

English

**Clearing**  
*Risk Based Margining*

**e u r e x**



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# Introduction

## Security of Trade Processing at Eurex Clearing AG

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Eurex Clearing AG acts as the central counterparty and guarantees the fulfillment of all transactions in futures and options on Eurex as well as for other trading platforms such as Eurex Bonds (cash market for bonds) and Eurex Repo (market for repurchase agreements). With the introduction of Eurex Clearing AG as the central counterparty (CCP) for equities<sup>1</sup>, the scope of services of Eurex Clearing AG is extended.

When a trade is executed in these markets, Eurex Clearing AG stands between the buyer and seller as clearing house for, and counterparty of, both contractual partners. The clearing house enables the parties to the transaction to make further decisions fully independently of each other and limit counterparty risks to a single contractual partner. The clearing system of Eurex Clearing AG, with its integrated safety and control mechanisms, thus guarantees fulfillment of every contract executed on Eurex Exchanges, Eurex Bonds and Eurex Repo or relevant equities.

In order to ensure this high degree of security, Eurex Clearing AG protects itself against the risk of default by any of its members. The mainstay of this security system is margin, i.e. the funds or securities which must be deposited by Clearing Members as collateral for a given position. The amount specified for such should not be excessive, but it also may not be set at a level that is too low. Oversecuring a position would tie up liquidity of the exchange participant unnecessarily, while an undersecured position could represent a potential threat to the guarantee of contract fulfillment.

Throughout this process, not only the losses calculated on the basis of current market prices, but also potential future price risks must be covered so that no collateral shortfall arises prior to the next calculation of margin requirements. The job of an efficient margin system is to find the right measure of protection for all market participants without causing an undue burden on any one of them and unnecessarily blocking liquidity.

The requirements for clearing membership establish clearly defined conditions with respect to the creditworthiness of exchange members participating in the clearing process. This is a key component of the protection provided by the Eurex system.

<sup>1</sup> In the first step, Eurex Clearing AG becomes the counterpart for on-exchange trades executed at the Frankfurt Stock Exchange (on Xetra or on the trading floor) in equities that are subject to collective safe custody, denominated in Euro and listed on Xetra.

## Admission to Trading

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Direct participation in exchange trading on Eurex Exchanges, Eurex Bonds, Eurex Repo and the Frankfurt Stock Exchange is possible as long as all admission requirements are fulfilled by the applicant. Some of the mandatory conditions for admission are:

- Regulation of a domestic regulatory authority.
- Participation in the Eurex Clearing AG clearing process either directly, as a Clearing Member of Eurex Clearing AG, or indirectly, by signing an agreement with an existing Clearing Member.
- Fulfillment of the technical requirements of Eurex Exchanges, Eurex Bonds, Eurex Repo or the Frankfurt Stock Exchange respectively, including maintenance of certain hardware and software, as well as observance of prescribed network requirements.
- Admission and registration of traders.

Comprehensive information on admission to trading is provided in

- the rules and regulations of Eurex Exchanges<sup>2</sup> and Frankfurt Stock Exchange<sup>3</sup>
- the terms and conditions for participation and trading on Eurex Bonds GmbH<sup>4</sup> and Eurex Repo GmbH<sup>5</sup>.

<sup>2</sup> See: [www.eurexchange.com](http://www.eurexchange.com) > market place > rules and regulations.

<sup>3</sup> See: [www.xetra.de](http://www.xetra.de) > admission > rules and regulations.

<sup>4</sup> See: [www.eurex-bonds.com](http://www.eurex-bonds.com) > access to Eurex Bonds > rules and regulations.

<sup>5</sup> See: [www.eurexrepo.com](http://www.eurexrepo.com) > euro market > publications > terms and conditions for participation and trading on Eurex Repo GmbH.

## Admission to Clearing

Admission to direct participation in the clearing process can take place in the form of a

- General Clearing Membership (GCM) or
- Direct Clearing Membership (DCM).

Participation as a GCM or DCM requires issuance of the appropriate license, for which the following requirements in particular must be fulfilled:

- A credit institution or bank as defined by relevant laws (KWG and BankG, respectively, in Germany).
- Sufficient liable equity capital in the given local currency as per the provisions of applicable laws.

**Diagram 1.1: Minimum Capital Requirements**

| Clearing License                          | General Clearing Member<br>Liable Equity Capital | Direct Clearing Member<br>Liable Equity Capital |
|---|--|---|
| Derivatives Clearing License <sup>6</sup> | EUR 125 million                                  | EUR 12.5 million                                |
| Bonds Clearing License <sup>6</sup>       | EUR 50 million                                   | EUR 5 million                                   |
| Repo Clearing License <sup>7</sup>        | EUR 175 million                                  | EUR 17.5 million                                |
| Equity Clearing License                   | EUR 25 million                                   | EUR 2.5 million                                 |

- Granting of a clearing guarantee issued by a third-party bank. The amount of the contribution provided shall be determined by Eurex Clearing AG for each Clearing Member.
- Maintenance of current accounts with the central banks or other fund clearing institutions stipulated by Eurex Clearing AG, as well as securities accounts at those central custodian organizations designated by Eurex Clearing AG.
- Necessary technical installations and personnel required for back-office clearing operations.

Should the institution not be able to fulfill these requirements or decide against holding clearing membership, it may participate as a Non Clearing Member (NCM). The requirement for such is a valid clearing agreement between the institution and a GCM or a company-affiliated DCM.

Comprehensive information on admission to clearing is provided in the clearing conditions<sup>8</sup>.

<sup>6</sup> When calculating capital, the capital already deposited for the Repo Clearing License is taken into account.

<sup>7</sup> When calculating capital, the capital already deposited for the Derivatives Clearing License and the Bonds Clearing License is taken into account.

<sup>8</sup> See: [www.eurexchange.com](http://www.eurexchange.com) > market place > rules and regulations.

## Clearing of Transactions

Only a market participant which has been admitted as a Clearing Member may be a counterparty of Eurex Clearing AG. Companies may become General Clearing Members (GCM) or Direct Clearing Members (DCM) of Eurex Clearing AG and may apply for one or more clearing licenses.

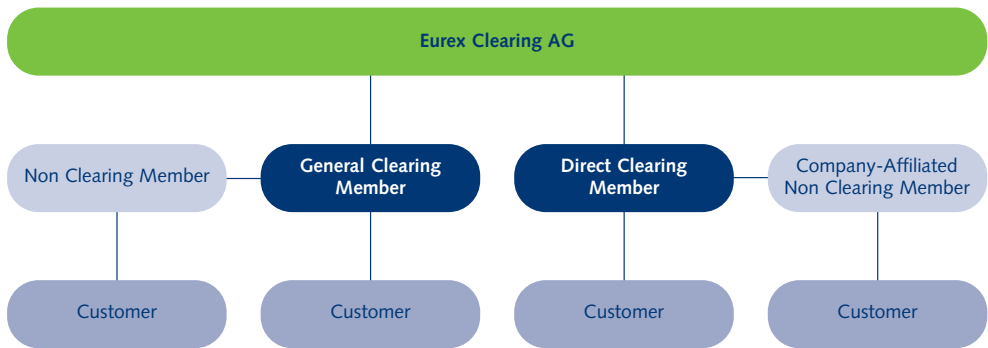
**Diagram 1.2: Clearing Licenses**

| Clearing License             | Cleared and settled products  |
|------------------------------|---|
| Derivatives Clearing License | <ul style="list-style-type: none"> <li>● Futures and options products</li> <li>● Futures leg of basis trades<sup>9</sup></li> </ul>   |
| Bonds Clearing License       | <ul style="list-style-type: none"> <li>● Fixed-rate bonds of the Federal Republic of Germany or the Treuhandanstalt</li> <li>● Jumbo Pfandbriefe of German issuers</li> <li>● Issues of the Kreditanstalt für Wiederaufbau (Reconstruction Loan Corporation), the European Investment Bank and the German States</li> <li>● Securities leg of basis trades<sup>4</sup></li> </ul> |
| Repo Clearing License        | General Collateral and Special Repo with: <ul style="list-style-type: none"> <li>● Fixed-rate bonds of the Federal Republic of Germany or the Treuhandanstalt</li> <li>● Jumbo Pfandbriefe from German issuers</li> <li>● Bonds issued by Kreditanstalt für Wiederaufbau and German States</li> </ul>   |
| Equity Clearing License      | <ul style="list-style-type: none"> <li>● Shares held in collective safe custody that are traded on the FWB floor or via Xetra</li> </ul>  |

A General Clearing Member (GCM) may settle its own transactions, those of its customers, as well as those of market participants which do not hold a clearing license (Non Clearing Members–NCM). A Direct Clearing Member (DCM) is entitled to clear only its own transactions, those of its customers, and those of its corporate affiliates which do not hold a clearing license. If a market participant does not itself hold a clearing license, it must clear its transactions via a General Clearing Member or a company-affiliated Direct Clearing Member. In such cases, the contractual party of the NCM will not be Eurex Clearing AG directly, but rather the GCM or company-affiliated DCM, which in turn is the contractual party of Eurex Clearing AG. Customers have contractual relationships solely with the respective market participants which execute customer orders and settle the transactions that have been made.

<sup>9</sup> The basis trade is a combination of a security and a futures contract, which has a price of its own. The purchase of a basis trade implies the purchase of a certain amount of securities and the simultaneous sale of the corresponding amount of futures contracts.

**Diagram 1.3: Contractual Relationship upon Conclusion of Transaction**



Each Clearing Member is obliged to demand from its customers and NCMs margin amounts which are at least as high as the levels that result from the Eurex Clearing AG method of calculation.

At Eurex Exchanges, the give-up trade functionality allows market participants to hand over a trade during order entry, or subsequent to matching, to a Clearing Member other than the one they have a clearing arrangement with.

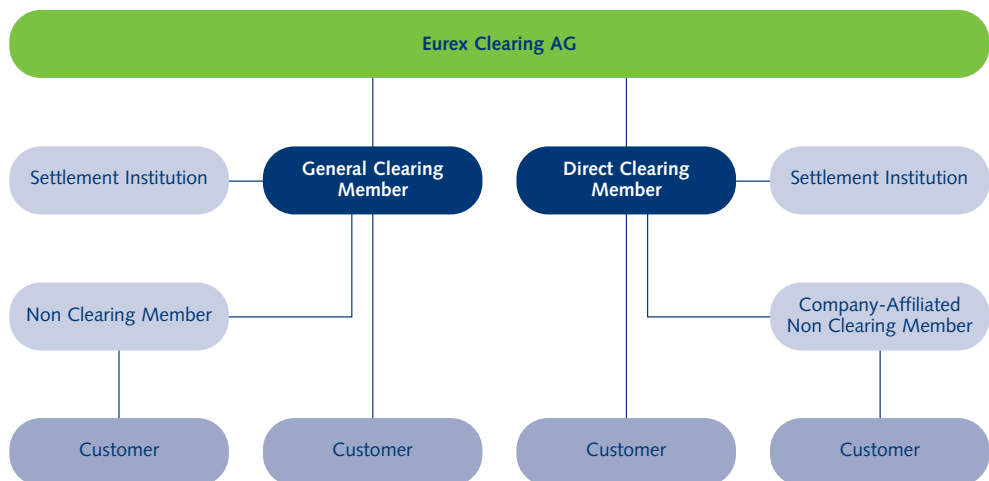
The financial clearing guarantees which must be put up by all Clearing Members are placed in the Eurex Clearing AG guarantee fund, so that a sufficient safety buffer is available with the clearing house in the case of the insolvency of a member.

## Settlement of Transactions

Although the Clearing Member is responsible for settlement, there is the possibility to stipulate a separate settlement institution for the settlement of transactions. Prerequisites for settlement are an account at the Bundesbank (of the Federal Republic of Germany) and a securities account at one central depository recognized by Eurex Clearing AG. These accounts are to be held either by the settlement institution or the Clearing Member with the necessary power of attorney.

Each custodian institution shall use appropriate technical equipment (back-office installation) in order to guarantee correct recording, accounting and supervision of all transactions.

Diagram 1.4: Contractual Relationship upon Conclusion of Transaction



A combination of the functions trading, clearing and settlement per financial institution is possible.

# Risks Associated with Different Product Types

## Options at Eurex Exchanges

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The contractual substance of every options transaction is a specific right: the right to opt. This right to opt is traded in the form of a so-called options contract. The purchaser of an options contract (buyer) acquires, against payment of a premium, the right

- to buy (**call option**) or
- to sell (**put option**)
- a pre-determined amount (**contract size**)
- of a specific security or asset (**underlying instrument**)
- on or before a specified date (**expiration**)
- at a pre-determined price (**strike or exercise price**).

The seller of an options contract (writer) assumes the respective obligation, and for doing so is entitled to receive the options price (premium) paid by the buyer. Should the buyer of a call (option to buy) exercise his or her right, the seller is obliged to deliver the underlying instrument to the buyer at the pre-determined price (strike or exercise price). On the other hand, should the buyer of a put (option to sell) exercise his or her right, then the seller is obliged to acquire the underlying instrument at the pre-determined price. If the underlying instrument is not deliverable, then settlement of the contract will take place in cash. Since the buyer of a traditional option acquires a right, but no obligation, he incurs no further capital risk than the amount of the premium paid. If prices develop favorably for him, he can either sell the position at a profit or exercise the option. On the other hand, if the market were to go against him, he may simply allow the option to expire without any further costs arising. For this reason, the buyer of a traditional option is not required to put up any margin because, once the options premium has been paid in full, no risk of non-performance of the contractual provisions remains. In the case of futures-style options, the premium is due in full only at the end of the contract's term or upon exercise of the option, so that here the buyer of the option is required to put up a security deposit as well.

The writer of an option assumes the obligations as described above. If market prices develop unfavorably, the fulfillment of the writer's contractual obligation for the case that the option were to be exercised must be ensured. However, the writer does not necessarily have to continue carrying this potential liability through to expiration of the contract, because he may offset the position prior to expiration by making an appropriate offsetting transaction.

## **Futures at Eurex Exchanges**

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Financial futures is a generic term for exchange-traded, standardized forward contracts involving specific financial instruments. Such contracts are always based on the firm contractual agreement

- to purchase (**buyer of a futures contract**)
- or to deliver (**seller of a futures contract**)
- a standardized quantity of a particular financial asset (**underlying instrument**)
- at a pre-determined price (**price of the futures contract**)
- at a pre-determined future point in time (**delivery date**).

Thus a financial futures contract fixes a price today for a financial instrument, but fulfillment of the contract will only take place at some later date.

In comparison to traditional forward transactions which are individually negotiated between both parties to the contract, the standardization of exchange-traded financial futures affords the investor considerable advantages. Above all, it enables previously established sell (short) or purchase (long) positions to be offset via appropriate opposite transactions (closing transaction). The actual fulfillment of the contract, i.e. the delivery or purchase of the underlying instrument, can therefore be avoided. Only the profit or loss arising from the difference between the entry and exit price remains.

Both parties to a financial futures contract, i.e. the buyer as well as the seller, have assumed an obligation. For that reason, it must be ensured that the buyer will pay, and the seller can deliver, on the pre-determined delivery date. Both positions are thus accompanied by risk. However, neither the buyer nor the seller is obliged to keep his position until the end of the contract's term. Both have the possibility to eliminate their risk exposure by executing an offsetting transaction.

## Bonds at Eurex Bonds

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Contractually, a transaction in bonds is the exchange of bonds (fixed income securities) for cash. The buyer of the bonds acquires on day T

- a specific amount (**par value**)
- of a specific bond
- that is exchanged at a specific point in time (**standard settlement period**)
- at a specific amount (**delivery versus payment**).

At settlement, the seller of the bonds receives the sales price from the buyer and is required to deliver the respective bonds. In addition to the sales price, the buyer is required to pay the seller the accrued interest on the bonds up until settlement.

## Repos at Eurex Repo

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Contractually, a repo transaction is the sale of a security for cash with the simultaneous agreement to repurchase the security. The buyer receives in return for payment of a specific amount on day T

- a specific amount (**par value**)
- of a specific bond
- that will be re-purchased at a specific point in time which is agreed to when the contract for the sale is made
- at a specific price plus accrued interest (**delivery versus payment**).

Given the agreed upon repurchase, a repo transaction simply creates a temporary exchange of bonds for cash between two parties.

While the front leg of a repo transaction is generally settled T+2 (exceptions are TOM-NEXT and overnight transactions, which are settled T+1 and T, respectively), the settlement of the term leg can occur up to 1 year after the settlement of the front leg. On the trading day, the counterparties agree upon the price at which the bond for the repo trade will be repurchased on settlement day. The risk of repos lies in that the bonds underlying the transaction in the time between the conclusion and repurchase of the transaction experience price changes.

The seller of the repo transaction (buyer of the term leg) carries the risk of falling bond prices while the buyer of the repo transaction (seller of the term leg) carries the risk of increasing bond prices.

## Equities at Frankfurt Stock Exchange

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Contractually, a transaction in equities is the exchange of equities for cash. The buyer of the equity acquires on day T

- a specific number of shares
- of a specific equity
- that is exchanged at a specific point in time (**standard settlement period**)
- at a specific amount (**delivery versus payment**).

At settlement, the seller of the equity receives the price at which the equity trade was executed from the buyer and is required to deliver the respective equity on the specified valuation date.

# Principal Elements of Risk Based Margining

Margining encompasses the entire process of measuring, calculating and administering the collateral that must be put up for coverage of open positions. The provision of collateral is intended to ensure that all financial commitments related to the open positions of a Clearing Member can be offset within a very short period of time.

## What is Risk Based Margining?

It is obviously advantageous for the investor if he/she must only provide coverage for the risk of the positions in his/her account rather than paying the full value of the contracts themselves. The amount of collateral which must be deposited is calculated on the basis of the total risk exposure of the entire account. The total risk exposure is determined from the price risk of the derivative and cash positions held in the account. The risk reducing effect of combinations of positions is taken into consideration in this calculation, in that equal but opposite risks within the account are offset against each other. As a result, an optimal degree of security is achieved with a minimum amount of collateral having to be provided by the market participant.

## How are Correlated Risks Offset?

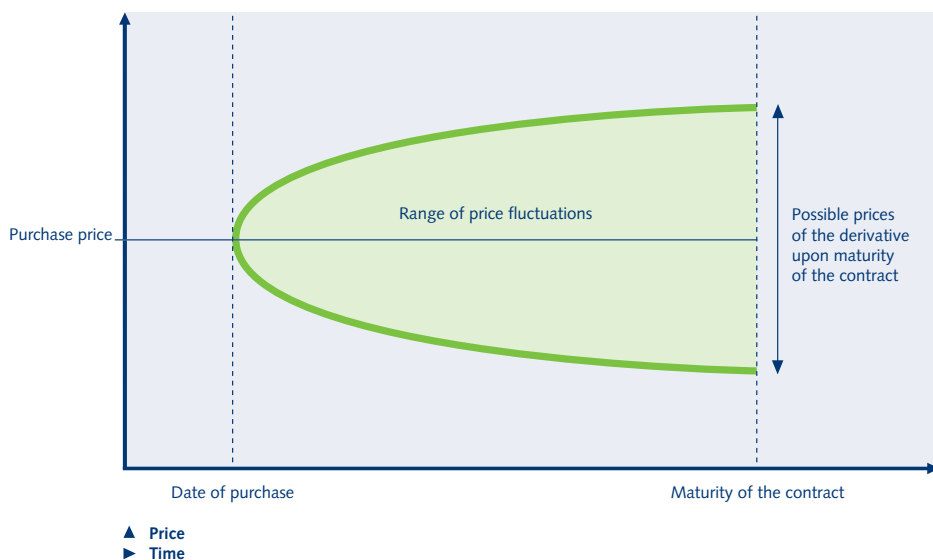
In order to segregate different futures contracts within a portfolio into "bundles" that carry similar risks, they are grouped together into so-called "margin classes" based on the underlying instruments themselves. For example, all DAX® options, together with the DAX futures, comprise the DAX margin class. Similarly, there is a separate class for every other type of equity index and interest rate future. In the case of equity options, all contracts with the same underlying security are grouped together. Unrealized profits and losses on futures contracts within the same margin class are offset against each other.

This process is known as "cross margining". It promotes liquidity because by offsetting equal but opposite risks it leads to considerably less collateral being required to cover the various positions in an account than would be the case if the sum of all margin requirements for each individual contract had to be deposited. If two or more margin classes whose underlying instruments are correlated with respect to their risk structure are combined, a "margin group" results. Within a given margin group, cross margining is again possible, i.e. the offsetting of equal but opposite risks. Therefore it makes sense to group together into a single margin group the FGBL margin class (which includes Euro Bund Futures and the relative Options), the FGBM class (Euro Bobl Futures and the relative Options), the FGBS class (Euro Schatz Futures and the relative Options) as well as the margin class for German bonds and jumbo mortgage bonds (Jumbo Pfandbriefe), because the underlying instruments of each margin class are exposed to exactly the same risks.

## For Which Time Frame are Margin Requirements Calculated?

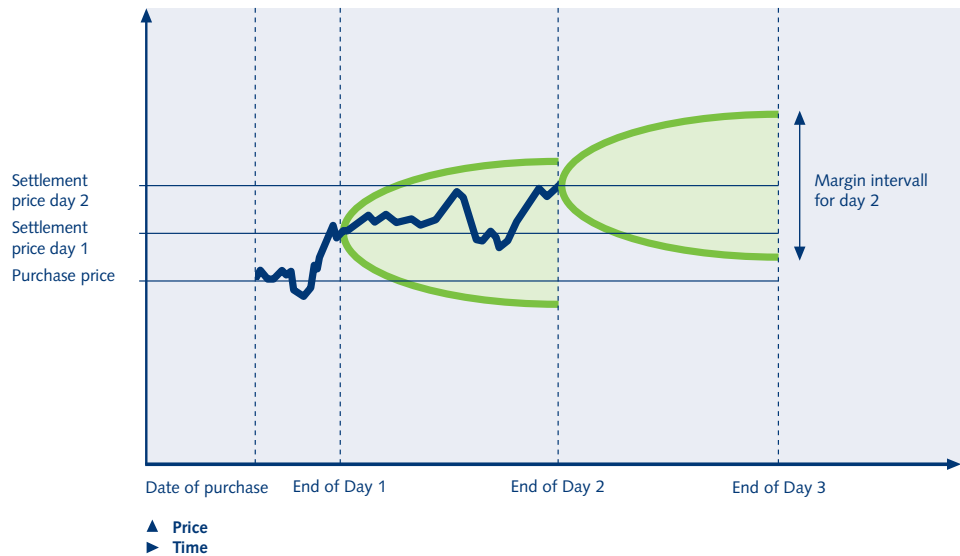
The level of margin required from each member is re-calculated on a daily basis, because transactions made during the trading day lead to new positions being established and existing ones being offset through appropriate opposite transactions. Nevertheless, Eurex Clearing AG calculates the margin during the day and reserves the right to make an intraday margin call. In addition, this process again promotes liquidity. If margin requirements were continuously measured on the basis of risk exposure up to the end of the contract term, this would lead to excessive margin being required due to the broad range of price movements which could arise during the life of the contract (compare Diagram 3.1).

Diagram 3.1: Price Development until Maturity of the Contract



The daily adjustment of margin requirements poses no problem because exchange-listed, standardized futures contracts, bonds and equities enable prices to be continuously monitored (see Diagram 3.2). The profits and losses arising from intra-day price movements are compensated either by cash being exchanged between the counterparties (variation margin) or in the form of higher margin payments from the seller being deposited with Eurex Clearing AG (premium margin).

**Diagram 3.2: Daily Margin Adjustment**



## Which Risks Should be Covered?

The amount of risk that needs to be covered is represented by the highest possible costs to offset a given account on the following trading day, using the assumption of the worst possible price movement that could take place in the positions held in the account. The calculation of margin requirements for proprietary account and agent account positions is performed separately. The worst possible price movement is also referred to as the “worst case loss”.

Risks which are exactly equal but opposite, namely those arising from long and short positions held in the same contract with the same expiration date or in the same security, would lead to unnecessarily high margin requirements if viewed separately. In order to avoid this, all such open long and short positions in the respective contracts are first offset against each other so that either an excess of long positions (i.e. a net long position) or an excess of short positions (net short position) results. Equity trades can be marked to have the selected processing method applied. Risk positions that result from trades marked for gross processing (so-called gross risk positions) are considered as individual risk positions. The net risk positions otherwise generated are accumulated and considered as a so-called aggregated net risk position. In order to avoid unnecessarily high margins for equity trades, the existing short risk positions and long risk positions are summed up afterwards on either side to calculate the resulting margin.

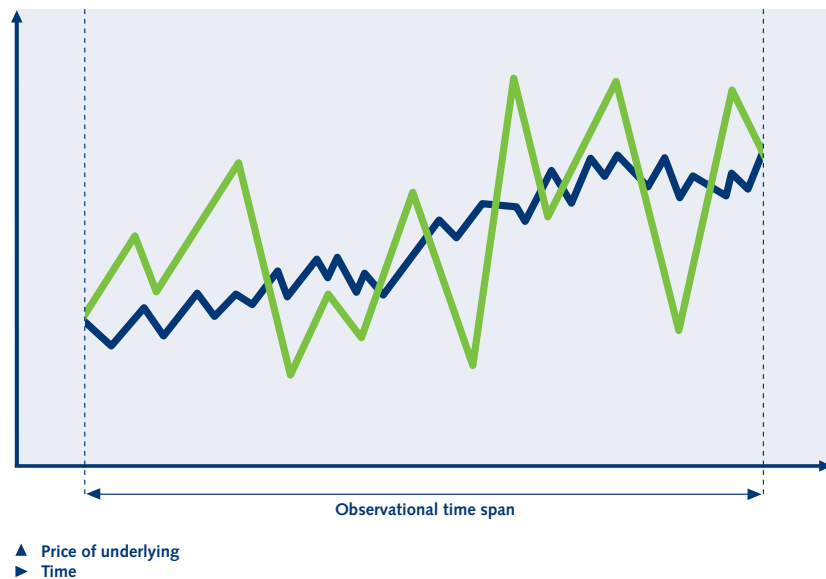
## Which Factors Determine the Amount of Security Required?

The primary task of risk based margining is to estimate the maximum costs that could arise by the immediate liquidation of a portfolio or a delivery failure. In order to determine the worst case price movement that could arise for the individual contracts or securities, the previous price behavior of the (underlying) securities (for example, in the case of equity options, the past price movements of the underlying shares) is analyzed.

Margin requirements are determined using a mathematical model with various parameters as well as current cash market prices. Among the most important parameters is the volatility of the (underlying) security.

Volatility expresses the price variations that arise between consecutive trading days, whereby "historical volatility" (as its empirical counterpart) acts as a means of comparison. Historical volatility, i.e. price movements observed in a given security during the past, provides a clue to the potential maximum price range in which the instrument can be expected to trade in the future. Wide price variations signify high volatility, while only a modest degree of price fluctuation demonstrates low volatility (see Diagram 3.3).

Diagram 3.3: Examples of Different Degrees of Price Volatility



In calculating volatility, Eurex Clearing AG normally goes back 30 or 250 trading days. The 30-day or, as the case may be, the 250-day historical volatility creates a basis for the future expected volatility.

In an effort to cover the risk of extreme price fluctuations, margin parameters for each individual product are fixed based on volatility and various current market estimates. The margin parameter defines the maximum price fluctuation from one trading day to the next, i.e. in 99 percent of all cases, the price of the underlying does not lie outside the predicted "margin interval". These margin parameters are adjusted and published by Eurex Clearing AG.

## **How are Theoretical Prices of the Contracts Calculated?**

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Once the minimum and maximum potential prices of the underlying security have been determined using the margin parameters, then the resulting theoretical prices of the associated contracts are calculated. At Eurex Clearing AG, this calculation takes place with the help of various options pricing models.

However, because certain trading strategies exist in which the largest potential for loss upon liquidation can occur at a very specific exercise price, all exercise prices which lie between the minimum and maximum theoretical prices of active options series are also used as additional projected prices of the underlying instrument.

The volatility factor used in this calculation is the "implied volatility" which is derived from the daily closing prices of the option.

# Types of Margin

## Premium Margin

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Premium margin must be deposited by the writer of an option. It covers the potential loss that could be incurred if the writer were forced today to liquidate the position. The premium margin is continuously adjusted, i.e. if prices fluctuate so that the potential loss upon liquidation increases, the writer will be obliged to deposit additional premium margin. If on the other hand, prices fluctuate so that the potential loss upon liquidation decreases, the writer will receive a credit for his premium margin.

Premium margin is calculated for all positions in options products that are subject to the procedure known as "traditional-style premium posting". This involves those options for which the premium is paid in full at the time of purchase (equity and equity index options). The premium margin covers the costs that would arise upon liquidating all positions of a specific margin class at their respective closing prices. The purchaser of a traditional option need not deposit any margin because, with the payment of the options premium, he acquires a right but not an obligation to take any further action. His maximum close-out risk simply amounts to a total loss of the options premium if the contract is allowed to expire without having been exercised or sold in a closing transaction.

In the case of options on futures, no premium margin is required because here a daily profit and loss adjustment (variation margin) is made by the procedure known as "marking-to-market". The profit of one party to the contract is the loss of the other party. The resulting gains and losses are either debited or credited to the appropriate account on a daily basis via the mark-to-market process.

## Current Liquidating Margin

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Current liquidating margin is collected from buyers or sellers of bonds and equities. The current liquidating margin covers losses that would occur in the case that a position were closed out today. As with the premium margin, the current liquidating margin is readjusted daily.

Contrary to premium margin, the current liquidating margin is collected from either the buyer or seller, depending on the relation of the agreed upon purchase price to the current market price.

## Variation Margin

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For those products which are handled on a mark-to-market basis, Eurex Clearing AG books the trading day's profits and losses of all open positions held in an account. Marking-to-market is carried out on futures and options on futures. Using variation margin, profits and losses that arise due to the price fluctuations of open positions are offset daily.

In this particular instance, the difference to other types of margin is the fact that, here, it is not a matter of depositing collateral, but rather one of offsetting in cash the daily profits and losses in an account.

With the mark-to-market procedure, the owner of a long position which was purchased at a lower price than the daily settlement price is credited with the difference between the two prices, whereas the owner of the related short position must pay that difference. When options positions are marked-to-market, calculation of the appropriate credits and debits depends on how the value of a call or put position changed during the trading day.

The mark-to-market procedure ensures that each position is revalued at the daily settlement price. The difference between today's and the previous day's settlement price is offset by daily compensating payments.

Therefore, the essential effect of marking positions to market is the "extraction" of potential liquidation profits or losses, so that on the last trading day only the difference between the daily settlement price of the previous day and the final settlement price of all open positions has to be calculated.

In the case of options on futures, the final valuation is made at the final settlement price of either the expiration date of the option or the day on which it was exercised.

## Additional Margin

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Additional margin serves to cover through the next trading any potential additional costs that could arise if the positions had to be liquidated immediately. These possible close-out costs would arise if, based on the current prices of contracts/securities held in an account, the worst case loss would occur during the subsequent trading day. Additional margin is imposed on options (also options on futures), non-spread futures positions, as well as equities.

## Futures Spread Margin

If an account holds a number of futures positions that are based on the same underlying instrument, then the long and short positions can be offset against each other as long as they have the same maturity ("netting of positions"). In such a case, the price risks are equal and opposite.

Only those long or short positions remain which have expiration dates that are not identical. These positions can also be offset against each other (spreading) because, generally speaking, the associated risks roughly offset each other, e.g. a long FGBL Sept. versus a short FGBL Dec. Counterbalanced positions of this kind are called "spreads", and those which are not are referred to as "non-spreads". However, a latent risk still exists, one arising from the fact that contracts with differing expiration dates do not demonstrate a perfect price correlation. The purpose of futures spread margin is to cover this risk until the next trading day.

Diagram 4.1: Types of Margin on Eurex

| Products            | Time frame: yesterday to today |                  | Time frame: today to tomorrow |                       |
|---------------------|--------------------------------|------------------|-------------------------------|-----------------------|
|                     | Premium Margin                 | Variation Margin | Additional Margin             | Futures Spread Margin |
| Traditional Options | -                              |                  | -                             |                       |
| Futures             |                                | -                | for Non-Spreads               | for Spreads           |
| Options on Futures  |                                | -                | -                             |                       |

|                 | Current Liquidating Margin |  | Additional Margin |  |
|-----------------|----------------------------|--|-------------------|--|
| Bonds and Repos | -                          |  | -                 |  |
| Equities        | -                          |  | -                 |  |
| Cash Position   | -                          |  |                   |  |

# Risk Based Margining of Traditional Options

Traditional options are all those options for which the premium must be paid in full by the buyer upon purchase. At Eurex Clearing AG, these are equity options and options on equity indexes.

## Long Option Position

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Since the purchaser of an option acquires a right, but not an obligation, to exercise, he is not subject to any further risk once he has paid the option premium. If prices move in his favor, he can either close out the position at a profit or exercise it. If the market goes against him, he can simply allow his right to expire without incurring any additional costs. For this reason, no margin is required from the options buyer.

## Short Option Position

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There is a differentiation made between two kinds of short positions: "covered" and "uncovered".

In the case of a covered short position, the underlying securities are on deposit and thus provide 100 percent collateral for the position, so no margin is charged. For example, a writer sells one BASF call and simultaneously deposits 100 BASF shares in a depository account in favor of Eurex Clearing AG. In the case of options that are settled in cash (e.g. equity index options), there is no such thing as a covered position because no physical delivery of securities will take place.

If a customer exercises an option, then a writer holding a corresponding short position will be selected by a random process from among all those with similar short positions in the Eurex system. This procedure is called "assignment". Obviously, every writer of an uncovered short position could potentially incur the costs associated with being forced upon exercise to acquire the underlying securities. That is why, theoretically at least, the writer must first deposit margin in an amount which corresponds exactly with that of the options premium. In practice, however, the premium margin is charged at the close of the trading day on the basis of the daily settlement price.

In addition, of course, the risk of adverse price movement through to the close of the next trading day must be covered. For that purpose, a calculation based on the margin interval is made to determine how high the theoretical maximum liquidation loss could be through the following close. This amount is then covered by a deposit of additional margin.

The sum of premium margin and additional margin is the total margin amount which must be put up by the writer.

## Short Option Adjustment

Theoretical options prices are calculated with the help of various options pricing models. In the case of options which are considerably out-of-the-money, the risk exists that the prices determined in this manner are too low, because large price fluctuations in the underlying security tend to cause exaggerated reactions in these options.

Open short positions are therefore subjected to an additional “short option adjustment” calculation which is used on out-of-the-money options when all theoretical prices within the interval are lower than the short option adjustment. It is intended as a protection against abruptly increasing volatility, and at times can lie considerably above prices calculated using the options pricing model.

One component of the short option adjustment calculation is the so-called “out-of-the-money minimum”, which is determined by Eurex Clearing AG and used as a system parameter. From that, the short option adjustment is calculated as follows:

$$\text{Short option Adjustment} = \text{Margin parameter} \times \text{Out-of-the-money-minimum} + \text{Daily settlement price of the option}$$

Diagram 5.1: Sample Calculation of Short Option Adjustment

|                                |   |   |          |
|--------------------------------|---|---|----------|
| <b>Contract</b>                | C ALV MAR 02 390.00   |   |          |
| <b>Margin parameter</b>        | 11%   | <b>Out-of-the-money minimum</b>         | 25%      |
| <b>Closing price of equity</b> | EUR 333.85  | <b>Daily settlement price of option</b> | EUR 1.39 |
| <b>Short option adjustment</b> | $(\text{EUR } 333.85 \times 0.11) \times 0.25 + \text{EUR } 1.39 = \text{EUR } 10.57$ |   |          |

If the short option adjustment for the call option (put option) is higher than the theoretical option price at the upper (lower) range of the margin interval and the risk of this option is not covered by other positions, then the theoretical option price will be replaced by the short option adjustment. Diagram 10.5 shows a portfolio for which the short option adjustment is used.

The short option adjustment is not used if the risk of the short position is covered by an opposing position in the same underlying instrument. All long call (put) positions with at least the same maturity and the same or lower (higher) exercise price as well as long (short) futures can be used to cover a short call (put) position. Varying contract sizes which can occur due to capital adjustments are taken into account for this coverage. For those covered short positions only the regular margin is calculated.

## **Sample Calculation**

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A concrete example will now demonstrate how margin is calculated on traditional options. The DAX option will be used for the sake of illustration (Diagram 5.2). The same procedure applies for other equity index options or uncovered equity options.

Diagram 5.2: Sample Calculation for Traditional Equity Index Options

|   |                           |           |  |  |                          |           |  |
|---|---------------------------|-----------|--|--|--------------------------|-----------|--|
| <b>Contract</b>   | <b>C ODAX FEB 02 4800</b> |           |  | <b>Margin parameter</b>  | 340.00 points            |           |  |
| Tick size   | 0.1 points                |           |  | Tick value   | EUR 0.50                 |           |  |
|   | <b>Option</b>             |           |  | <b>Underlying instrument (DAX)</b>   |                          |           |  |
| <b>Daily settlement price</b>   | 142.3 points              |           |  | 4,801.95 points  |                          |           |  |
| <b>Buyer</b>  |                           |           |  | <b>Writer</b>  |                          |           |  |
| <b>Premium Margin</b>   |                           |           |  |  |                          |           |  |
| Daily settlement price  | Tick value                | Tick size | Premium-Margin                           | Daily settlement price   | Tick value               | Tick size | Premium-Margin                           |
| –(142.3 points × EUR 0.5) /   | 0.1 points                | →         | <b>EUR –711.50</b>                       | (142.3 points × EUR 0.5) /   | 0.1 points               | →         | <b>EUR 711.50</b>                        |
|   |                           |           | Liquidation proceeds                     |  |                          |           | Liquidation proceeds                     |
| <b>Additional Margin</b>  |                           |           |  |  |                          |           |  |
| Underlying instrument   | Projection                |           | Daily settlement price                   |  | Projection <sup>10</sup> |           |  |
| Option  | 4,461.95                  | ← –340    | 4,801.95                                 | +340 →   | 5,141.95                 |           |  |
|   | 38.2                      |           | 142.3                                    |  | 344.7                    |           |  |
| Worst case: option price falls by 104.1 points from 142.3 points to 38.2 points                       |                           |           |  | Worst case: option price rises by 202.4 points from 142.3 points to 344.7 points |                          |           |  |
| Difference  | Tick value                | Tick size | Additional Margin                        | Difference   | Tick value               | Tick size | Additional Margin                        |
| (104.1 points × EUR 0.5) /  | 0.1 points                |           | <b>EUR 520.50</b>                        | (202,4 points × EUR 0,5) /   | 0,1 points               |           | <b>EUR 1.012,00</b>                      |
|   |                           |           | Liquidation loss = additional margin due |  |                          |           | Liquidation loss = additional margin due |
| <b>Total Margin</b>   |                           |           |  |  |                          |           |  |
| Premium Margin  | <b>EUR –711.50</b>        |           |  | Premium Margin   | <b>EUR 711.50</b>        |           |  |
| Additional Margin   | <b>EUR 520.50</b>         |           |  | Additional Margin  | <b>EUR 1,012.00</b>      |           |  |
| Margin Credit   | <b>EUR –191.00</b>        |           |  | Margin Credit  | <b>EUR 1,723.50</b>      |           |  |
| The margin credit can be applied against margin due on other margin classes held in the same account. |                           |           |  | The writer must deposit margin amounting to EUR 1,723.50.                        |                          |           |  |

<sup>10</sup> For the sake of simplification, projections on exercise prices lying between minimum and maximum prices, as well as any close-out costs for credits resulting therefrom, have been omitted because the portfolio contains no combinations, but rather consists of only one position.

For a long position, a zero balance or – as is the case in this example – a paid-in credit will always result. Margin will therefore never be due in an account that consists solely of long positions. If a number of long and short positions of the same margin class are being held, then either a paid-in credit or the need to deposit more money can result. Any credit can be applied against margin obligations arising from other margin classes held in the account.

## Exercised Equity Options

If an equity option has been exercised, margin will continue to be required until delivery has taken place. This, however, is no longer based on the option, but rather on the underlying security that is to be delivered. The difference between the exercise price and the settlement price is due as premium margin – price changes in the underlying security are covered by additional margin. Diagram 5.3 shows an example:

Diagram 5.3: Sample Calculation for Exercised Equity Options

| Contract     | 1 C BMW 4000 | Margin parameter  | 11 %      |
|--------------|--------------|-------------------|-----------|
| Trading unit | 100          | Closing price BMW | EUR 43.20 |

| Buyer (Receiver of the shares) |                     |              |   | Seller                      |                     |              |                                     |
|--------------------------------|---------------------|--------------|---|-----------------------------|---------------------|--------------|-------------------------------------|
| <b>Premium Margin</b>          |                     |              |   |                             |                     |              |                                     |
| Final settle-<br>ment price    | Exercise price      | Trading Unit |   | Final settle-<br>ment price | Exercise price      | Trading unit |                                     |
| –(43.20                        | – 40.00)            | × 100        | → EUR –320.00<br>Liquidation-<br>proceeds | (43.20                      | – 40.00)            | × 100        | → EUR 320.00<br>Liquidation<br>loss |
| <b>Additional Margin</b>       |                     |              |   |                             |                     |              |                                     |
| Final settle-<br>ment price    | Margin<br>parameter | Trading unit |   | Final settle-<br>ment price | Margin<br>parameter | Trading unit |                                     |
| 43.20                          | × 11 %              | × 100        | → EUR 475.20<br>Liquidation<br>loss       | 43.20                       | × 11 %              | × 100        | → EUR 475.20<br>Liquidation<br>loss |
| <b>Total Margin</b>            |                     |              |   |                             |                     |              |                                     |
| Premium Margin                 |                     |              | EUR –320.00                               | Premium Margin              |                     |              | EUR 320.00                          |
| Additional Margin              |                     |              | EUR 475.20                                | Additional Margin           |                     |              | EUR 475.20                          |
| Total Margin                   |                     |              | EUR 155.20                                | Total Margin                |                     |              | EUR 795.20                          |

# Risk Based Margining of Futures

## Variation Margin

For Eurex futures (interest rate and equity index futures), a daily offsetting of profits and losses takes place according to the so-called mark-to-market principle. This means that every day, the current prices of all positions are compared to the previous day's levels. The resulting profits and losses are then credited or debited to the exchange participant's account, thus preventing profits or losses from accumulating.

In the following example (Diagram 6.1), the DAX future will be used for the sake of illustration.

**Diagram 6.1: Sample Calculation of Variation Margin**

| Contract  | FDAX MAR 02       |            |                |
|-----------|-------------------|------------|----------------|
| Tick size | 0.5 points        | Tick value | EUR 12.50      |
| Position  | Long 10 contracts | Bought at  | 4,976.5 points |

|                        | Day 1          | Day 2          | Day 3          |
|------------------------|----------------|----------------|----------------|
| Daily settlement price | 5,083.5 points | 5,010.0 points | 5,065.5 points |

| Variation Margin |                               |                                |                              |  |
|------------------|-------------------------------|--------------------------------|------------------------------|--|
| <b>Day 1</b>     |                               | bought at                      | Daily settlement price day 1 | Tick difference                          |
|                  |                               | 4,976.5                        | 5,083.5                      | 214                                      |
|                  | Tick difference<br>214 Ticks  | × Tick value<br>EUR 12.50/Tick | × 10 Contracts               | = Variation Margin<br><b>EUR 26,750</b>  |
| <b>Day 2</b>     |                               | Daily settlement price day 1   | Daily settlement price day 2 | Tick difference                          |
|                  |                               | 5,083.5                        | 5,010.0                      | -147                                     |
|                  | Tick difference<br>-147 Ticks | × Tick value<br>EUR 12.50/Tick | × 10 Contracts               | = Variation Margin<br><b>EUR -18,375</b> |
| <b>Day 3</b>     |                               | Daily settlement price day 2   | Daily settlement price day 3 | Tick difference                          |
|                  |                               | 5,010.0                        | 5,065.5                      | 111                                      |
|                  | Tick difference<br>111 Ticks  | × Tick value<br>EUR 12.50/Tick | × 10 Contracts               | = Variation Margin<br><b>EUR 13,875</b>  |

## Spread Margin

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After the daily offsetting of profits and losses has taken place, the required coverage of potential liquidation costs that could arise until the end of the next trading day must be determined.

To do this, first all long and short positions of a given delivery month are offset against each other. This procedure is called "netting". Depending on whether there is a surplus of long or short positions, one speaks of having a "net long" or "net short" position. Afterwards, a check is made whether any spreads can be constructed from the long and short positions in the account that have varying delivery months ("spreading"), i.e. long and short positions of varying maturities are compared. For any spreads that result from this comparison, the spread margin rate is applied. This rate is considerably lower than that for additional margin, because the risks associated with the long and short positions offset each other to the greatest degree.

## Spot-Month Spread Margin and Back-Month Spread Margin

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In calculating the spread margin, a differentiation is made between spot-month spread margin and back-month spread margin. The expiration month closest to the current date is called the "spot month", and the associated contract is the "front contract". All other expiration months are considered "back months" and their related contracts are referred to as "deferred contracts". This procedure takes into account the fact that, for futures contracts which are physically deliverable (e.g. Bund Futures), the volatility increases during the last few days leading up to the delivery date. Therefore, as the expiration of a contract approaches, the risk also rises that the price correlation between the spot-month and the back-month contract becomes increasingly unbalanced. In other words, the possibility increases that the risks of long and short positions no longer compensate for each other.

As long as the spot-month has not yet been reached, the margin calculation is based on the normal spread margin rate (i.e. the back-month spread margin rate). Once the month starts in which the front contract will expire, then it is automatically assumed that this contract will demonstrate a higher degree of volatility. From this day onwards, all spread pairs containing a front-month position must be backed at the higher spot-month spread margin rate.

When spreading is being done, the attempt is always made first to create spreads that include front contracts. Only when that is no longer possible is spreading carried out among the deferred contracts.

Taking the sample calculation shown in Diagram 6.3, and assuming that it is now January, the method of calculating spread margin will continue unchanged until the end of February because the delivery month of the front contract (in this instance, the March contract) has not yet been reached. As of the first day of March, however, the calculation of the spread margin rate is accomplished under otherwise unchanged parameters in the following manner:

As of March 1st, all spread pairs which contain the front month contract (March), will be charged the higher spot-month spread margin rate (here, EUR 240) instead of the back-month spread margin rate (EUR 160) (see Diagram 6.2).

From March 1st through to the expiration of the contract, this procedure leads to a considerably higher spread margin (in this instance, EUR 14,400 instead of EUR 10,400).

When it comes to equity index futures contracts, this phenomenon of increased volatility in the days prior to final settlement does not arise because no physical delivery of the underlying instrument will take place. For that reason, the spot-month and back-month spread margin rates are the same.

**Diagram 6.2: Spread Margining in the Delivery Month**

| <b>Spread Margining</b>    |                 |                    |                   |
|----------------------------|-----------------|--------------------|-------------------|
| Type of Spread             | Spread Position | Spread Margin Rate | Spread Margin     |
| March / June Spread        | 50 ×            | EUR 240 =          | EUR 12,000        |
| June / September Spread    | 15 ×            | EUR 160 =          | EUR 2,400         |
| March / September Spread   | 0 ×             | EUR 240 =          | EUR 0             |
| <b>Total Spread Margin</b> |                 |                    | <b>EUR 14,400</b> |

### **Additional Margin for Non-Spread Futures Positions**

After all spread pairs have been constructed, a number of long or short positions remain for which no spreads can be made (i.e. non-spread positions). These positions carry the full risk of liquidation losses through to the end of the next day and must consequently be secured by additional margin.

## Sample Calculations

The sum of the spread margin and additional margin results in the total margin which must be deposited by the Clearing Member by the next trading day.

Using Euro Bund Futures as an example, the calculation of total margin is illustrated in Diagram 6.3. This method of calculation is the same as that used for other interest rate and equity index futures.

In January, a market participant is holding various Euro Bund Futures positions. The following margin calculation results:

**Diagram 6.3: Sample Calculation for Futures**

| Netting   |               |                |              | Spreading       |                 |                 |                                |
|-----------|---------------|----------------|--------------|-----------------|-----------------|-----------------|--------------------------------|
| Contract  | Long Position | Short Position | Net Position | Mar/Jun-Spreads | Jun/Sep-Spreads | Mar/Sep-Spreads | Remaining Non-Spread Positions |
| March     | 100           | 150            | -50 Short    | -50             |                 |                 | 0                              |
| June      | 140           | 10             | 130 Long     | 50              | 15              |                 | 65 Long                        |
| September | 5             | 20             | -15 Short    |                 | -15             |                 | 0                              |

| Spread Margining           |                 |                    |                   |  |
|----------------------------|-----------------|--------------------|-------------------|--|
| Type of Spread             | Spread Position | Spread Margin Rate | Spread Margin     | In calculating spread margin, the spread positions are paired-off separately and then multiplied by the appropriate spread margin rate <sup>11</sup> . |
| Mar/ Jun-Spread            | 50              | × EUR 160          | = EUR 8,000       |  |
| Jun/ Sep-Spread            | 15              | × EUR 160          | = EUR 2,400       |  |
| Mar/ Sep-Spread            | 0               | × EUR 160          | = EUR 0           |  |
| <b>Total Spread Margin</b> |                 |                    | <b>EUR 10,400</b> |  |

| Additional Margin              |                                |                        |                    |  |
|--------------------------------|--------------------------------|------------------------|--------------------|--|
|                                | Remaining Non-Spread Positions | Additional Margin Rate | Additional Margin  | In calculating additional margin, the remaining non-spread position of 65 contracts is multiplied by the additional margin rate <sup>11</sup> of EUR 1,600. This represents a projected margin interval of 160 ticks at EUR 10 per tick. |
| <b>March</b>                   | 0                              | × EUR 1,600            | = EUR 0            |  |
| <b>Juni</b>                    | 65 Long                        | × EUR 1,600            | = EUR 104,000      |  |
| <b>September</b>               | 0                              | × EUR 1,600            | = EUR 0            |  |
| <b>Total Additional Margin</b> |                                |                        | <b>EUR 104,000</b> |  |

| Total Margin                   |  |                    |
|--------------------------------|--|--------------------|
| <b>Total Spread Margin</b>     |  | <b>EUR 10,400</b>  |
| <b>Total Additional Margin</b> |  | <b>EUR 104,000</b> |
| <b>Total Margin</b>            |  | <b>EUR 114,400</b> |

<sup>11</sup> The margin parameters for additional spread margin are adjusted per margin class by Eurex Clearing AG and published.

# Risk Based Margining of Options on Futures

## Method for Calculating Future-Style Margin

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The premium margin associated with traditional options does not apply to options on futures. It can be ignored because a premium debit or credit for existing losses/profits takes place as a result of the daily settlement of unrealised profits and losses via the mark-to-market procedure. Also, additional margin covers potential losses Eurex Clearing AG could incur in a worst-case situation until the next trading day.

Eurex options on futures are subject to “futures-style premium posting”. This means that upon exercise or expiration of a contract, the remaining unpaid balance of a portion of the premium is due in addition to the daily settlement of profits and losses. In other words, the options premium must only be paid in full at the end of the contract’s term or upon exercise of the contract. This procedure provides an advantage to the holder of a long position, in that he does not have to pay the options premium in full at the time the transaction takes place.

Another advantage of this method is that the unrealized profits and losses on positions that result from marking-to-market are credited or debited on a daily basis. In applying this daily settlement of profits and losses, the calculation of credits and debits depends on how the value of a call or put position has changed.

In order to finally arrive at the originally agreed upon options price when exercise or expiration of the contract occurs, the buyer must make one more premium settlement payment in the amount of the settlement price on the day of the exercise or, as it were, the final settlement price upon expiration. Again with this method of settlement, the maximum risk assumed by the buyer is limited to the amount of the options premium.

Under this procedure, it is not possible for the writer to receive interest income from the reinvestment of the options premium. Therefore, in comparison to traditionally-settled options, the seller demands a higher options premium than traditional options premiums as a means of compensating for the opportunity loss.

The purchaser enjoys a clear advantage from a liquidity point of view because the mark-to-market process means that he does not have to pay the full amount of the options premium upon purchase of the option. Instead, additional margin is due, which can be deposited in the form of interest-bearing securities or cash.

The writer, of course, does not receive the full amount of the options premium, but he also does not have to pay premium margin, rather only the variation margin plus additional margin which he, too, may deposit in the form of securities or cash. As a result, only a small amount of the writer’s liquidity is tied up. This creates a strong argument for the futures-style margin procedure, in which both sides benefit from the low level of liquid capital that must be committed.

## Sample Calculation

Using the example of an option on Euro Bund Futures, a margin calculation using the futures-style procedure will be illustrated (Diagram 7.1). This procedure also applies for margin calculations on other options on futures.

Diagram 7.1: Sample Calculation for Options on Futures

|                 |                               |                  |             |
|-----------------|-------------------------------|------------------|-------------|
| <b>Contract</b> | <b>1 C OGBL MAR 02 114.00</b> | Margin parameter | 1.6 points  |
| Tick size       | 0.01 points                   | Tick value       | EUR 10      |
| Position        | 10 contracts                  | Bought/sold at   | 1.16 points |

| Daily settlement price               | Day 1  | Day 2  | Day 3  |
|--------------------------------------|--------|--------|--------|
| Underlying instrument<br>FGBL MAR 02 | 114.30 | 114.64 | 114.59 |
| Option C OGBL<br>MAR 02 114.00       | 1.13   | 1.30   | 1.25   |

### Day 1

| Buyer   |                               |                                      | Writer  |                               |                         |
|---|-------------------------------|--------------------------------------|---|-------------------------------|-------------------------|
| <b>Variation Margin on the Option</b>                                       |                               |                                      |   |                               |                         |
| Option  | Purchase/Sale<br>1.16         | daily settlement price day 1<br>1.13 | Tick difference<br>3  |                               |                         |
| Tick difference   | Tick value                    | Variation margin debit               | Tick differenz  | Tick value                    | Variation margin credit |
| -3 Ticks × EUR 10/Tick × 10 Contracts =                                     |                               | <b>EUR -300</b>                      | 3 Ticks × EUR 10/Tick × 10 Contracts =                                      |                               | <b>EUR 300</b>          |
| <b>Additional Margin on the Option</b>                                      |                               |                                      |   |                               |                         |
| Underlying inst.  | Projection<br>112.70          | ← -1.6                               | daily settlement price<br>114.30  | + 1.6 →                       | Projection<br>115.90    |
| Option  | 0.63                          |                                      | 1.13  |                               | 2.06                    |
| Worst case: option price falls by 50 ticks from 1.13 points to 0.63 points. |                               |                                      | Worst case: option price rises by 93 ticks from 1.13 points to 2.06 points. |                               |                         |
| Tick difference   | Tick value                    | Additional margin                    | Tick difference   | Tick value                    | Additional margin       |
| 50 Ticks ×  | EUR 10/Tick × 10 Contracts =  | <b>EUR 5,000</b>                     | 93 Ticks ×  | EUR 10/Tick × 10 Contracts =  | <b>EUR 9,300</b>        |
|   | Previously deposited<br>EUR 0 | → <b>EUR 5,000</b>                   |   | Previously deposited<br>EUR 0 | → <b>EUR 9,300</b>      |

## Day 2

| Buyer   |                                      |                                      | Writer  |                              |                        |
|---|--------------------------------------|--------------------------------------|---|------------------------------|------------------------|
| <b>Variation Margin on the Option</b>                                       |                                      |                                      |   |                              |                        |
| Option  | daily settlement price day 1<br>1.13 | daily settlement price day 2<br>1.30 | Tick difference<br>17   |                              |                        |
| Tick difference   | Tick value                           | Variation margin credit              | Tick difference   | Tick value                   | Variation margin debit |
| 17 Ticks  | × EUR 10/Tick × 10 Contracts         | = EUR 1,700                          | -17 Ticks   | × EUR 10/Tick × 10 Contracts | = EUR -1,700           |
| <b>Additional Margin on the Option</b>                                      |                                      |                                      |   |                              |                        |
| Underlying inst.  | Projection<br>113.04                 | ← -1.6                               | daily settlement price<br>114.64  | +1.6 →                       | Projection<br>116.24   |
| Option  | 0.71                                 |                                      | 1.30  |                              | 2.28                   |
| Worst case: option price falls by 59 ticks from 1.30 points to 0.71 points. |                                      |                                      | Worst case: option price rises by 98 ticks from 1.30 points to 2.28 points. |                              |                        |
| Tick difference   | Tick value                           | Additional margin                    | Tick difference   | Tick value                   | Additional margin      |
| 59 Ticks  | × EUR 10/Tick × 10 Contracts         | = EUR 5,900                          | 98 Ticks  | × EUR 10/Tick × 10 Contracts | = EUR 9,800            |
|   | Previously deposited                 | Margin call                          |   | Previously deposited         | Margin call            |
|   | EUR 5,000                            | → EUR 900                            |   | EUR 9,300                    | → EUR 500              |

## Day 3

| Buyer  |  |  | Writer   |                              |                                   |
|--|--|--|--|------------------------------|-----------------------------------|
| <b>Variation Margin on the Option</b>              |  |  |  |                              |                                   |
| Option   | daily settlement price day 2<br>1.30   | daily settlement price day 3<br>1.25   | Tick difference<br>5                               |                              |                                   |
| Tick difference                                    | Tick value                             | Variation margin debit                 | Tick difference                                    | Tick value                   | Variation margin credit           |
| -5 Ticks   | × EUR 10/Tick × 10 Contracts           | = EUR -500                             | 5 Ticks  | × EUR 10/Tick × 10 Contracts | = EUR 500                         |
| <b>Exercise of the Option</b>                      |  |  |  |                              |                                   |
| <b>Premium Settlement Payment on the Option</b>    |  |  |  |                              |                                   |
| Option   | daily settlement price<br>1.25         | Ticks<br>125                           |  |                              |                                   |
| Ticks  | Tick value                             | Premium settlement payment debit       | Ticks  | Tick value                   | Premium settlement payment credit |
| -125 Ticks   | × EUR 10/Tick × 10 Contracts           | = EUR -12,500                          | 125 Ticks  | × EUR 10/Tick × 10 Contracts | = EUR 12,500                      |
| <b>Creating a Futures Position</b>                 |  |  |  |                              |                                   |
| New Position: 10 FGBL MAR 02 Long                  |  |  | New Position: 10 FGBL MAR 02 Short                 |                              |                                   |
| <b>Variation Margin on the Future</b>              |  |  |  |                              |                                   |
| Future   | Exercise price of the Option<br>114.00 | daily settlement price day 3<br>114.59 | Tick difference<br>+59                             |                              |                                   |
| Tick difference                                    | Tick value                             | Variation margin credit                | Tick difference                                    | Tick value                   | Variation margin debit            |
| 59 Ticks   | × EUR 10/Tick × 10 Contracts           | = EUR 5,900                            | -59 Ticks  | × EUR 10/Tick × 10 Contracts | = EUR -5,900                      |
| <b>Additional Margin on the Future</b>             |  |  |  |                              |                                   |
| Worst case: Future falls by 1.6 points/ 160 ticks. |  |  | Worst case: Future rises by 1.6 points/ 160 ticks. |                              |                                   |
| Tick difference                                    | Tick value                             | Additional margin                      | Tick difference                                    | Tick value                   | Additional margin                 |
| 160 Ticks  | × EUR 10/Tick × 10 Contracts           | = EUR 16,000                           | 160 Ticks  | × EUR 10/Tick × 10 Contracts | = EUR 16,000                      |
|  | Previously deposited                   | Margin call                            |  | Previously deposited         | Margin call                       |
|  | EUR 5,900                              | → EUR 10,100                           |  | EUR 9,800                    | → EUR 6,200                       |

# Risk Based Margining for Bonds and Repo

## Clearing for Bonds and Repo

---

Eurex Clearing AG provides clearing services for the following bonds and repo transactions:

- Cash and forward trades in certain highly liquid fixed rate government bonds, and
- Repo trades on the above mentioned bonds which comply with the following conditions:
  - Exclusively fixed term repos
  - Fixed price repos, i.e. without rate resets during the life of the repo
  - One security per repo
  - There are no substitutions (underlying bond traded in both legs of a repo cannot be changed during the life of the repo).

All bond positions are split for calculation purposes into separate cash and bond positions. Additionally, coupon compensation payments that must be processed are identified and set up as cash positions. Notifications and allocations will continue to be considered as futures positions until they successfully settle, i.e. they are not treated as bond positions in the margin calculation.

## Current Liquidating Margin (CLM)

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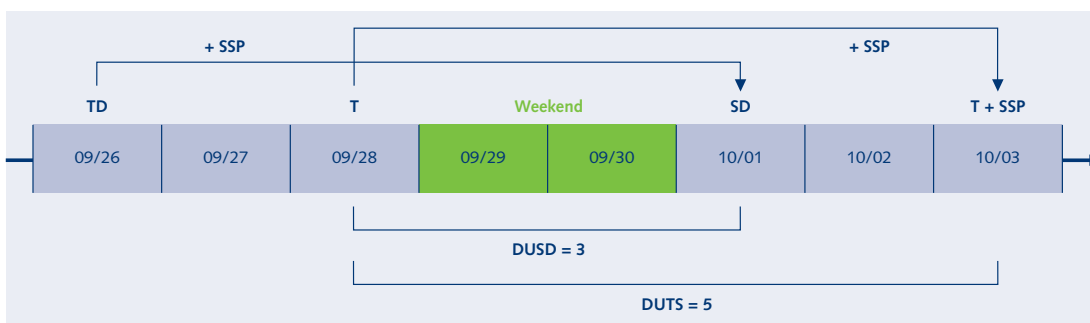
In order to protect Eurex Clearing AG against shifts in market rates, the Current Liquidating Value of a cash payment (CLVC) is calculated conservatively. The rate used to discount positive cash positions is below market rates (Risk Adapted Interest Rate-Down – RAIRD). The rate used to discount negative cash positions is above market rates (Risk Adapted Interest Rate-Up – RAIRU). All cash positions are netted and the CLVC is then calculated.

Bond values can be calculated by referencing market prices as of the valuation date. The cash amount determined for the bond position is then discounted back to the current valuation date. With the exception of cases where there are coupon payments between valuation date and settlement date, bond valuation will not take the settlement date of the bond position into account. The CLVC for a bond position is calculated using a net bond position, i.e. the sum of long and short bond positions.

## Sample Calculation

Diagram 8.1: Sample Calculation for Bonds

|   |              |
|---|--------------|
| Bond                                      | DE0001141349 |
| Coupon (C)                                | 4.250 %      |
| Margin Class                              | DE40         |
| Margin Parameter (MP)                     | 0.750        |
| Trade Date (TD)                           | 09/26/2001   |
| Day of Assessment (T)                     | 09/28/2001   |
| Settlement Date (SD)                      | 10/01/2001   |
| Notional Settlement Date (T + SSP)        | 10/03/2001   |
| Nominal Value (NV)                        | 5,000,000.00 |
| Trade Price (TP)                          | 101.355      |
| Last Price on Day T (LP)                  | 101.540      |
| Accrued Interest (AI)                     | 2.643 %      |
| Cash Interest Rate (CIR)                  | 3.120 %      |
| Risk Adapted Interest Rate – up (RAIRU)   | 4.120 %      |
| Risk Adapted Interest Rate – down (RAIRD) | 2.120 %      |
| Standard Settlement Period (SSP)          | 3            |
| Days Until Settlement (DUSD)              | 3            |
| Days Until Notional Settlement (DUTS)     | 5            |



|   |  |
|---|--|
| Cash Net Position (CNP)   | Amount due from the buyer on SD  |
| Current Liquidating Value Cash (CLVC)   | Present value of CNP   |
| Current Liquidating Value Security (CLVS)   | Notional present value of a notional CNP due on T + 3, in case Eurex must organize a buy-in on day T |
| <b>CNP = NV/100 × (TP + (C × 225/365)) = 5,000,000/100 × (101.355 + (4.250 × 225/365)) = 5,198,743.15</b> |  |

| Buyer (receiver of the bonds)                   |  | Seller                     |  |
|---|--|----------------------------|--|
| <b>Current Liquidating Margin = CLVC + CLVS</b> |  |                            |  |
| CLVC (Cash <sup>12</sup> )                      | 5,198,743.15/1.0001742 → EUR 5,197,837.45    | CLVC (Cash <sup>13</sup> ) | 5,198,743.15/1.0003386 → EUR -5,196,983.30 |
| CLVS (Bond <sup>14</sup> )                      | -50,000.00 × 104.1386421 → EUR -5,206,932.11 | CLVS (Bond <sup>14</sup> ) | 50,000.00 × 104.1386421 → EUR 5,206,932.11 |
| <b>Total</b>                                    | <b>EUR -9,094.66</b>                         | <b>Total</b>               | <b>EUR 9,948.81</b>                        |
| <b>Additional Margin<sup>15</sup></b>           |  |                            |  |
|   | 50,000.00 × 0.7496796 → EUR 37,483.98        |                            | 50,000.00 × 0.7496796 → EUR 37,483.98      |
| <b>Total Margin</b>                             |  |                            |  |
| Current Liquidating Margin                      | EUR -9,094.66                                | Current Liquidating Margin | EUR 9,948.81                               |
| Additional Margin                               | EUR 37,483.98                                | Additional Margin          | EUR 37,483.98                              |
| <b>Total Margin</b>                             | <b>EUR 28,389.32</b>                         | <b>Total Margin</b>        | <b>EUR 47,432.79</b>                       |

<sup>12</sup> Formula: CNP/(1 + RAIRD × DUSD/365)

<sup>13</sup> Formula: CNP/(1 + RAIRU × DUSD/365)

<sup>14</sup> Formula: NV/100 × (LP + AI) / (1 + CIR × DUTS/365)

<sup>15</sup> Formula: NV/100 × MP / (1 + CIR × DUTS/365)

# Risk Based Margining for Equities

## Clearing for Equities

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Eurex Clearing AG provides clearing services for equity trades that:

- were concluded in German equities, that are subject to collective safe custody, listed on Xetra and denominated in Euro.
- result from on-exchange trades on the supported trading platforms Xetra and /or the floor of the Frankfurt Stock Exchange.

Risk positions that result from equity trades are examined to determine whether or not the respective trades are subject to gross or net processing. Gross risk positions are considered individually in the risk based margining calculation. Net risk positions are aggregated to form a net risk position that serves as a basis for further calculation of the margin. All risk positions relevant for the risk based margining are separated into a cash and a security side.

Furthermore, risk positions might result from corporate actions. This encompasses income events (e.g. dividends, bonus payments), price differences (from floor trading) and non-income events (splits and mergers). Risk positions that result from income events are risk positions on the cash side whereas risk positions resulting from non-income events are risk positions on the security side. For relevant risk positions the margin is calculated until the settlement day.

## Current Liquidating Margin (CLM)

---

The calculation of the Current Liquidating Margin (CLM) quantifies for the Clearing Member potential losses of their positions for the time period of one trading day.

The calculation of the Current Liquidating Margin for the individual gross risk positions and the aggregated net risk position is done separately for all security and cash risk positions.

For the security risk positions, the Current Liquidating Value (CLV) is calculated by discounting the settlement price to the valuation date.

For the cash risk position, the CLV results from the discounting of the debited or credited amount for the relevant period of time (trade execution until settlement). In order to protect Eurex Clearing AG against shifts in market rates, the CLV of a cash payment is calculated conservatively. The rate used to discount positive cash positions (payments to Eurex Clearing AG) is below market rates (Risk Adapted Interest Rate – Down /RAIRD). The rate used to discount negative cash positions (payments from Eurex Clearing AG) is above market rates (Risk Adapted Interest Rate-Up /RAIRU). All cash positions are netted and the CLV is then calculated.

In a next step, the CLVs of a security risk position and a cash risk position are added. A margin credit, i.e. a negative CLV, is only taken into account for the (aggregated) net risk position, while for gross risk positions, negative CLVs are disregarded, therefore will not reduce the margin.

The sum of all CLVs of a margin class within the same trading member and account type results in the Current Liquidating Margin (CLM) of a class.

## **Additional Margin**

---

The Additional Margin covers the risk of the adverse price movement of an equity on the following business day. Therefore, it is calculated for the security side but not for the cash side of a risk position and is determined for net risk positions as well as for gross risk positions. For this purpose, the long security risk positions and the short security risk positions are aggregated.

By using the margin parameters, Upside and Downside Liquidating Values (LV) of the individual security, risk positions are calculated.

In order to determine the risk incurred in the price movement, the LV is reduced by the corresponding CLV of the security position. This difference (delta of liquidating value –  $\Delta LV$ ), is calculated for the upward and downward movement of the price, and separately for long and short risk positions. The one with the higher  $\Delta LV$  is used for the margin calculation.

## Total Margin

The sum of the margin requirements of the current liquidating margin and the additional margin – separated per trading member and account type – results in the total margin amount of a particular margin class.

The daily margin requirement (DM) of a Clearing Member per currency is calculated by summing up the total margin amounts for all margin classes of all corresponding trading members and account types.

## Sample Calculation for Equities

This example serves as a demonstration for the determination of risk positions. For this reason, only trades of one trading participant in one security are considered.

**Diagram 9.1: Sample Calculation for Equities and Determination of Risk Positions.**

|   |                                |
|---|--------------------------------|
| ISIN                                    | DE0005810055 Deutsche Börse AG |
| Margin Parameter (MP)                   | 10 %                           |
| Cash Interest Rate (CIR)                | 5 %                            |
| Risk Adapted Interest Rate-up (RAIRU)   | 6 %                            |
| Risk Adapted Interest Rate-down (RAIRD) | 4 %                            |
| Standard Settlement Period (SSP)        | 2                              |
| Days Until Settlement (DUSD)            | 2                              |
| Daily Settlement Price (SP)             | 39.10 Euro                     |

**Diagram 9.2: Transactions Performed**

| Trade Number | Buy Trade/<br>Sell Trade | Marked for<br>Net- / Gross-<br>Processing | Number of<br>Shares | Trading Price<br>(EUR) | Payable Amount<br>(EUR) |
|--------------|--------------------------|---|---------------------|------------------------|-------------------------|
| 1            | Buy                      | Net                                       | + 200               | 42.10                  | - 8,420.00              |
| 2            | Buy                      | Net                                       | + 100               | 43.20                  | - 4,320.00              |
| 3            | Sell                     | Net                                       | - 50                | 40.65                  | + 2,032.50              |
| 4            | Buy                      | Gross                                     | + 100               | 38.80                  | - 3,880.00              |
| 5            | Sell                     | Gross                                     | - 50                | 38.00                  | + 1,900.00              |
| 6            | Sell                     | Gross                                     | - 100               | 41.00                  | + 4,100.00              |

## Calculation of the Current Liquidating Margin

All trades that are not marked for gross processing are accumulated and result in an (aggregated) net risk position either long or short. Trades that are marked for gross processing individually represent a risk position. The respective split of the risk position into a security side and a cash side is made. Additionally in this example, a positive (negative) sign next to the number of shares means that the respective member receives (delivers) equities. A positive (negative) sign in front of the payable amount means that the respective member receives (pays) cash payments.

In this example, the aggregation of net risk positions amounts to:

Diagram 9.3:

| Trade Number  | Number of Shares | Trading Price (EUR) | Payable Amount (EUR) |
|---|------------------|---------------------|----------------------|
| 1   | + 200            | 42.10               | - 8,420.00           |
| 2   | + 100            | 43.20               | - 4,320.00           |
| 3   | - 50             | 40.65               | + 2,032.50           |
| Security long and cash short aggregated net risk position | + 250            |                     | - 10,707.50          |

The following gross risk positions resulting from trades that are marked for gross processing amount in this example to:

Diagram 9.4:

| Trade Number                                       | Number of Shares | Trading Price (EUR) | Payable Amount (EUR) |
|--|------------------|---------------------|----------------------|
| 4  | + 100            | 38.80               | - 3,880.00           |
| Security long and cash short gross risk position 1 | + 100            |                     | - 3,880.00           |
| 5  | - 50             | 38.00               | + 1,900.00           |
| Security short and cash long gross risk position 2 | - 50             |                     | + 1,900.00           |
| 6  | - 100            | 41.00               | + 4,100.00           |
| Security short and cash long gross risk position 3 | - 100            |                     | + 4,100.00           |

The Current Liquidating Values are calculated for the aggregated net risk position and the gross risk positions.

Diagram 9.5:

| Security Long/Cash Short                       |           | Security Short/Cash Long                          |           |
|--|-----------|---|-----------|
| <b>Current Liquidating Margin<sup>16</sup></b> |           |   |           |
| For the net risk position (trades 1–3)         |           | For the net risk position (trade 5)               |           |
| CLV security                                   |           | CLV security                                      |           |
| $-250 \times 39.10 / (1 + (5\% \times 2/365))$ | -9,772.32 | $-(-50) \times 39.10 / (1 + (5\% \times 2/365))$  | 1,954.46  |
| CLV cash                                       |           | CLV cash  |           |
| $-(-10,707.50) / (1 + (4\% \times 2/365))$     | 10,705.15 | $-1,900.00 / (1 + (6\% \times 2/365))$            | -1,899.38 |
| CLM =  | → 932.83  | CLM =   | → 55.09   |
| For the gross risk position 1 (trade 4)        |           | For the gross risk position 3 (trade 6)           |           |
| CLV security                                   |           | CLV security                                      |           |
| $-100 \times 39.10 / (1 + (5\% \times 2/365))$ | -3,908.93 | $-(-100) \times 39.10 / (1 + (5\% \times 2/365))$ | 3,908.93  |
| CLV cash                                       |           | CLV cash  |           |
| $-(-3,880.00) / (1 + (4\% \times 2/365))$      | 3,879.15  | $-4,100.00 / (1 + (6\% \times 2/365))$            | -4,098.65 |
| CLM =  | → -29.78  | CLM =   | → -189.72 |

| Current Liquidating Margin              | Unadjusted Margin | Adjusted Margin |
|---|-------------------|-----------------|
| For the Net Risk Position (Trades 1–3)  | 932.83            | 932.83          |
| For the Gross Risk Position 1 (Trade 4) | -29.78            | 0.00            |
| For the Gross Risk Position 2 (Trade 5) | 55.09             | 55.09           |
| For the Gross Risk Position 3 (Trade 6) | -189.72           | 0.00            |
| <b>Current Liquidating Margin</b>       |                   | <b>987.92</b>   |

Legend:

|       |                                   |
|-------|-----------------------------------|
| STK   | Number of Equities                |
| SP    | Spot Price                        |
| CIR   | Cash Interest Rate                |
| SSP   | Standard Settlement Period        |
| CNP   | Cash Net Position                 |
| RAIRD | Risk Adapted Interest Rate – Down |
| RAIRU | Risk Adapted Interest Rate – Up   |
| DUSD  | Days Until Settlement             |

<sup>16</sup> CLV-Equity:  $STK \times SP / (1 + (CIR \times SSP / 365))$

CLV-Cash-Short:  $CNP / (1 + (RAIRD \times DUSD / 365))$

CLV-Cash-Long:  $CNP / (1 + (RAIRU \times DUSD / 365))$

The total Current Liquidating Margin results from the sum of all positive margin values (margin debit). Negative values for the margin (margin credit) are not considered further in the calculation. In this example, the margin credits of the gross risk positions 1 and 3, resulting from trade 4 and 6, are not included in the calculation of the Current Liquidating Margin.

## Calculation of the Additional Margin

---

For the calculation of the Additional Margin, in a first step, the sum of the long and short security risk positions (gross risk positions and the aggregated net risk position) is determined. The aggregated long net risk position and the corresponding security long (or short) gross risk positions are grouped as mentioned in the following table:

**Diagram 9.6:**

|   | Number of Equities |   | Number of Equities |
|---|--------------------|---|--------------------|
| Security long and cash short aggregated net risk position             | + 250              | Security short and cash long gross risk position 2                    | - 50               |
| Security long and cash short gross risk position 1                    | + 100              | Security short and cash long gross risk position 3                    | - 100              |
| <b>Total security long risk position and cash short risk position</b> | <b>+ 350</b>       | <b>Total Security short risk position and cash long risk position</b> | <b>- 150</b>       |

For these two risk positions the Delta Liquidating Value ( $\Delta LV$ ) is calculated.

Diagram 9.7:

| Security long risk position and cash short risk position                      |            | Security short risk position and cash long risk position           |          |
|---|------------|--|----------|
| <b>Additional Margin</b>  |            |  |          |
| Maximum Price <sup>17</sup><br>PU = 39.10 × (1 + 0.1)                         | 43.01      | Maximum Price<br>PU = 39.10 × (1 + 0.1)                            | 43.01    |
| Maximum Price <sup>18</sup><br>PD = 39,10 × (1 – 0,1)                         | 35.19      | Maximum Price<br>PD = 39,10 × (1 – 0,1)                            | 35.19    |
| Liquidating Value - Up <sup>19</sup><br>– 350 × 43,01 / (1 + (5 % × 2/365))   | –15,049.38 | Liquidating Value - Up<br>– (–150) × 43,01 / (1 + (5 % × 2/365))   | 6,449.73 |
| Liquidating Value - Down <sup>20</sup><br>– 350 × 35,19 / (1 + (5 % × 2/365)) | –12,313.13 | Liquidating Value - Down<br>– (–150) × 35,19 / (1 + (5 % × 2/365)) | 5,277.05 |
| CLV <sup>21</sup><br>– 350 × 39,10 / (1 + (5 % × 2/365))                      | –13,681.25 | CLV<br>– (–150) × 39,10 / (1 + (5 % × 2/365))                      | 5,863.39 |
| ΔLVup = LVup – CLV  | –1,368.13  | ΔLVup = LVup – CLV   | 586.34   |
| ΔLVdown = CLV – LVdown  | 1,368.13   | ΔLVdown = CLV – LVdown   | –586.34  |

The different values for ΔLV are compared and the ΔLV with the maximum value is considered further in the margin calculation; in this case EUR 1,368.13.

**Legend:**

|     |                            |
|-----|----------------------------|
| PU  | Upside Price               |
| PD  | Downside Price             |
| SP  | Settlement Price           |
| MP  | Margin Parameter           |
| STK | Number of Equities         |
| CIR | Cash Interest Rate         |
| SSP | Standard Settlement Period |
| LV  | Liquidating Value          |
| CLV | Current Liquidating Value  |
| ΔLV | Delta Liquidating Value    |

<sup>17</sup> Formula: PU = SP × (1 + MP)

<sup>18</sup> Formula: PD = SP × (1 – MP)

<sup>19</sup> Formula: – STK × PU / (1 + (CIR × SSP/365))

<sup>20</sup> Formula: – STK × PD / (1 + (CIR × SSP/365))

<sup>21</sup> Formula: CLV = – STK × SP / (1 + (CIR × SSP/365))

## Calculation of the Total Margin

---

The sum of Additional Margin and Current Liquidating Margin results in the Total Margin.

**Diagram 9.8:**

|                            |          |
|----------------------------|----------|
| Total Margin               |          |
| Current Liquidating Margin | 987.92   |
| Additional Margin          | 1,368.13 |
| Total Margin               | 2,356.05 |

# Cross Margining

## Cross Margining within a Margin Class

---

If an account holds a number of contracts that are based on the same underlying instrument, it is possible that the risk components of these contracts partially offset each other. A typical example of this is a spread in which the risk of a call (put) that was sold is to a large extent neutralized by the simultaneous purchase of a call (put).

The role of cross margining is to reflect this partial offset when margin calculations are being made and, in order not to block liquidity unnecessarily, to make sure that only that amount of margin is being charged that is required to cover the remaining risks inherent in these contracts. In a highly liquid market like that of Eurex, such positions with counterbalancing risks exist because the prices of options and futures on the same underlying instrument are essentially driven by the same factors: the price and the volatility of the underlying instrument as well as the trend in interest rates.

The influence of these factors on the individual futures or options positions, however, can vary in intensity. In the case of options which differ only in exercise price, the correlation between their respective price patterns is very high. This starts to diverge as soon as differing expirations are involved. Even less of a lockstep pattern is observable in the prices of calls and puts. In order to take into account the price correlation between options and futures that are based on the same underlying instrument, Eurex Clearing AG groups products into margin classes. Within such classes, all positions in an account that are linked to the same underlying instrument are bunched together. For example, all DAX Options and DAX Futures are related to the German equity index, DAX. When it comes to equity options, all contracts in an account that are based on the same underlying security are consolidated into one margin class.

The collateral that has to be deposited should cover the liquidation costs that could arise if a market participant were not able to meet his obligations and, as a result, all of his positions had to be liquidated. In such an instance, it is not enough to just cover potential liquidation costs at today's market value, but rather the risk that a close-out would have to be made tomorrow at a disadvantageous price must be taken into consideration.

Thus the basis for calculation is the assumed maximum price fluctuation that could take place in the underlying instrument through the end of the following day (the margin parameter). Margin parameters are set by Eurex Clearing AG on the basis of statistical studies and the volatility of the underlying instrument and are published regularly. By adding the margin parameter to and subtracting it from the current market price, the margin interval can be established, and with that, the maximum and minimum price the underlying instrument could potentially reach during the following trading day.

These projected prices are then used to identify which of all the exercise prices of active options series are contained within the interval. On the basis of these exercise prices, the theoretical prices of the associated options can be calculated. As mentioned, Eurex Clearing AG accomplishes this using various option pricing models.

Afterwards, these theoretical prices are used to calculate the potential liquidation costs for all exercise prices within the margin interval (projected values) according to the following equation:

$$\text{Liquidation costs} = \text{Theoretical price} \times \text{Contract size} \times \frac{\text{Tick value}}{\text{Tick size}}$$

If the liquidation costs of all contracts in a given margin class are added together, the sum reflects the potential liquidation costs that could arise for the entire portfolio if the underlying instrument were to move by the full amount of the margin parameter within 24 hours. The close-out costs at the daily settlement price will be charged as premium margin, and the worst-case liquidation costs, less the premium margin, will be charged as additional margin.

Cross margining comes into play especially when combinations are traded. The investor creates a combination by simultaneously establishing two derivatives positions which are both based on the same underlying instrument. In so doing, it is possible to achieve a risk/reward profile that is tailor-made to the wishes of the investor. Some frequently traded combinations are straddles, strangles and bull and bear spreads.

Diagram 10.1 illustrates the cross margin calculation by using an example of a short straddle on the DAX. In a short straddle, both a call and a put on the same underlying instrument are sold at the same exercise price. This strategy is used in anticipation of a reduction in volatility; in other words, the investor expects that the market will neither rise nor fall dramatically. The maximum profit is limited to the total of both premiums received. A profit arises when the minimal change in price of the underlying instrument (i.e. reduced volatility) causes the short options to fall in value. Should, however, a meaningful upwards or downwards move take place in the price of the underlying instrument, the losses on such a position are potentially unlimited.

## Sample Calculations

The example demonstrates the liquidity advantages that cross margining provides in relation to calculating the positions individually. If the positions were considered separately, then a total of EUR 4,118.40 in margin would have to be deposited: EUR 2,117.70 for the short call and EUR 2,000.70 for the short put. By linking both positions via cross margining, only EUR 2,493.75 is required.

Diagram 10.1: Sample Calculation of a Short Straddle

|                  |  |                  |            |
|------------------|--|------------------|------------|
| <b>Contracts</b> | <b>1 C ODAX JUN 02 4900 Short</b><br><b>1 P ODAX JUN 02 4900 Short</b> | Margin parameter | 340 points |
| Tick size        | 0.1 points   | Tick value       | EUR 0.50   |

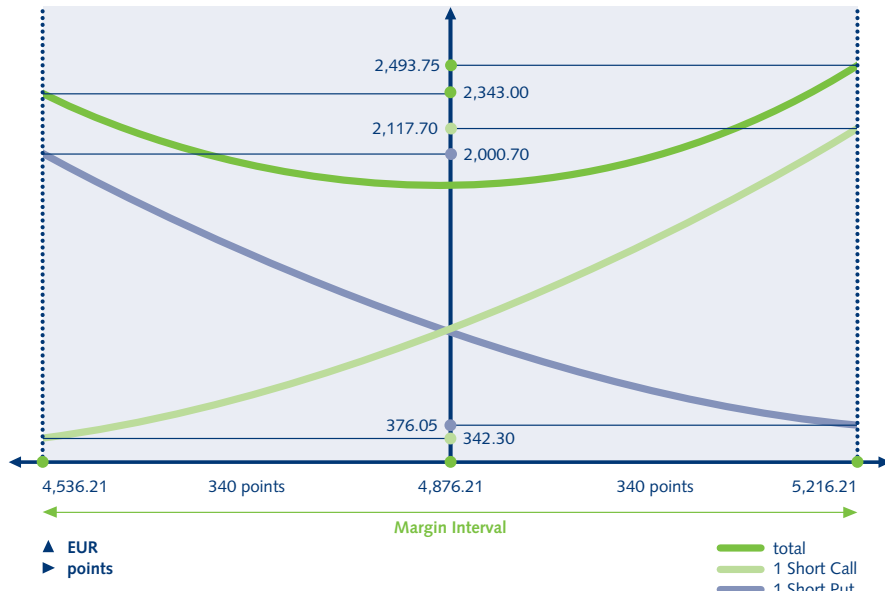
|                        |                 |               |               |
|------------------------|-----------------|---------------|---------------|
|                        | <b>DAX</b>      | <b>Call</b>   | <b>Put</b>    |
| Daily settlement price | 4,876.21 points | 201.19 points | 192.87 points |

|                 | Projected Values DAX (points) | 1 C ODAX JUN 02 4900 Short Theoretical Prices (points) | 1 C ODAX JUN 02 4900 Short Liquidation Costs <sup>22</sup> (EUR) | 1 P ODAX JUN 02 4900 Short Theoretical Prices (points) | 1 P ODAX JUN 02 4900 Short Liquidation Costs <sup>22</sup> (EUR) | Total Liquidation Costs (EUR) |          |
|-----------------|-------------------------------|--|--|--|--|-------------------------------|----------|
| Margin Interval | +340                          | 5,216.21   | 423.54   | 2,117.70   | 75.21  | 376.05                        | 2,493.75 |
|                 |                               | 5,200.00   | 411.16   | 2,055.80   | 79.05  | 395.25                        | 2,451.05 |
|                 |                               | 5,150.00   | 373.97   | 1,869.85   | 91.86  | 459.30                        | 2,329.15 |
|                 |                               | 5,100.00   | 338.37   | 1,691.85   | 106.26   | 531.30                        | 2,223.15 |
|                 |                               | 5,050.00   | 304.47   | 1,522.35   | 122.35   | 611.75                        | 2,134.10 |
|                 |                               | 5,000.00   | 272.36   | 1,361.80   | 140.24   | 701.20                        | 2,063.00 |
|                 |                               | 4,950.00   | 242.14   | 1,210.70   | 160.03   | 800.15                        | 2,010.85 |
|                 |                               | 4,900.00   | 213.92   | 1,069.60   | 181.80   | 909.00                        | 1,978.60 |
|                 | Daily settlement price        | 4,876.21   | 201.19   | 1,005.95   | 192.87   | 964.35                        | 1,970.30 |
|                 | -340                          | 4,850.00   | 187.65   | 938.25   | 205.54   | 1,027.70                      | 1,965.95 |
|                 |                               | 4,800.00   | 163.30   | 816.50   | 231.19   | 1,155.95                      | 1,972.45 |
|                 |                               | 4,750.00   | 141.05   | 705.25   | 258.93   | 1,294.65                      | 1,999.90 |
|                 |                               | 4,700.00   | 120.86   | 604.30   | 288.74   | 1,443.70                      | 2,048.00 |
|                 |                               | 4,650.00   | 102.68   | 513.40   | 320.57   | 1,602.85                      | 2,116.25 |
|                 |                               | 4,600.00   | 86.45  | 432.25   | 354.34   | 1,771.70                      | 2,203.95 |
| 4,550.00        |                               | 72.10  | 360.50   | 389.99   | 1,949.95   | 2,310.45                      |          |
| 4,536.21        | 68.46                         | 342.30   | 400.14   | 2,000.70   | 2,343.00   |                               |          |

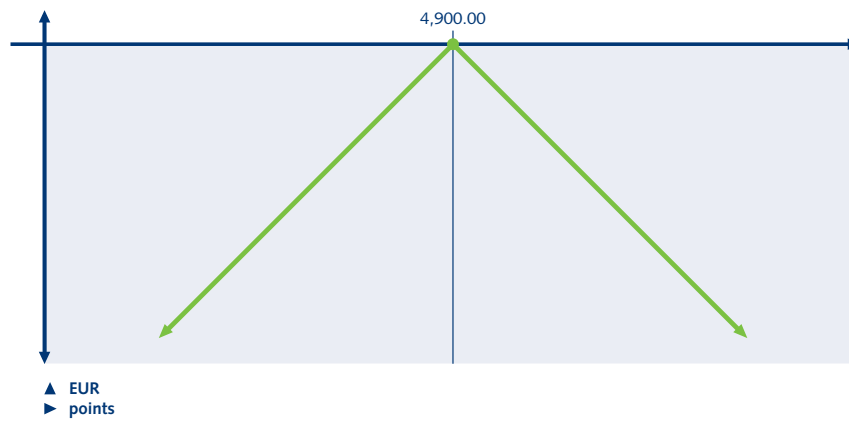
<sup>22</sup> =  $\frac{\text{theor. price} \times \text{tick value}}{\text{tick size}}$

**Result:** The maximum liquidation costs would arise if the DAX were to gain 340 points. Accordingly the total margin amounts to EUR 2,493.75. It comprises EUR 1,970.30 premium margin (close-out costs on the basis of the daily settlement price) and EUR 523.45 additional margin (i.e. total margin less the premium margin).

### Liquidation Costs



### Payment upon Last Trading Day



Using the example of a synthetic short put (see Diagram 10.2), it will be shown how the cross margin calculation is made when options and futures with the same underlying instrument are evaluated jointly. In this strategy, the investor buys a DAX Future and sells against it five DAX Options. The margin that must be deposited totals EUR 10,211.50 and, as such, is lower for the overall portfolio than would be the case if only the five short options were being held.

**Diagram 10.2: Sample Calculation of a Synthetic Short Put**

| Contracts              | 5 C ODAX JUN 02 4900 Short<br>1 FDAX JUN 02 4900 Long | Margin parameter | 340 points     |
|------------------------|---|------------------|----------------|
|                        | DAX   | Call             | Future         |
| Tick size              |   | 0.1 points       | 0.5 points     |
| Tick value             |   | EUR 0.5          | EUR 12.5       |
| Daily settlement price | 4,876.21 points                                       | 201.19 points    | 4,896.5 points |

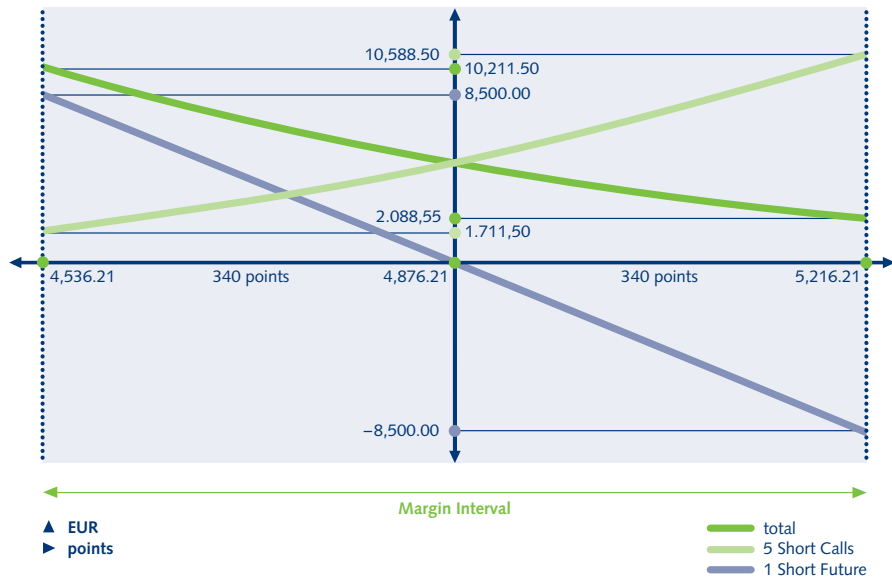
| DAX             | Projected Values Prices (points) | 5 C ODAX JUN 02 4900 Short               | 1 FDAX JUN 02 Long | Total Liquidation Costs (EUR) |                                       |          |
|-----------------|----------------------------------|--|--------------------|-------------------------------|---------------------------------------|----------|
|                 |                                  | Theoretical Costs <sup>23</sup> (points) | Liquidation (EUR)  |                               | Liquidation Costs <sup>24</sup> (EUR) |          |
| Margin Interval | +340                             | 5,216.21                                 | 423.54             | 10,588.50                     | -8,500.00                             | 2,088.50 |
|                 |                                  | 5,200.00                                 | 411.16             | 10,279.00                     | -8,094.75                             | 2,184.25 |
|                 |                                  | 5,150.00                                 | 373.97             | 9,349.25                      | -6,844.75                             | 2,504.50 |
|                 |                                  | 5,100.00                                 | 338.37             | 8,459.25                      | -5,594.75                             | 2,864.50 |
|                 |                                  | 5,050.00                                 | 304.47             | 7,611.75                      | -4,344.75                             | 3,267.00 |
|                 |                                  | 5,000.00                                 | 272.36             | 6,809.00                      | -3,094.75                             | 3,714.25 |
|                 |                                  | 4,950.00                                 | 242.14             | 6,053.50                      | -1,844.75                             | 4,208.75 |
|                 |                                  | 4,900.00                                 | 213.92             | 5,348.00                      | -594.75                               | 4,753.25 |
|                 | Daily settlement price           | 4,876.21                                 | 201.19             | 5,029.75                      | 0.00                                  | 5,029.75 |
|                 | -340                             | 4,850.00                                 | 187.65             | 4,691.25                      | 655.25                                | 5,346.50 |
|                 |                                  | 4,800.00                                 | 163.30             | 4,082.50                      | 1,905.25                              | 5,987.75 |
|                 |                                  | 4,750.00                                 | 141.05             | 3,526.25                      | 3,155.25                              | 6,681.50 |
|                 |                                  | 4,700.00                                 | 120.86             | 3,021.50                      | 4,405.25                              | 7,426.75 |
|                 |                                  | 4,650.00                                 | 102.68             | 2,567.00                      | 5,655.25                              | 8,222.25 |
|                 |                                  | 4,600.00                                 | 86.45              | 2,161.25                      | 6,905.25                              | 9,066.50 |
| 4,550.00        |                                  | 72.10                                    | 1,802.50           | 8,155.25                      | 9,957.75                              |          |
| 4,536.21        | 68.46                            | 1,711.50                                 | 8,500.00           | 10,211.50                     |                                       |          |

<sup>23</sup> =  $\frac{\text{theor. price} \times \text{tick value}}{\text{tick size}}$

<sup>24</sup> =  $\frac{(\text{proj. value} - \text{settl. value}) \times \text{tick value}}{\text{tick size}}$

**Result:** The maximum liquidation costs would arise were the DAX to fall by 340 points. Accordingly the total margin amounts to EUR 10,211.50. It comprises EUR 5,029.75 premium margin (close-out costs on the basis of the daily settlement price) and EUR 5,181.75 additional margin (i.e. total margin less the premium margin).

### Liquidation Costs



### Payment upon Last Trading Day



Another example can be made with the bear call spread. In this particular instance, a DAX call with a lower exercise price is sold, and a DAX call with a higher exercise price is bought (see Diagram 10.3). In using such a strategy, the investor expects that the market will not rise, however she wishes to limit her risk at the same time. A bear call spread is a conservative strategy for those who consider a fall in the market to be more likely than a rise in prices. The maximum profit potential is limited to the original net amount of premiums received initially, while the maximum loss is limited to the difference between the two exercise prices less the net amount of premium originally received.

**Diagram 10.3: Sample Calculation of a Bear Call Spread**

|                  |   |                  |            |
|------------------|---|------------------|------------|
| <b>Contracts</b> | <b>1 C ODAX JUN 02 4850 Short</b><br><b>1 C ODAX JUN 02 4900 Long</b> | Margin parameter | 340 points |
| Tick size        | 0.1 points  | Tick value       | EUR 0.50   |

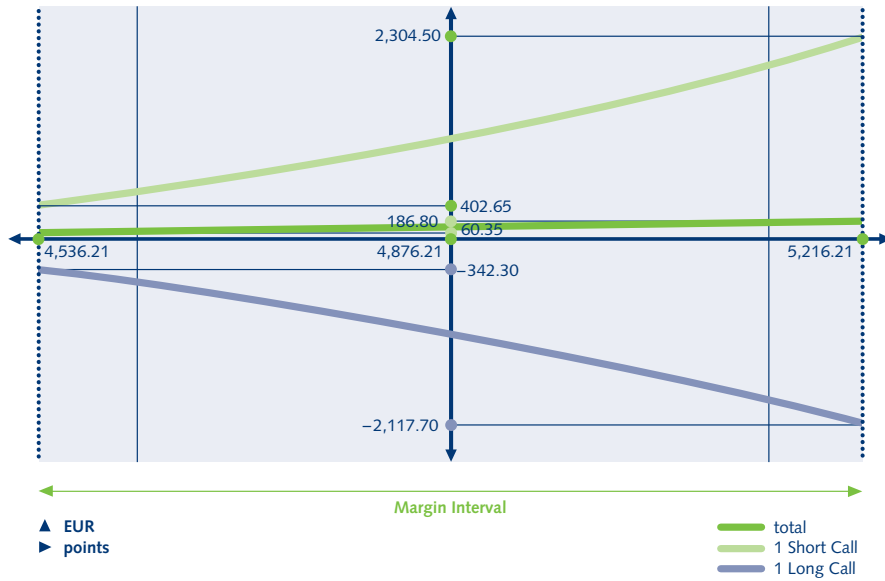
|                        |                 |                           |                           |
|------------------------|-----------------|---------------------------|---------------------------|
|                        | <b>DAX</b>      | <b>C ODAX JUN 02 4850</b> | <b>C ODAX JUN 02 4900</b> |
| Daily settlement price | 4,876.21 points | 226.28 points             | 201.19 points             |

|                 | Projected Values DAX (points) | 1 C ODAX JUN 02 4850 Short |                                       | 1 C ODAX JUN 02 4900 Long  |                                       | gesamte Liquidation Costs (EUR) |        |
|-----------------|-------------------------------|----------------------------|---------------------------------------|----------------------------|---------------------------------------|---------------------------------|--------|
|                 |                               | Theoretical Price (points) | Liquidation Costs <sup>25</sup> (EUR) | Theoretical Price (points) | Liquidation-Costs <sup>25</sup> (EUR) |                                 |        |
| Margin Interval | +340                          | 5,216.21                   | 460.9                                 | 2,304.50                   | 423.54                                | -2,117.70                       | 186.80 |
|                 |                               | 5,200.00                   | 448.04                                | 2,240.20                   | 411.16                                | -2,055.80                       | 184.40 |
|                 |                               | 5,150.00                   | 409.29                                | 2,046.45                   | 373.97                                | -1,869.85                       | 176.60 |
|                 |                               | 5,100.00                   | 372.02                                | 1,860.10                   | 338.37                                | -1,691.85                       | 168.25 |
|                 |                               | 5,050.00                   | 336.34                                | 1,681.70                   | 304.47                                | -1,522.35                       | 159.35 |
|                 |                               | 5,000.00                   | 302.37                                | 1,511.85                   | 272.36                                | -1,361.80                       | 150.05 |
|                 |                               | 4,950.00                   | 270.22                                | 1,351.10                   | 242.14                                | -1,210.70                       | 140.40 |
|                 |                               | 4,900.00                   | 239.97                                | 1,199.85                   | 213.92                                | -1,069.60                       | 130.25 |
|                 | Daily settlement price        | 4,876.21                   | 226.28                                | 1,131.40                   | 201.19                                | -1,005.95                       | 125.45 |
|                 | -340                          | 4,850.00                   | 211.73                                | 1,058.65                   | 187.65                                | -938.25                         | 120.40 |
|                 |                               | 4,800.00                   | 185.48                                | 927.40                     | 163.3                                 | -816.50                         | 110.90 |
|                 |                               | 4,750.00                   | 161.16                                | 805.80                     | 141.05                                | -705.25                         | 100.55 |
|                 |                               | 4,700.00                   | 138.96                                | 694.80                     | 120.86                                | -604.30                         | 90.50  |
|                 |                               | 4,650.00                   | 118.84                                | 594.20                     | 102.68                                | -513.40                         | 80.80  |
| 4,600.00        |                               | 100.76                     | 503.80                                | 86.45                      | -432.25                               | 71.55                           |        |
|                 | 4,550.00                      | 84.64                      | 423.20                                | 72.1                       | -360.50                               | 62.70                           |        |
|                 | 4,536.21                      | 80.53                      | 402.65                                | 68.46                      | -342.30                               | 60.35                           |        |

<sup>25</sup> =  $\frac{\text{theor. price} \times \text{tick value}}{\text{tick size}}$

**Result:** The maximum liquidation costs would arise if the DAX were to gain 340 points. Accordingly the total margin amounts to EUR 186.80. It comprises EUR 125.45 premium margin (close-out costs on the basis of the daily settlement price) and EUR 61.35 additional margin (i.e. total margin less the premium margin).

### Liquidation Costs



### Payment upon Last Trading Day



Diagram 10.4 demonstrates a variation of this strategy. In this instance, the investor sells nine DAX calls with a lower exercise price and simultaneously buys ten DAX calls with a higher exercise price. This example illustrates that, depending on the specific position, the maximum close-out costs do not necessarily exist at the limits of the margin interval, but rather can lie somewhere in between. Therefore, it is always necessary to determine the potential liquidation costs for all projected values of the underlying instrument.

**Diagram 10.4: Sample Calculation of a Modified Bear Call Spread**

|                  |                                   |                  |            |
|------------------|-----------------------------------|------------------|------------|
| <b>Contracts</b> | <b>9 C ODAX JUN 02 4850 Short</b> | Margin parameter | 340 points |
|                  | <b>10 C ODAX JUN 02 4900 Long</b> |                  |            |
| Tick size        | 0.1 points                        | Tick value       | EUR 0.50   |

|                        |                 |                           |                           |
|------------------------|-----------------|---------------------------|---------------------------|
|                        | <b>DAX</b>      | <b>C ODAX JUN 02 4850</b> | <b>C ODAX JUN 02 4900</b> |
| Daily settlement price | 4,876.21 points | 226.28 points             | 201.19 points             |

|                        | Projected Values DAX (points) | 9 C ODAX JUN 02 4850 Short    |                                       | 10 C ODAX JUN 02 4900 Long |                                       | Total Liquidation-Costs (EUR) |            |
|------------------------|-------------------------------|-------------------------------|---------------------------------------|----------------------------|---------------------------------------|-------------------------------|------------|
|                        |                               | Theoretical Price (points)    | Liquidation Costs <sup>26</sup> (EUR) | Theoretical Price (points) | Liquidation Costs <sup>26</sup> (EUR) |                               |            |
| <b>Margin Interval</b> |                               | 5,216.21                      | 460.90                                | 20,740.50                  | 423.54                                | -21,177.00                    | -436.50    |
|                        | <b>+340</b>                   | 5,200.00                      | 448.04                                | 20,161.80                  | 411.16                                | -20,558.00                    | -396.20    |
|                        |                               | 5,150.00                      | 409.29                                | 18,418.05                  | 373.97                                | -18,698.50                    | -280.45    |
|                        |                               | 5,100.00                      | 372.02                                | 16,740.90                  | 338.37                                | -16,918.50                    | -177.60    |
|                        |                               | 5,050.00                      | 336.34                                | 15,135.30                  | 304.47                                | -15,223.50                    | -88.20     |
|                        |                               | 5,000.00                      | 302.37                                | 13,606.65                  | 272.36                                | -13,618.00                    | -11.35     |
|                        |                               | 4,950.00                      | 270.22                                | 12,159.90                  | 242.14                                | -12,107.00                    | 52.90      |
|                        |                               | 4,900.00                      | 239.97                                | 10,798.65                  | 213.92                                | -10,696.00                    | 102.65     |
|                        |                               | <b>Daily settlement price</b> | 4,876.21                              | 226.28                     | 10,182.60                             | 201.19                        | -10,059.50 |
|                        | <b>-340</b>                   | 4,850.00                      | 211.73                                | 9,527.85                   | 187.65                                | -9,382.50                     | 145.35     |
|                        |                               | 4,800.00                      | 185.48                                | 8,346.60                   | 163.30                                | -8,165.00                     | 181.60     |
|                        |                               | 4,750.00                      | 161.16                                | 7,252.20                   | 141.05                                | -7,052.50                     | 199.70     |
|                        |                               | 4,700.00                      | 138.96                                | 6,253.20                   | 120.86                                | -6,043.00                     | 210.20     |
|                        |                               | 4,650.00                      | 118.84                                | 5,347.80                   | 102.68                                | -5,134.00                     | 213.80     |
|                        |                               | 4,600.00                      | 100.76                                | 4,534.20                   | 86.45                                 | -4,322.50                     | 211.70     |
| 4,550.00               |                               | 84.64                         | 3,808.80                              | 72.10                      | -3,605.00                             | 203.80                        |            |
| 4,536.21               | 80.53                         | 3,623.85                      | 68.46                                 | -3,423.00                  | 200.85                                |                               |            |

<sup>26</sup> =  $\frac{\text{theor. price} \times \text{tick value}}{\text{tick size}}$

**Result:** The maximum liquidation costs would arise were the DAX to fall to 4,650 points. Accordingly the total margin amounts to EUR 213.80. It comprises EUR 123.10 premium margin (close-out costs on the basis of the daily settlement price) and EUR 90.70 additional margin (i.e. total margin less the premium margin).

Diagram 10.5 shows one use of the Short Option Adjustment (compare section “Risk Based Margining of Traditional Options”). The theoretical price of a call with the exercise price of 390.00 lies between EUR 0.07 on the lower end and EUR 8.92 on the higher end of the margin interval. The call is so far out-of-the-money that the theoretical price of the option within the margin interval is lower than the Short Option Adjustment of EUR 10.57. Therefore, the theoretical price at the upper end of the margin interval for the option is substituted with the higher value of the Short Option Adjustment. In this situation both the total liquidation costs and the total margin increase.

**Diagram 10.5: Sample Calculation Short Option Adjustment**

|                  |                                    |                  |      |
|------------------|------------------------------------|------------------|------|
| <b>Contracts</b> | <b>1 C ALV MAR 02 390.00 Short</b> | Margin parameter | 11 % |
|                  | <b>1 C ALV MAR 02 260.00 Short</b> | Trading unit     | 50   |

|                        |            |                              |                              |
|------------------------|------------|------------------------------|------------------------------|
|                        | <b>ALV</b> | <b>1 C ALV MAR 02 390.00</b> | <b>1 C ALV MAR 02 260.00</b> |
| Daily settlement price | EUR 333.85 | EUR 1.39                     | EUR 80.45                    |

|                        |                               |        | <b>1 C ALV MAR 02 390.00</b> |                                 | <b>1 C ALV MAR 02 260.00</b> |                                 | Total Liquidation |
|------------------------|-------------------------------|--------|------------------------------|---------------------------------|------------------------------|---------------------------------|-------------------|
|                        |                               |        | Theoretical Price            | Liquidation Costs <sup>27</sup> | Theoretical Price            | Liquidation Costs <sup>27</sup> |                   |
| <b>Margin Interval</b> | <b>+11 %</b>                  | 370.57 | 10.57<br>8.92                | 528.50                          | 115.05                       | 5,752.50                        | 6,281.00          |
|                        |                               | 370.00 | 8.70                         | 435.00                          | 114.50                       | 5,725.00                        | 6,160.00          |
|                        |                               | 360.00 | 5.72                         | 286.00                          | 104.90                       | 5,245.00                        | 5,531.00          |
|                        |                               | 350.00 | 3.53                         | 176.50                          | 95.45                        | 4,772.50                        | 4,949.00          |
|                        |                               | 340.00 | 2.04                         | 102.00                          | 86.15                        | 4,307.50                        | 4,409.50          |
|                        | <b>Daily settlement price</b> | 333.85 | 1.39                         | 69.50                           | 80.45                        | 4,022.50                        | 4,092.00          |
|                        | <b>-11 %</b>                  | 330.00 | 1.09                         | 54.50                           | 77.05                        | 3,852.50                        | 3,907.00          |
|                        |                               | 320.00 | 0.53                         | 26.50                           | 68.22                        | 3,411.00                        | 3,437.50          |
|                        |                               | 310.00 | 0.24                         | 12.00                           | 59.68                        | 2,984.00                        | 2,996.00          |
|                        |                               | 300.00 | 0.09                         | 4.50                            | 51.50                        | 2,575.00                        | 2,579.50          |
| 297.13                 |                               | 0.07   | 3.50                         | 49.16                           | 2,458.00                     | 2,461.50                        |                   |

<sup>27</sup> = theoretical price × trading unit

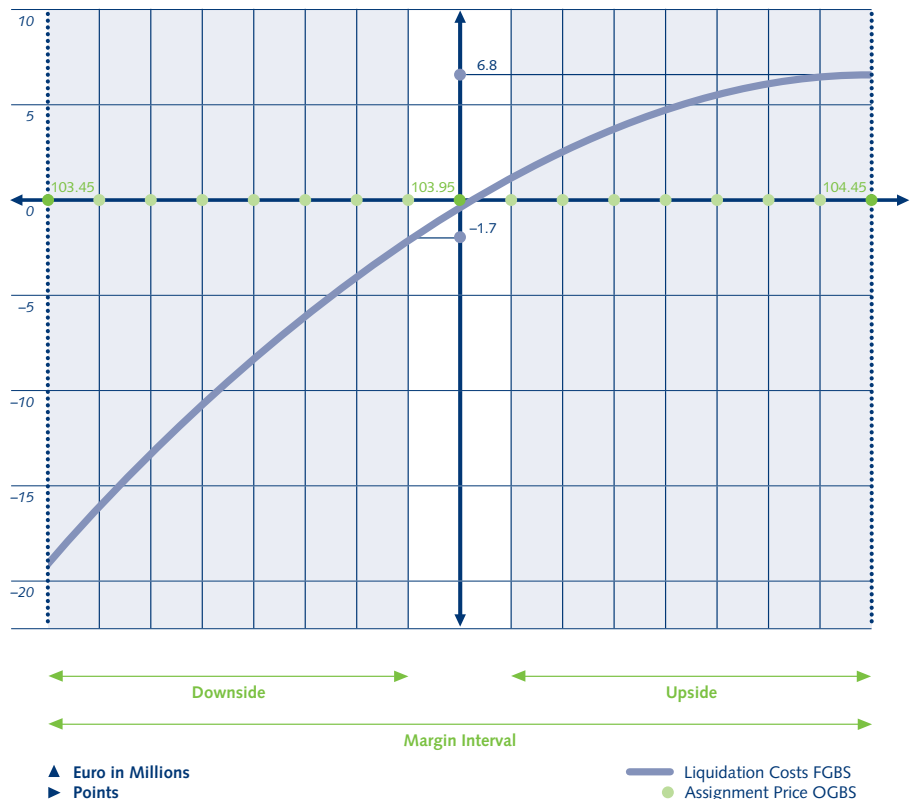
**Results:** The maximum liquidation costs result when ALV reaches EUR 370.57. Accordingly, the total margin amounts to EUR 6,281.00. It is comprised of EUR 4,092.00 premium margin (close-out costs on the basis of the daily settlement price) and EUR 2,189.00 additional margin (i.e. total margin less the premium margin).

## Cross Margining within a Margin Group

If several underlying instruments, and thus several margin classes, are subject to the same risks, then it makes sense to bunch the associated margin classes into a “margin group”. At Eurex Clearing AG, this is done, for example, with the FGBS, FGBM and FGBL margin classes, which together constitute the BUBO margin group.

First off, the additional margin for the upper and lower half of the margin interval is calculated individually for each margin class. The resulting values are then converted in the following manner: if negative margin rates (i.e. margin credits) arise, these will be taken into consideration only to a certain percentage (the “offset percent”), i.e. the margin credit (negative value) is multiplied with the offset percentage. For most margin groups, this percentage is zero, i.e. the margin credits are simply ignored. Afterwards, the additional margin amounts for all margin classes in the upper half of the margin interval are added together. The sum is the “upside additional margin” of that particular margin group. The same procedure is applied to the lower half of the margin interval and results in the “downside additional margin” total. The resulting upside and downside amounts of additional margin of the group are then compared with each other. The higher of the two will then be the amount charged as additional margin for the margin group.

Diagram 10.6: Liquidation Costs of the Margin Class FGBS



In comparison to collateralizing each margin class separately, this method results in a considerably lower call on liquidity. Diagram 10.7 provides a sample calculation for the BUBO margin group. For the FGBS, the additional margin for the upper (Upside) and the lower (Downside) half amounts to EUR 6.8 million and EUR –1.7 million (see graph on previous page). The amounts mentioned below reflect the worst case loss for all margin classes in the margin group BUBO, if the underlying either increases or decreases. Additional margin amounting to EUR 9.7 million is due for the margin group BUBO, i.e. without grouping, the additional margin would have amounted to:  
 EUR 6.8 million + EUR 3.5 million + EUR 6.2 million = EUR 16.5 million.

**Diagram 10.7: Sample Calculation of the BUBO Margin Group with Offset Percentage = 0 Percent**

| Margin Class | Additional Margin |                | Converted Values <sup>28</sup> |                      |
|--------------|-------------------|----------------|--------------------------------|----------------------|
|              | Downside          | Upside         | Downside                       | Upside               |
| FGBS         | EUR –1,700,000    | EUR 6,800,000  | EUR 0                          | EUR 6,800,000        |
| FBGM         | EUR 3,500,000     | EUR 2,500,000  | EUR 3,500,000                  | EUR 2,500,000        |
| FGBL         | EUR 6,200,000     | EUR –2,000,000 | EUR 6,200,000                  | EUR 0                |
|              | <b>Totals</b>     |                | <b>EUR 9,700,000</b>           | <b>EUR 9,300,000</b> |

Diagram 10.8 provides another sample calculation for the LIBO margin group. As opposed to the example described above, an offset percentage of 25 percent is assumed, which means that a margin credit of 25 percent is taken into consideration. Additional margin amounting to EUR 1,043,750 is due for the margin group LIBO, i.e. without grouping, the additional margin would have amounted to:  
 EUR 625,000 + EUR 1,250,000 + EUR 400,000 = EUR 2,275,000

**Diagram 10.8: Sample Calculation of the LIBO Margin Group with Offset Percentage = 25 Percent**

| Margin Class | Additional Margin |               | Converted Values <sup>29</sup> |                      |
|--------------|-------------------|---------------|--------------------------------|----------------------|
|              | Downside          | Upside        | Downside                       | Upside               |
| FEU1         | EUR 625,000       | EUR –625,000  | EUR 625,000                    | EUR –156,250         |
| FEU3         | EUR –1,250,000    | EUR 1,250,000 | EUR –312,500                   | EUR 1,250,000        |
| OEU3         | EUR 400,000       | EUR –200,000  | EUR 400,000                    | EUR –50,000          |
|              | <b>Totals</b>     |               | <b>EUR 712,500</b>             | <b>EUR 1,043,750</b> |

<sup>28</sup> Margin credits (negative margin rates) are multiplied with the offset percentage (here 0 percent).

<sup>29</sup> Margin credits (negative margin rates) are multiplied with the offset percentage (here 25 percent)

# Settlement

## Depositing Margin

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Essentially, the Clearing Member can satisfy all margin requirements by depositing the appropriate amount of cash. Cash collateral can be paid into the account in various currencies. The Board of Directors of Eurex Clearing AG stipulates which currencies are permitted for the deposit of cash collateral.

When it comes to depositing the total margin, the choice can be made to cover the required amount of collateral by depositing securities instead of cash. In that Eurex Clearing AG does not pay interest on cash that has been deposited as collateral, depositing securities that the Clearing Member has in its own inventory offers the benefit that those instruments will continue to provide returns.

It is absolutely necessary that coverage of variation margin (i.e. the daily settlement of profits and losses), as well as margin calls, be made in cash. In addition, the payments of premiums on traditional options, as well as premium settlement payments on options on futures, must always be made in cash.

## Intra-Day Margin

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Eurex Clearing AG, based on its own risk assessment carried out during the course of a given trading day, at all times reserves the right to demand from the Clearing Member a higher, or additional, amount of either cash collateral or those securities or rights to securities that are accepted by Eurex Clearing AG. Additional collateral must be deposited immediately in the appropriate currency in the appropriate account.

The same right exists with respect to a General Clearing Member or a Direct Clearing Member vis-a-vis any Non Clearing Members with which they are associated.

## **Procedure in Cases of Default**

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If a market participant is no longer able to fulfill its obligations, Eurex Clearing AG will liquidate all of its open positions. All liquidation gains or losses will be offset against each other, and any remaining debit balance will be covered from the margin which has been deposited.

If, thereafter, an uncovered debit balance still exists, the next step will be to liquidate the cash and securities collateral of the Clearing Member that is in arrears, and – insofar as it is necessary – a claim will be made against the clearing guarantee of that Clearing Member. If any surplus remains, it will be paid out.

If uncovered debit balances still exist, however, then a pro-rata claim will be made against the clearing guarantees which have been deposited in the guarantee fund by those institutions which are not in default, given that the reserves which Eurex Clearing AG has set aside for such purposes are also insufficient to cover the remaining amounts due.

This procedure guarantees that the fulfillment of all contracts traded via Eurex Clearing AG can be unconditionally assured.

# Appendix

## Glossary of Terms

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### Account

Margin calculations are performed by Eurex Clearing AG for a member's own house account and its customer's account. > **Netting** and > **spreading** between the house account and customer's accounts does not take place.

### Additional Margin

Additional margin serves to cover the additional liquidation costs that potentially could be incurred. Such possible close-out costs could arise if, based on the current market value of a portfolio, the worst case loss were to occur within a 24-hour period. It is used for options (also options on futures) and > **non-spread futures positions**, bonds and equity trades. For bonds and equity trades, the additional margin is calculated for security positions but not for the corresponding cash positions.

### Aggregated Net Risk Position

Risk positions that result from trades not marked for gross processing are indicated as net risk positions. By accumulating these net risk positions an aggregated net risk position is generated.

### Allocated Position

> A **long position** in fixed income futures contracts, which, on final settlement date, has been assigned the securities which are to be delivered.

### Allocation Process

During overnight batch processing, Eurex Clearing AG, by means of a random selection procedure, assigns to corresponding > **long positions** the actual underlying instruments that are to be delivered.

### Assigned Position

An allotted position; the position of a > **writer** in a given options series which has been randomly selected for exercise.

### Assignment

When a > **long position** in options is > **exercised**, the Eurex system randomly selects from among all open > **short positions** of the same options series a > **writer** who will be allotted that exercise, i.e. the writer will be obliged to fulfill the contractual conditions for delivery or, as the case may be, receipt of the > **underlying** instruments.

### Back Month

All delivery months of a specific futures contract other than the > **spot month**.

**Back-Month Spread Margin**

The margin rate which is applied prior to the first day of the delivery month on all > **spread positions**, and during the delivery month on those spread positions in which the > **front contract** is not contained. This rate is always less than, or equal to, the > **spot-month spread margin** rate.

**Close out of a Position**

An open position is offset (closed out) by the execution of a transaction that is equal but opposite to that which established the open position. This means that a > **long position** can be closed by an offsetting > **short position**, and vice-versa.

**Closing Transaction**

The offsetting of a position

**Combinations**

The simultaneous execution of at least two derivatives positions which are based on the same > **underlying instrument**. The investor can employ this strategy to achieve a risk/reward profile that matches his specific needs.

**Contract Size**

The quantity of the > **underlying instrument** which one contract represents.

**Covered Short Position**

A > **short position** in a > **traditional** option, for which 100 percent security has been provided by depositing the > **underlying instrument**. In such a case, no margin will be charged.

**Cox-Ross-Rubinstein Model**

> **Options Pricing Model (OPM)**

**Cross Margining**

Offsetting of equal but opposite risks that compensate each other at least partially. Within a > **margin class** the offset is 100 percent. Within a > **margin group** the offset is made based on an > **offset factor**.

**Current Liquidating Margin**

The current liquidating margin is paid by the buyer or the seller of the bonds. This margin covers losses that would occur if a position were to be liquidated today. The current liquidating margin is adjusted daily similar to > **premium margin**.

**Daily Settlement**

In order to carry out the daily offsetting of profits and losses, changes in value versus the previous day are determined for each position. This is accomplished on the basis of the > **daily settlement prices**.

**Daily Settlement Price**

The daily official closing price of a derivative as determined by Eurex Clearing AG; used as a basis for margin calculations.

**Deferred Contract**

A futures contract which will become due in a > **back month**.

**Derivative**

Futures and options contracts are always associated with an > **underlying instrument** from which they are derived. Therefore, one speaks of "derivatives" as a general description of these types of instrument.

**Direct Clearing Member (DCM)**

A Clearing Member which may clear its own transactions and those of its clients, as well as those of company-affiliated market participants which do not hold a clearing license (> **Non Clearing Member**).

**Exercise**

An owner of a > **long position** in an option who makes use of his option right is said to "exercise" his option.

**Exercised Option**

A > **long position** in a given options series which the holder of the position has elected to > **exercise**.

**Front Contract**

Contracts which become due in the > **spot month**.

**Futures Spread Margin**

This kind of margin is levied in order to cover those risks associated with a futures spread which could arise between today and tomorrow. It is used when an > **account** contains several futures positions whose risks neutralize each other to a certain extent. In calculating this amount, > **long** and **short positions** are offset against each other, whereby contracts with different expiration months are deemed comparable to one another (e.g. long Bund Sept. vs. short Bund Dec.). Futures spread margin therefore provides protection against the non-perfect price correlation that exists between two contracts (long and short) of differing expirations.

### **Futures-Style Premium Posting**

The residual options premium is debited/credited only upon exercise or expiration of the options position. This procedure is used by Eurex Clearing AG on all options on futures. Compare with > [traditional-style premium posting](#).

### **General Clearing Member (GCM)**

A GCM may clear its own transactions, those of its customers, and those of market participants which do not hold a clearing license (> [Non Clearing Members](#)).

### **Gross Risk Position**

Gross risk positions result from trades marked for processing on a gross basis. Hereby, the short and the long side are accumulated separately, i.e. the result is a gross risk short position and a gross risk long position.

### **Gross Processing**

Individual processing of trades, therefore no contractual netting/settlement netting is applicable. Trades that are subject to gross processing have to be collateralized separately. Additionally, separate gross delivery instructions are generated for these trades.

### **Initial Margin**

“Initial margin” is not used in Eurex terminology because it has the same meaning as > [additional margin](#). In international securities industry circles, the expression “initial rate” is used synonymously.

### **Interval Product**

The product within a given > [margin class](#) which is used by Eurex risk based margining to determine the > [projected value](#) of the underlying instrument for that margin class (> [risk array](#), > [theoretical prices](#)). For each margin class, there is only one interval product.

### **Intra-Day Margin**

Additional collateral that must be provided during the trading day in cases of highly volatile market conditions.

### **Long Position**

An open derivatives contract that the holder purchased.

### **Margin**

Margin is a collateral which has to be deposited by the Clearing Member and serves to cover the risk of Eurex Clearing AG.

### **Margin Call**

If the collateral that has been deposited is no longer sufficient, meaning a lack of coverage exists, then the market participant will be called upon to provide additional cash as collateral. This process is known as a “margin call”.

### Margin Class

The bunching together for margin purposes of all > derivatives of the same > underlying instrument.

### Margin Group

The bunching together of several > margin classes, the > underlying instruments of which possess generally the same kinds of price risk.

### Margin Interval

An interval which is arrived at for each margin class by addition or, as the case may be, subtraction of the > margin parameter from the > settlement price of the > underlying instrument. The underlying instrument will, with 99 percent probability, not exceed the margin interval within a given one-day trading period. This parameter is used in the calculation of > additional margin.

### Margin Parameter

The parameter established by Eurex Clearing AG that reflects the maximum price fluctuation which the > underlying instrument can be expected to make during the next trading day. The margin parameters are used to calculate the > margin interval. The basis of this calculation is the historical > volatility. Margin parameters are adjusted from time to time by Eurex Clearing AG, and any such changes are published regularly.

### Mark-to-Market

The expression "mark-to-market" indicates that a daily revaluation and settlement of profits and losses (> settlement price yesterday vs. settlement price today) will be made.

### Net-long Position/Net-short Position

When all open > long positions and short positions in an > account are offset against each other, either a surplus of long or of short positions results. This is referred to as a net-long or net-short position.

### Netting

The offsetting of open > long positions against > short positions in order to determine the > net-short or net-long position.

### Non Clearing Member (NCM)

A market participant which is not a Clearing Member. Such a participant must have a clearing agreement in effect with a > General Clearing Member or with a company-affiliated > Direct Clearing Member.

### Non-Spread Futures Position

A > long or short position which exists after the > spreading procedure has been carried out, and for which > additional margin must be deposited.

**Notification Day**

The last trading day of a specific contract.

**Notified Position**

A position for which an indication has been given that delivery will take place.

A > **short position** in an fixed income futures for which the seller has been advised that the > **underlying** securities are to be delivered in fulfillment of the contract.

**Offset of Profits and Losses**

> **Variation margin**

**Offset Factor**

Percentage with which margin credits are multiplied by > **cross margining** within a > **margin group**

**Opening of a Position**

The purchase or sale of an options or futures contract which establishes a new position.

**Options Premium**

The amount of money that the options buyer must pay the options > **writer**.

At Eurex Clearing AG, there exists > **traditional-style premium posting** and > **futures-style premium posting**.

**Options Pricing Model (OPM)**

Eurex Clearing AG uses various options pricing models to calculate the “fair” options price. The risk-free interest rate and volatility are important parameters for this calculation.

**Positive Price Correlation**

A lockstep price relationship between two or more > **underlying instruments**.

**Premium Margin**

Premium margin must be deposited by the > **writer** of a traditional options position.

It remains effective until the exercise or expiration of the option, and covers the potential costs of a > **close-out** (liquidation) of the position of the > **writer** at the > **settlement price**. Premium margin is continuously adjusted. The options buyer does not need to deposit margin because, with the payment of the > **options premium**, he has acquired a right, but not an obligation, to make use of his option. His maximum risk consists of the loss of the options premium were he to allow the contract to expire.

**Projected Values of the Underlying Instrument**

All exercise prices of active options series of the > **interval product** which lie within the > **margin interval**.

**Risk Positions**

These are positions resulting from trades and serve as a basis for calculation in the risk margining process.

**Risk Array**

The matrix of values used to determine the > **additional margin** required for each > **margin class**. On the one hand, it consists of the > **settlement price**, the maximum and minimum extremes of the > **margin interval** and the > **projected values** of the underlying instrument, and on the other, of the > **theoretical prices** of all options and futures contracts that result from this set of values.

**Short Position**

An open derivatives contract that the holder sold.

**Spot Month**

The expiration month closest to the current delivery month.

**Spot-Month Spread Margin**

The margin rate which, throughout the delivery month, is applied to > **spread positions** which contain a > **front contract**. This rate is always greater than, or equal to, the > **back-month spread margin rate**.

**Spread Position**

A pairing of positions that results from > **spreading**.

**Spreading**

The creation of generally equal but opposite position pairs that consist of > **long** and > **short futures positions** of different expiration months.

**Theoretical Prices**

Options prices which have been deduced by the > **options pricing model** as > **projected values** of the underlying instrument.

**Tick Size**

The smallest increment in which the price of a derivatives contract may trade (minimum price movement).

**Tick Value**

The monetary value represented by a one-tick difference in price.

**Time Spread**

The pairing of a > **long position** and an equal but opposite > **short position**, in which the expiration months of the two positions are different.

**Total Margin Amount**

The sum of the > premium margin, > current liquidating margin, > futures spread margin and > additional margin, for which collateral must be deposited.

**Traditional Options**

Options for which the > traditional-style premium posting method is used for settlement.

**Traditional-Style Premium Posting**

The traditional method used for the margin treatment of the > options premium.

The premium is payable in full by the buyer of the option. Eurex Clearing AG uses this method on all equity and equity index options. Compare with > futures-style premium posting.

**Underlying Instrument**

The financial instrument or security upon which a derivatives contract is based; the underlying instruments of Eurex contracts are shares, equity indexes or synthetic interest rate securities.

**Variation Margin**

Variation margin (a daily offsetting of profits and losses) occurs as a result of the > mark-to-market procedure used for futures and options on futures. Through variation margin, the gains and losses incurred as a result of the price changes in open positions during a given trading day are offset against each other. In contrast to other kinds of margin, variation margin is not an amount which must be deposited as collateral, but is rather a daily cash settlement of debit and credit balances.

**Volatility (Historical)**

A measurement of the price fluctuations which have occurred in the past. The changes in value of the instrument upon which an options contract is based are expressed as a percentage; in the case of futures, this reading is expressed in percentage points or index points. Risk based margining employs the historical volatility, calculated on a daily basis, which is then multiplied by a risk factor that has been determined statistically for each underlying instrument by Eurex Clearing AG, and the resultant product is used to establish the > margin parameter.

**Worst Case Loss**

The largest possible liquidation loss that could potentially arise prior to the end of the next trading day. This amount is secured by provision of > additional margin.

**Writer**

The seller of an option.

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The Deutsche Börse Learning Portal (<https://trainingscenter.deutsche-boerse.com>) gives you one-stop access to all Eurex training sessions and exams. For further questions please contact the Trainingscenter:

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### Brochures and Learning Tools

The following brochures and applications are available on the Internet for download (<http://www.eurexchange.com>):

#### Brochure

Eurex – The European Derivatives Market

Eurex – Products

Eurex Quick Reference Guide Trading

Eurex Quick Reference Guide Clearing

Interest Rate Derivatives –

Fixed Income Trading Strategies

Equity and Equity Index Derivatives –

Trading Strategies

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Trading Strategies – Questions and Case Studies

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Market Place > Products > Trading Calendar

#### Applications

Eurex MarginCalculator

#### Location

Clearing > Risk Based Margining

The following educational tools can be ordered on CD Rom via the Learning Portal:

All about Eurex Options

All about Eurex Futures

Eurex StrategyMaster

Eurex MarginCalculator

Eurex OptionAlligator (option price calculator)



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