Annexure 1

Method for calculating the VaR (EWMA) based Margin

The method used to derive the VaR Margin requirements for Futues contracts is based on the Initial Margin methodology suggested in the "***Varma Committee Report for Risk Containment in Derivatives Market***".

Computation :

1. The standard deviation (Volatility estimate) of prices is computed using the Exponentially Weighted Moving Average method ("EWMA").
2. The Standard Deviation (Volatility estimate) at the end of time period t (σt) is estimated using the Standard Deviation (Volatility estimate) at the end of the previous time period. i.e. as at the end of t-1 time period (σt-1), and the return (rt) observed during the time period t (price difference in previous two days).

Formula for Standard Deviation (Volatility Estimate) :

$$\sigma_t^2 = \lambda(\sigma_{t-1})^2 + (1-\lambda)(r_t)^2$$

Where,

- σ (sigma) means the standard deviation
- λ (Lambda) determines how rapidly volatility estimates changes. The value is taken as 0.99 currently.
- r (return) is defined as the logarithmic return: rt = ln (St/St-1) where St is the price of the Silver at time t.

Based on the Standard Deviation, the VaR Margin for a particular day is calculated using the below formula.

VaR% = 100 * (EXP(3.5 σ)-1)

Initial Margin = Square Root (MPoR Days) * VaR Margin , where MPoR Days = **3**

Notes :

1) The value of Lambda is taken as 0.99.

2) As per L.C. Gupta committee recommendations, Margins for VaR should be based on 3.5 sigma limits. ***3.5 sigma provides more than 99.7% confidence level****.*

3) The VaR margin is multiplied by √3 to cover 3 days of Margin Period of Risk (MPOR)