikely event that there are no debits.
- D. If the class group is part of a larger product group, multiply any additional margin amounts for the class group which are credits (negative) by the product group offset by to arrive at an array of ten class group additional margin values which are saved for use in the calculation of product group additional margin.

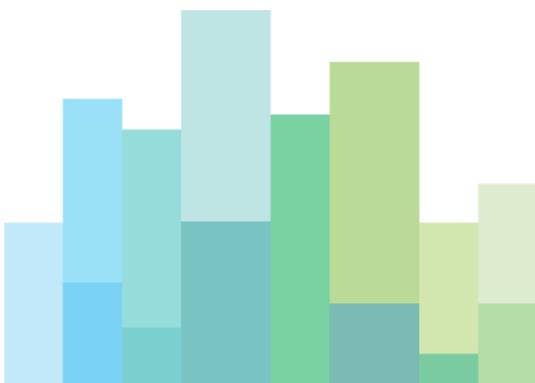
Note: The product group offset is contained on the class file and represents the percentage of margin credits calculated at the class group level which will be allowed to offset margin requirements for other class groups in the product group. The offset is based on the historical price correlation between the various class groups which comprise a product group.



E. Example

	D5	D4	D3	D2	D1	U1	U2	U3	U4	U5
Class	2000	2500	1800	1100	400	-700	-1400	-2100	-2800	-3500
@85%										
Totals	2000	2500	1800	1100	400	-595	-1190	-1785	-2380	-2975

F. The array of ten class group additional margin values are saved for use in the calculation of product group additional margin.



3.8 Calculate the Minimum Margin for the class group

Step 8

- A. Data Requirements
The *minimum margin rates* for options, futures, securities are contained on the class file distributed daily by CG&G.
- B. Calculate the net long or short contract quantity (as the absolute value) for all calls, puts, futures, securities in the class group.

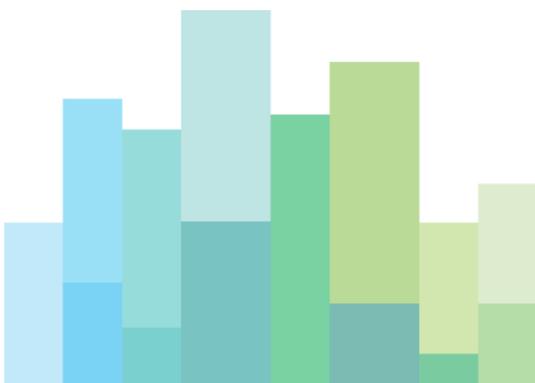
Note: The net long or short contract quantity for calls (puts) is calculated as the absolute value of the difference between a) the sum of the net long positions for all series of calls (puts) in the class group and b) the sum of the net short positions for all series of calls (puts) in the class group.

- C. Calculate the options minimum margin in the class group as follows.
1. Calculate the Option Minimum margin for each option position in the class group

Class group options minimum margin = Net long or short contract quantity for calls * options minimum margin rate + Net long or short contract quantity for puts * options minimum margin rate

2. If the class group premium margin (from step 4E) is a credit or is equal to zero, compare the class group options minimum margin to the absolute value of the class group premium margin. If the class group options minimum margin is greater than the absolute value of the class group premium margin, then the class group options minimum margin is equal to the absolute value of the class group premium margin.

- D. Calculate the securities minimum margin in the class group as follows.
1. Calculate the Securities minimum margin for each security position in the class group.



*Net long or short contract quantity for equity * Equity minimum margin rate*

*Net long or short contract quantity for warrant * Warrant minimum margin rate*

Class group securities minimum margin = *Net long or short contract quantity for rights issues * rights issues minimum margin rate*

- E. Calculate the futures minimum margin in the class group as follows.
 - 1. Calculate the future minimum margin for each futures position in the class group.

Class group futures minimum margin = *Net long or short contract quantity for futures * futures minimum margin rate*

- F. Calculate the minimum margin for the class group by summing up the class group minimum margin calculated for options, futures and securities.
- G. The total class group minimum margin is saved for use in the calculation of total minimum margin for the product group.



3.9 Calculate Additional Margin for the product group

Step 9

A. Calculate the total upside and downside additional margin for the product group by summing up the additional margin requirements for each class group in the product group at their respective upside and downside points.

B. Example

	D5	D4	D3	D2	D1	U1	U2	U3	U4	U5
CCG 1	2000	2500	1800	1100	400	-595	-1190	-1785	-2380	-2975
CCG 2	-1000	-800	-600	-400	-200	200	400	600	800	1000
CCG 3	-100	-80	-60	-40	-20	20	60	100	150	210
Totals	900	1620	1140	660	180	-375	-730	-1085	-1430	-1765

C. To determine the total additional margin requirement for the product group, select the largest debit from the array of upside and downside product group additional margin values. In the unlikely event that all of the values in the array are credits, the product group additional margin is equal to zero.

Note: A negative margin total is a margin credit and a positive margin total is a margin debit or requirement.



D. Example

	D5	D4	D3	D2	D1	U1	U2	U3	U4	U5
Total	900	1620	1140	660	180	-375	-730	-1085	-1430	-1765

Product Group Additional Margin = 1620

E. Calculate the minimum margin requirement for the product group by summing up the minimum margin calculated for each class group in the product group.

Product group minimum margin = *Class group¹ minimum margin* + *Class group² minimum margin* + ... *Class groupⁿ minimum margin*

F. Compare the minimum margin calculated for the product group in paragraph E to the additional margin requirement calculated for the product group in paragraph D. If the minimum margin is greater than the additional margin requirement, then the minimum margin for the product group becomes the additional margin requirement for the product group.

3.10 Calculate total Margin requirement for the product group

Step 10

- A. Calculate the total spread margin requirement for the product group by summing up the spread margin amounts for each class group in the product group.

$$\text{Product group spread margin} = \text{Class group}^1 \text{ spread margin} + \text{Class group}^2 \text{ spread margin} + \dots \text{Class group}^n \text{ spread margin}$$

- B. Calculate the total premium margin requirement by summing up the premium margin requirements (or credits) for each class group in the product group.

$$\text{Product group premium margin} = \text{Class group}^1 \text{ premium margin} + \text{Class group}^2 \text{ premium margin} + \dots \text{Class group}^n \text{ premium margin}$$

- C. Calculate the total MTM margin requirement by summing up the MTM margin requirements (or credits) for each class group in the product group.

$$\text{Product group MTM margin} = \text{Class group}^1 \text{ MTM margin} + \text{Class group}^2 \text{ MTM margin} + \dots \text{Class group}^n \text{ MTM margin}$$

- D. Calculate the total margin requirement or credit for the product group by summing algebraically the total of the product group spread margin, the product group delivery margin, the product group premium margin and the total additional margin (or minimum margin) for the product group.

$$\begin{aligned} & \text{Total product group spread margin} \\ + & \text{Total product group premium margin} \\ + & \text{Total product group MTM margin} \\ + & \text{Total product group additional margin} \\ = & \text{Total product group margin requirement} \end{aligned}$$

Note: A negative Total product group margin requirement represents a margin credit and a positive total represents a margin requirement.

3.11 Calculate total Margin requirement for the account

Step 11

- A. Calculate the total margin requirement for the account by summing up algebraically all of the product group margin requirements for the account.

$$\begin{aligned} & \text{Product group}^1 \text{ margin requirement} \\ + & \text{Product group}^2 \text{ margin requirement} \\ + & \text{Product group}^3 \text{ margin requirement} \\ + & \text{Product group}^n \text{ margin requirement} \\ = & \textbf{Account Total Margin Requirement} \end{aligned}$$

Note: If the Account Total Margin Requirement is a credit, zero is assumed.

3.12 Include Margins on Fail Positions in the Margin Req. for the account

Step 12

- A. Margins on fail positions are calculated using the same procedure used for ordinary positions. However, fail positions and ordinary positions are maintained segregated for all margining purposes. Therefore margins on fail positions are calculated separately and summed, only if at debit, to the total margin requirement for ordinary positions.
- B. Segregation between ordinary positions and fail position is total. Under no circumstances margin credits on fail (ordinary) positions may compensate debits on ordinary (fail) positions.
- C. The Margin Intervals applied to fail positions are in all cases the ones applied to Share BIT Section.

$$\begin{aligned} & \text{Product group}^1 \text{ fail position margin requirement} \\ + & \text{Product group}^2 \text{ fail position margin requirement} \\ + & \text{Product group}^3 \text{ fail position margin requirement} \\ + & \text{Product group}^n \text{ fail position margin requirement} \\ = & \textbf{Account Total Fail Position Margin Requirement} \end{aligned}$$

Note: If the Account Total Fail Position Margin Requirement is a credit, zero is assumed.

$$\begin{aligned} & \text{Account Total Margin Requirement} \\ + & \text{Account Total Fail Position Margin Requirement} \\ = & \textbf{Account Grand Total Margin Requirement} \end{aligned}$$

3.13 Appendix. MARS Data Files

The updated description of MARS Data Files records (Risk Array, Class File, Futures Price) are available on website www.ccg.it and www.icws.it.

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