August 23, 2010
033/2010-DP

CIRCULAR LETTER

To: The BM&FBOVESPA (BVMF) Market Participants – BM&F Segment

Re: **Open Interest Limits for Options Contracts.**

BM&FBOVESPA sets open interest limits for customer-owned positions in derivatives contracts (BM&F market segment) and automatically aggregates the positions of all brokerage houses that are responsible for a customer or group of customers acting in concert.

Similarly to the limits for futures contracts, the limits for options contracts are defined as the maximum number between a certain percentage of the total open interest in the market and a fixed number of contracts in a certain maturity. This methodology, however, does not take into account the different risk profiles associated to the various strike prices.

Therefore, in order to better assess the participants' open interest in the options market, BM&FBOVESPA has developed a methodology through which options positions are described in terms of their underlying assets, thereby allowing the correct aggregation and comparison between different strike prices. This methodology sets a limit for a participant's delta-equivalent position relative to the market's delta-equivalent position.

This methodology provides greater efficiency in the calculation of open interest limits and will become effective as of **September 13, 2010**.

According to the new methodology, the process of assessing a participant's compliance to a position limit is characterized by the following two stages: (i) the calculation of the delta-equivalent position of a participant's portfolio; and (ii) the calculation of the delta-equivalent quantity of the limit against which the participant's delta-equivalent exposure will be assessed (market's delta-equivalent position).

1. Calculation of the delta-equivalent position of a portfolio

Generally, the delta-equivalent position of a portfolio with maturity t is calculated based on the sum of the quantities of each contract multiplied by their respective deltas. Based on the option's delta and position, the following position sets are possible:

- Long delta: based on long call option positions and short put option positions;
- Short delta: based on short call option positions and long put option positions.

The calculation of the delta-equivalent position of a portfolio with maturity t is performed by using expressions (1) to (3), as follows:

$$Q(t)^{Total} = Q(t)^{Comprada} + Q(t)^{Vendida} \tag{1}$$

$$Q(t)^{Comprada} = \sum_{k \in \{\text{Strike Price}\}} \left\{ \text{Max}\left[Q(t)_k \times \Delta(t)_k ; 0 \right] \right\} \tag{2}$$

$$Q(t)^{Vendida} = \sum_{k \in \{\text{Strike Price}\}} \left\{ \text{Min}\left[Q(t)_k \times \Delta(t)_k ; 0 \right] \right\} \tag{3}$$

Where:

- $Q(t)^{Total}$: the total delta-equivalent quantity of options contracts belonging to a portfolio with maturity t;
- $Q(t)^{Comprada}$: the long delta-equivalent quantity of options contracts belonging to a portfolio with maturity t;
- $Q(t)^{Vendida}$: the short delta-equivalent quantity of options contracts belonging to a portfolio with maturity t;
- $Q(t)_k$: the quantity of options contracts with maturity date *t* and strike price *k*, with $Q(t)_k > 0$ for long positions and $Q(t)_k < 0$ short positions;
- $\Delta(t)_k$: the delta of the option contract with maturity date *t*, and strike price *k*, with $\Delta(t)_k > 0$ for call options and $\Delta(t)_k < 0$ for put options.

The delta-equivalent quantity, calculated based on expression (1), must be less than the delta-equivalent position limit set by the Exchange, as described in the section below.

2. **Delta-equivalent position limit**

The open interest limit applicable to the total number of call and put options on the same underlying asset, with maturity *t,* is given by the following expression (4):

$$\text{Limit(t)} = \text{Max}\left[p(t) \times Q(t)^{\text{Aberto}} ; L(t)\right] \qquad (4)$$

Where:

- $Q(t)^{\text{Aberto}}$: the delta-equivalent quantity of options contracts with maturity *t*;
- $p(t)$: the percentage associated to the options contracts with maturity date *t*;
- $L(t)$: the delta-equivalent quantity limit for options contracts with maturity date *t*.

The calculation of the delta-equivalent quantity is given by the following expression (5):

$$Q(t)^{\text{Aberto}} = \frac{1}{2} \times \left(\sum_{k \in \{\text{Strike Price}\}} \left\{ Q(t)_k^{\text{Aberto}} \times \left|\Delta(t)_k\right| \right\} \right) \qquad (5)$$

Where:

- $Q(t)_k^{\text{Aberto}}$: the quantity of outstanding option contracts with maturity date *t* and strike price *k*;
- $\Delta(t)_k$: the delta of the option contract with maturity date *t* and strike price *k*, with $\Delta(t)_k > 0$ for call options and $\Delta(t)_k < 0$ for put options.

The parameters *p*(*t*) and *L*(*t*) and the delta values calculated daily for each outstanding option series will be published on the BM&FBOVESPA Website.

In addition to the previously described limits, BM&FBOVESPA may also set open interest limits for: (i) the total number of delta-equivalent positions held by a participant in a certain option's type regardless of the expiration dates; (ii) the long and short delta-equivalent quantities of each option expiration month; and (iii) the absolute limits for the long and short quantities of each option month and strike price.

It should be noted that the Exchange will provide the corresponding brokerage houses, the BM&FBOVESPA Market Supervision (BSM) and the Brazilian Securities and Exchange Commission (CVM) with information regarding any violation to the established open interest limits.

In the case of violations, the Exchange may require the corresponding participants not only to reduce their positions in accordance with the established limits and within a time frame stipulated in advance, but also to post additional margin. The additional margin may be calculated in a manner equivalent to the violation of the open interest limit.

The pricing models utilized for the calculation of options premiums and deltas are described in the Annex to this Circular Letter.

Further information may be obtained from the Risk Management Department, by telephone at (+55-11) 2565-4199.

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Annex to Circular Letter 033/2010-DP

PRICING MODELS FOR OPTIONS CONTRACTS

Pricing of options on actuals

For the purposes of pricing and calculating the delta of options on actuals (gold and IDI), the Black-Scholes model is utilized, as follows:

$$P_{Call} = S \times N(d_1) - K \times e^{-rT} \times N(d_2)$$
$$P_{Put} = K \times e^{-rT} \times N(-d_2) - S \times N(-d_1)$$

$$d_1 = \frac{ln\left(S/K\right) + \left(r + \sigma^2/2\right) \times T}{\sigma \times \sqrt{T}}$$
$$d_2 = d_1 - \sigma \times \sqrt{T}$$

$$\Delta_{Call} = N(d_1)$$
$$\Delta_{Put} = N(d_1) - 1$$

Where:

P_{Call}	=	the call option's price;
P_{Put}	=	the put option's price;
S	=	the underlying asset's spot market price;
K	=	the option's strike price;
r	=	the risk-free interest rate;
σ	=	the underlying asset's volatility;
T	=	the contract's time to maturity;
$N()$	=	the accumulated normal distribution function;
Δ_{Call}	=	the call option's delta coefficient
Δ_{Put}	=	the put option's delta coefficient

Pricing of options on futures

For the purposes of pricing and calculating the delta of options on futures (Ibovespa and agricultural contracts), Black model is utilized, as follows:

$$P_{Call} = e^{-rT} \times \left(F \times N(d_1) - K \times N(d_2)\right)$$
$$P_{Put} = e^{-rT} \times \left(K \times N(-d_2) - F \times N(-d_1)\right)$$

$$d_1 = \frac{ln\left(F/K\right) + \left(\sigma^2/2\right) \times T}{\sigma \times \sqrt{T}}$$
$$d_2 = d_1 - \sigma \times \sqrt{T}$$

$$\Delta_{Call} = e^{-rT} \times N(d_1)$$
$$\Delta_{Put} = e^{-rT} \times \left[N(d_1) - 1\right]$$

Where:

P_{Call}	=	the call option's price;
P_{Put}	=	the put option's price;
F	=	the underlying asset's price (futures contract);
K	=	the option's strike price;
r	=	the risk-free interest rate;
σ	=	the underlying asset's volatility;
T	=	the contract's time to maturity;
$N()$	=	the accumulated normal distribution function;
Δ_{Call}	=	the call option's delta coefficient;
Δ_{Put}	=	the put option's delta coefficient

Pricing of options on ID futures contracts

For the purposes of pricing and calculating the delta of options on ID futures, the Black model is utilized, as follows:

$$K^* = \left((1+K)^{\left(T_{Longo,DU} - T_{Curto,DU}\right)} - 1 \right) \times \frac{1}{\left(T_{Longo,DC} - T_{Curto,DC}\right)}$$

$$S^* = \left(\frac{PU_{Curto}}{PU_{Longo}} - 1 \right) \times \frac{1}{\left(T_{Longo,DC} - T_{Curto,DC}\right)}$$

$$\delta = \frac{PU_{Longo} \times \left(T_{Longo,DC} - T_{Curto,DC}\right)}{\left(1 + K^* \times \left(T_{Longo,DC} - T_{Curto,DC}\right)\right)}$$

$$P_{Call} = \delta \times \left(S^* \times N(d_1) - K^* \times N(d_2) \right)$$

$$P_{Put} = \delta \times \left(K^* \times N(-d_2) - S^* \times N(-d_1) \right)$$

$$d_1 = \frac{ln\left(S^* / K^* \right) + \left(\sigma^2 / 2 \right) \times T_{Curto,DC}}{\sigma \times \sqrt{T_{Curto,DC}}}$$

$$d_2 = d_1 - \sigma \times \sqrt{T_{Curto,DC}}$$

$$\Delta_{Call} = N(d_1) \times \frac{PU_K}{PU_{fwd}}$$

$$\Delta_{Put} = \left[N(d_1) - 1 \right] \times \frac{PU_K}{PU_{fwd}}$$

$$PU_{fwd} = \frac{PU_{Longo}}{PU_{Curto}} \times 100.000$$

Where:

P_{Call}	=	the call option's price;
P_{Put}	=	the put option's price;
PU_{Curto}	=	the unit price (PU) for the ID futures contract with the same expiration date as the option's expiration date;
PU_{Longo}	=	the unit price (PU) for the ID futures contract;
PU_{fwd}	=	the unit price (PU) based on the forward rate;
K	=	the option's strike price (forward rate);
σ	=	the forward rate's volatility;
$T_{Curto,DU}$	=	the option's time to maturity (for a 252-business day year);
$T_{Curto,DC}$	=	the option's time to maturity (for a 365-calendar day year);
$T_{Longo,DU}$	=	the contract's time to maturity (for a 252-business day year);
$T_{Longo,DC}$	=	the contract's time to maturity (for a 365-calendar day year);
$N()$	=	the accumulated normal distribution function;
Δ_{Call}	=	the call option's delta coefficient;
Δ_{Put}	=	the put option's delta coefficient;

Pricing of options on exchange rate contracts

For the purposes of pricing and calculating the delta of options on spot U.S Dollar, the Garman-Kohlhagen model is utilized, as follows:

$$P_{Call} = e^{-r_c T} \times S \times N(d_1) - K \times e^{-rT} \times N(d_2)$$

$$P_{Put} = K \times e^{-rT} \times N(-d_2) - e^{-r_c T} \times S \times N(-d_1)$$

$$d_1 = \frac{ln\left(S/K\right) + \left(r - r_c + \sigma^2/2\right) \times T}{\sigma \times \sqrt{T}}$$

$$d_2 = d_1 - \sigma \times \sqrt{T}$$

Where:

P_{Call}	=	the call option's price;
P_{Put}	=	the put option's price;
S	=	the option's underlying asset price;
K	=	the option's strike price;
r	=	the risk-free internal interest rate;
r_c	=	the risk-free external interest rate;
σ	=	the underlying asset's volatility;
T	=	the contract's time to maturity;
$N()$	=	the accumulated normal distribution function.

The delta coefficient is calculated by the following formula:

$$\Delta_{Call} = e^{-rT} \times N(d_1)$$

$$\Delta_{Put} = e^{-rT} \times \left[N(d_1) - 1 \right]$$

$$d_1 = \frac{\ln\left(\frac{F}{X}\right) + \frac{\sigma^2}{2} \times T}{\sigma \times \sqrt{T}}$$

Where:

F	=	the U.S. Dollar futures contract's price;
Δ_{Call}	=	the call option's delta coefficient;
Δ_{Put}	=	the put option's delta coefficient

Pricing of options on futures-style exchange rate contracts

For the purposes of pricing and calculating the delta of futures-style options on spot U.S Dollar, the Garman-Kohlhagen model with some modifications is utilized, as follows:

$$P_{Call} = e^{-rT} \times e^{-r_c T} \times S \times N(d_1) - K \times N(d_2)$$
$$P_{Put} = K \times N(-d_2) - e^{-rT} \times e^{-r_c T} \times S \times N(-d_1)$$

$$d_1 = \frac{ln\left(S/K\right) + \left(r - r_c + \sigma^2/2\right) \times T}{\sigma \times \sqrt{T}}$$
$$d_2 = d_1 - \sigma \times \sqrt{T}$$

Where:

P_{Call}	=	the call option's price;
P_{Put}	=	the put option's price;
S	=	the option's underlying asset price;
K	=	the option's strike price;
r	=	the risk-free internal interest rate;
r_c	=	the risk-free external interest rate;
σ	=	the underlying asset's volatility;
T	=	the contract's time to maturity;
$N()$	=	the accumulated normal distribution function.

The delta coefficient is calculated by the following formula:

$$\Delta_{Call} = N(d_1)$$
$$\Delta_{Put} = N(d_1) - 1$$

$$d_1 = \frac{\ln\left(\frac{F}{X}\right) + \frac{\sigma^2}{2} \times T}{\sigma \times \sqrt{T}}$$

Where:

F	=	the U.S. Dollar futures contract's price;
Δ_{Call}	=	the call option's delta coefficient;
Δ_{Put}	=	the put option's delta coefficient