

OSLO CLEARING ASA

# Margin Methodology

Equity Market Instruments

**Version 1.2**

**08-04-2010**

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## **1 Introduction**

### **1.1 Oslo Clearing ASA**

Oslo Clearing ASA ("Oslo Clearing") is a central counterparty ("CCP") authorised as a Clearing House pursuant to Chapter 13 of the Securities Trading Act ("STA"). Oslo Clearing is a public limited company, owned by Oslo Børs VPS Holding ASA, and subject to supervision by the Financial Supervisory Authority of Norway ("Finanstilsynet").

The company currently operates as a central counterparty for financial derivatives and securities lending products, including standardised derivatives that are listed and traded on Oslo Børs. Oslo Clearing will extend its clearing service to include clearing of equity market instruments in May 2010.

### **1.2 Principles for the Margin Methodology**

The margin methodology follows the standards established by CPSS-IOSCO and ESCB-CESR. The margin methodology is subject to an annual review.

The margin model is risk based, and follows the principles of the value-at-risk methodology. The margin shall ensure that Oslo Clearing has adequate protection against potential losses from defaults by its participants, so that closing out any participant's positions does not disrupt the operations of the CCP, or expose non-defaulting participants to losses that they cannot anticipate or control.

The intended margin coverage has been defined at the 99 pct. confidence level.

This document provides a description of the margin methodology for the clearing of equity market instruments.

## 2 Margin per Clearing Member

The margin is calculated on each Margin Account, in accordance with the account structure. The margin requirement for a clearing member is an aggregate of the individual margins per Margin Account.

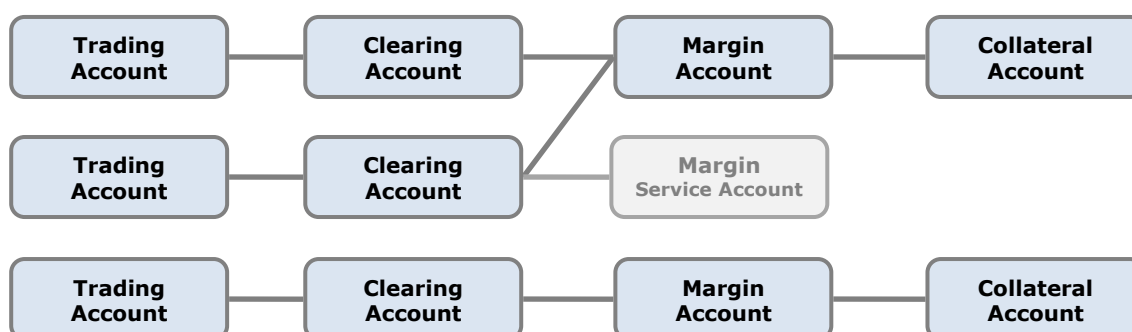
### 2.1 Account Structure

The margin is calculated on the open positions on a Margin Account, which reflects clearing transactions registered on the corresponding Clearing Accounts, but also eligible collateral positions from the corresponding Collateral Accounts.

Each clearing member is given a standard account structure in the clearing system. The standard account structure comprises four different account types: Trading Account, Clearing Account, Margin Account and Collateral Account. The member may choose how Clearing Accounts and Collateral Accounts relate to the Margin Account

Figure 1, below illustrates the standard account structure described above.

**Figure 1: Account Structure**



One or several Clearing Accounts may be associated with the same Margin Account, and one or several Collateral Accounts may be associated with the same Margin Account. Segregation of accounts are defined at the Margin Account level.

General Clearing Members ("GCM") may set up segregated Margin Accounts for their Non-Clearing Members ("NCM"). Clearing members are permitted to establish Service Accounts. A Service Account is used solely to mirror all or part of a holding booked on another account, and therefore does not give rise to settlement instructions or form the basis for margin calls. The objective of a Service Account is solely to give clearing members the opportunity to generate information and reports at the level of individual NCMs or clients.

Further details on the account structure are available in the Service Description.

## **2.2 Aggregating the Margins**

The clearing member is responsible for settling the margin call, which is the margin calculated on its Margin Account, or if the member has several Margin Accounts, the aggregate value of margins calculated for all Margin Accounts.

Margins on a segregated Margin Accounts will only be aggregated with the margins of the member's other accounts if negative (indicating a margin requirement in total). Positive margins on segregated Margin Accounts will not offset margins on the member's other Margin Accounts.

### **3 The Margin Model**

The margin is calculated as the sum of the Initial Margin ("IM") and the Variation Margin ("VM").

The Initial Margin is the monetary expression of the potential volatility of the portfolio. The defined confidence level for the model calculating the Initial Margin has been set to 99 pct., and the model performance is regularly back-tested. The Initial Margin can only be negative or zero.

The Variation Margin is the liquidation value of a portfolio of clearing transactions, defined by the Margin Account. The Variation Margin can be positive, zero, or negative.

The margin for each member is calculated continuously through the clearing day in the clearing system. The basis for the calculation is the real-time or current position on the member's Margin Account(s) and the actual market prices ("Margin Price"). Clearing members have access to margin information close to real-time via the Oslo Clearing web application.

#### **3.1 The Initial Margin**

The Initial Margin is calculated following the value-at-risk principles. The risk parameters used for the calculation are the Margin Rates, the Correlation Coefficients and the Spreads.

##### *The Margin Rate*

The Margin Rate is derived from the observed daily volatility of each ISIN accepted for clearing, or as collateral. Oslo Clearing performs a Jarque-Bera test for Normal Distribution for each series. The Margin Rate of a normally distributed series will be derived from the observed volatility last 60 trading days, and adjusted for a confidence level of 99 pct. If the condition of normality is not satisfied, the Margin Rate will be set as the 99 pct. quantile of the actual distribution.

The daily volatility at the 99 pct. confidence level is scaled with the applicable closing period for each ISIN to set the Margin Rate. The closing period may vary from 2 to 10 days, dependent on the average turnover last 60 days: e.g. a daily turnover of NOK 100 mill. on average, or higher will usually qualify for a short closing period, while a daily turnover less than NOK 100.000 on average will qualify for the longest closing period.

The Margin Rate will take the default values displayed in table 1, below if there is a significant number of days without trading for the last 60 trading days, in relative terms.

**Table 1. Margin for days without trade**

<b>days without trading (pct.)</b>	10-25 pct.	25-40 pct.	40 pct. or higher
<b>Minimum Margin</b>	40 pct.	60 pct.	80 pct.

The Margin Rates and Spreads are available on the website of Oslo Clearing, and the data are organised in accordance with table 2, below:

The Spread is a representative Bid-Ask spread observed on the cleared market place, and set for each underlying instrument accepted for clearing, or as collateral.

**Table 2. Example of Margin Rates and Spreads available from the Website**

BMG1190N1002	0.25	0.02
BMG2786A1062	0.2	0.05
BMG3682E1277	0.13	0.01
BMG4032A1045	0.25	0.05
BMG5137R1088	0.25	0.05

The file available from the website contains the list of ISINs cleared or accepted as collateral in column 1, sorted in ascending order with the applicable Margin Rate indicated in column 2 and the Spread in column 3.

A portfolio consisting of DnBNOR (NO0010031479), Norsk Hydro (NO0005052605) and Statoil (NO0010096985) will serve as an example and be illustrated in section 3.3, below. The Margin Rates and Spreads for the 3 ISIN are:

**Table 3. Margin Rates and Spreads for DnBNOR, NHY and STL**

NO0010031479	0.13	0.01
NO0005052605	0.1	0.01
NO0010096985	0.08	0.01

Margin rates are regularly reassessed, and the process of reassessing the Margin Rates is more frequent under volatile market conditions.

The margin model can adjust the Margin Rate for a large position held on one Margin Account.

### The Correlation Coefficients

Correlation coefficients are calculated daily on a rolling window of 60 trading days. The model will automatically use the values [0,9; -0,9] if there are 5 days or more without trade for one or both series. For situations where the relation of dependency between a pair of ISIN may no longer can be satisfied, for example due to altered market conditions or new information relative to one or both ISINs, Oslo Clearing may set the values [0,9; -0,9] for the pair of ISINs.

The correlation model thus implies that a each pair of ISIN will be tested for the direction of the positions, and the model will define two intermediary correlation matrices:

- the LL Matrix which holds correlation coefficients for positions in the same direction (the pair of ISINs are both either LONG or SHORT)
- the LS Matrix which holds correlation coefficients for positions in opposite direction (for the pair of ISINs, one is LONG, the other is SHORT)

For each calculation of Initial Margin on a Margin Account, the margin model will select the applicable correlation coefficient for the pair of ISINs from one of the two above mentioned matrices.

The correlation coefficients are published on the website of Oslo Clearing as a .csv-file. The data available on the website are displayed in accordance with table 4, below:

**Table 4. Example of Correlation Coefficients available from the Website**

NO0010031479	NO0005052605	-0,9	0
NO0010031479	NO0005052605	0,9	1
NO0010031479	NO0010096985	0,52	0
NO0010031479	NO0010096985	0,52	1
NO0005052605	NO0010096985	0,71	0
NO0005052605	NO0010096985	0,71	1

ISIN 1      ISIN 2      Correlation coefficient      binary identifier

The file available on the website contains the list of ISINs cleared, or accepted as collateral in column 1, sorted in ascending order. The ISIN is repeated as many times as necessary in order to exhaust the number of combinations with every other possible ISIN listed in column 2, also sorted in ascending order. The list, thus constitutes all possible combinations of correlation pairs, and is virtually organised as a triangular matrix. Each correlation pair is displayed on two rows, enabling the display of the minimum and maximum correlations for the pair of ISINs respectively, in column 3. Column 4 contains a binary value [0; 1], where 0 corresponds to the LS-Matrix and 1 to the LL-Matrix.

The LL-Matrix and LS-Matrix holding the maximum and minimum correlations for the 3 ISINs (DnBNOR, Norsk Hydro and Statoil), used in our example, would take the following shape:

$$\text{LL - Matrix: } \begin{bmatrix} 1 & 0,9 & 0,52 \\ 0,9 & 1 & 0,71 \\ 0,52 & 0,71 & 1 \end{bmatrix} \quad \text{LS - Matrix: } \begin{bmatrix} 1 & -0,9 & 0,52 \\ -0,9 & 1 & 0,71 \\ 0,52 & 0,71 & 1 \end{bmatrix} \quad (1)$$

### Calculating the Initial Margin

The value of each position per ISIN valued at the Margin Price serves as the base for calculating the Initial Margin.

The Margin Price is the Last Price if traded on the relevant clearing day, or else the Close Price if any of the two prices are higher than the Bid Price, or lower than the Ask Price. The Bid Price is used if Last/Close is lower than Bid, else the Ask Price is used if Last/Close is higher than Ask.

Depending on the direction of each position pair, the model will select the applicable correlation coefficient from the LL-Matrix or the LS-Matrix, thus creating a unique correlation, or var-covar matrix for calculating the margin per Margin Account and per sequence of margin calculation.

The var-covar matrix is post- and pre-multiplied by a vector containing each position to find the portfolio variance. The standard deviation for the same portfolio is the monetary expression of the expected portfolio volatility, and represents the Initial Margin.

The portfolio variance is determined in accordance with:

$$\sigma_{\text{Portfolio}}^2 = \begin{bmatrix} \text{ISIN} & \text{ISIN} & \dots & \text{ISIN} \end{bmatrix} \begin{bmatrix} \sigma_1^2 & \rho_{12} & \dots & \rho_{1n} \\ \rho_{12} & \sigma_2^2 & \dots & \rho_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \rho_{1n} & \rho_{2n} & \dots & \sigma_n^2 \end{bmatrix} \begin{bmatrix} \text{ISIN} \\ \text{ISIN} \\ \dots \\ \text{ISIN} \end{bmatrix} \quad (2)$$

which can be denoted as:

$$\sigma_{\text{Portfolio}}^2 = \mathbf{P} \mathbf{VCV} \mathbf{P}' \quad (3)$$

where:

$\mathbf{P}$  is the positions (per ISIN) vector  
 $\mathbf{VCV}$  is the var-covar matrix

Equation (3) can be rewritten, decomposing the var-covar matrix in to a correlation matrix that is pre- and post-multiplied by a diagonal matrix with the Margin Rates for each ISIN:

$$\sigma_{\text{Portfolio}}^2 = P \text{ diag}(V) C \text{ diag}(V)' P' \quad (4)$$

where:

P is the positions (per ISIN) vector  
diag(V) is the diagonal matrix with Margin Rates  
C is the correlation matrix

The square root of the portfolio variance ( $\sigma^2$ ) constitutes the initial margin per Margin Account, as calculated in equation (4).

### 3.2 The Variation Margin

For each sequence of the margin calculation, the clearing system will calculate the Variation Margin as the cumulative profit or loss on each clearing transaction from its original Trade Amount.

The Variation Margin is calculated as:

$$VM = \sum_{i=1}^n \text{TradeAmount}_i + \left\{ \left( \sum_{i=1}^n \text{Volume}_i * \text{MarginPrice}_i \right) - \left| \sum_{i=1}^n \text{Volume}_i * \text{MarginPrice}_i \right| * \text{Spread}_i / 2 \right\} \quad (5)$$

where:

The Trade Amount is the value of the net open position for all settlement days per ISIN at the traded price. The Trade amount is positive for a member that is in a receive position, i.e. with the obligation to deliver equity market instruments (seller). The Trade Amount is negative for a member which is in the payer position.

The Volume is the net open position per ISIN for all settlement days on a Margin Account.

### 3.3 Margin Example

Table 5, below contains the net clearing transactions that will serve as an example for calculating the margin. The netted clearing transactions belong to one Margin Account:

**Table 5. Example - Netted Positions on a Margin Account**

ISIN	Ticker	Trade Amount	Volume	Margin Price	Market Value
NO0010031479	DNBNOR	-92 057 020	1 363 000	66,65	90 843 950
NO0005052605	NHY	25 724 480	-608 000	41,92	-25 487 360
NO0010096985	STL	167 410 900	-1 241 000	135,8	-168 527 800

The margin for the example portfolio will be calculated in two steps, first the Initial Margin, and then subsequently the Variation Margin.

### The Initial Margin

The applicable correlation matrix for this portfolio, illustrated in equation (6), will be derived from the LL-Matrix and LS-Matrix, cf. equation (1) above:

$$C = \begin{bmatrix} 1 & -0,9 & 0,52 \\ -0,9 & 1 & 0,71 \\ 0,52 & 0,71 & 1 \end{bmatrix} \quad (6)$$

The positions vector P is adjusted using the diagonal matrix with the Margin Rates, and the result is illustrated in equation (7):

$$P \text{ diag}(V) = \begin{bmatrix} 0,13 & 0 & 0 \\ 0 & 0,10 & 0 \\ 0 & 0 & 0,08 \end{bmatrix} \begin{bmatrix} 0844 & -25487 & -168528 \end{bmatrix} \quad (7)$$

values in 1.000 currency units

Using equation (4), above, the portfolio variance ( $\sigma^2$ ) is obtained by pre- and postmultiplying the correlation matrix (C) with the adjusted positions vector (P *diag*(V)). The Initial Margin is finally obtained by:

$$IM = \sqrt{\sigma_{\text{Portfolio}}^2} \quad (8)$$

and for this example, the Initial Margin is -16.466.339.

### The Variation Margin

The Variation Margin for the portfolio will be calculated in accordance with equation (5), above. Table 6, below, provides the detail of the profit or loss per ISIN, and the total Variation Margin.

**Table 6. Example - Variation Margin for the Portfolio**

ISIN	Ticker	Trade Amount	Position	VM per ISIN
NO0010031479	DNBNOR	-92 057 020	90 389 730	-1 667 290
NO0005052605	NHY	25 724 480	-25 614 797	109 683
NO0010096985	STL	167 410 900	-169 370 439	-1 959 539
<b>Sum Variation Margin - Portfolio</b>				<b>-3 517 146</b>

### The Margin

The margin for the portfolio will consist of the sum of the Initial Margin: -16.282.517 and the Variation Margin: -3.517.146, which is a total of -19.799.662.

### **3.4 Margin Collateral**

Clearing members are required to pledge collateral to meet their margin requirement. Alternatively, Oslo Clearing can accept on-demand guarantees to meet the margin requirement.

Oslo Clearing accepts the following forms of collateral to satisfy the margin requirement:

- financial instruments held on a securities collateral account, when approved as eligible collateral.
- cash held on a cash collateral account.
- on-demand guarantees issued by credit institutions approved by Oslo Clearing, in a form approved by Oslo Clearing.

The collateral value is calculated as the market value for each collateral object, with the deduction of a "haircut". The collateral value of an equity market instrument approved for clearing is included in the margin calculation.

The list of acceptable collateral and the list of accepted institutions for holding collateral are available on the website.

### **3.5 Settlement of Margin Requirements**

Margin requirements are available on the Oslo Clearing web application. Clearing Members will also be notified about the margin requirements.

#### **3.5.1 Ordinary Margin Requirements**

Each day an ordinary margin requirement is issued to each Clearing Member. This is issued after the completion of Settlement 1 in the Central Securities Settlement System ("VPO"), usually around 06:00 CET. The ordinary margin requirement shall be settled by 11:00 CET.

#### **3.5.2 Extraordinary Margin Requirements**

Oslo Clearing may issue an extraordinary margin requirement if the collateral provided by a Clearing Member is deemed to be insufficient to cover the risk on the Clearing Member or in other circumstances when considered necessary in view of the prevailing market conditions or for any other imperative reasons. The Clearing Member must settle the margin requirement within a time due set by Oslo Clearing, however with a minimum of one (1) hour after the time at which Oslo Clearing notifies the Clearing Member of the extraordinary margin requirement.