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# Mark-to-Market Methodology

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# MARK-TO-MARKET METHODOLOGY

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All futures positions are marked-to-market based on the daily settlement price of the futures contracts at the end of each trading day.

The profits/losses are computed as the difference between the price traded or the previous day's settlement price, as the case may be, and the current day's settlement price. The Clearing Members who have suffered a loss are required to pay the mark-to-market loss amount to the Clearing House which is passed on to the members who have made a profit. This is known as daily mark-to-market settlement.

The mark-to-market price will be calculated through two methodologies:

## 1. Volume Weighted Average Price (VWAP)

The Volume-Weighted Average Price (VWAP) is the ratio of the value of a traded security to that security's total volume traded over a particular time period. It is a means to determine a security's average trading price during a set time, taking into consideration both the price and quantity of the security being traded.

$$VWAP = \frac{\text{Total Value Traded}}{\text{Total Volume Traded}}$$

The full day's VWAP will be the preferred method of calculating the settlement price for liquid contracts. **All contracts that trade will be considered liquid** and will be settled based on VWAP.

## 2. Theoretical Price (Spot Price + Cost of Carry)

In the derivatives market, the cost of carry of a futures contract is the net cost of holding positions in the underlying security until the expiry of the futures contract. For equity futures this reflects finance (interest) costs and expected dividends. It is commonly used to interpret market sentiment for the stock or index, as higher values of cost of carry indicate traders are willing to pay more for holding futures.

**All contracts that do not trade will be considered illiquid** and will be settled based on the theoretical price.

### 2.1 Single Stock Futures

The theoretical price will be calculated as follows:

$$F = (S \times (1 + r)^{\frac{t}{364}}) - FVD$$

Where;

$F$	–	Futures price (theoretical)
$S$	–	Spot price
$r$	–	Risk-free rate
$FVD$	–	Future value of expected dividends
$t$	–	Time to maturity

The spot price is the closing price of the underlying security as published by the Exchange.

The risk-free rate used is interpolated based on current Kenyan interbank rates and Kenyan Treasury bill (T-bill) rates as published by the Central Bank of Kenya. The theoretical price is the preferred methodology to use for illiquid contracts.

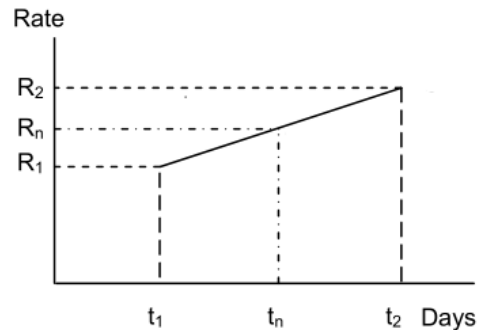
### Determination of the Risk-Free Rate

The risk-free rate is interpolated in order to match the time left to expiry to an appropriate rate.

The interpolated risk-free rate is calculated as follows:

$$R_n = R_1 + SLOPE \times (T_n - T_1);$$

$$SLOPE = \frac{(R_2 - R_1)}{(T_2 - T_1)}$$



Where;

- R<sub>n</sub> – Interpolated risk-free rate for period n
- R<sub>1</sub> – Closest available risk-free rate (before R<sub>n</sub>)
- R<sub>2</sub> – Next available risk-free rate (after R<sub>n</sub>)
- T<sub>n</sub> – Time to maturity for period n
- T<sub>1</sub> – Time to maturity matching R<sub>1</sub>
- T<sub>2</sub> – Time to maturity matching R<sub>2</sub>

E.g. If a contract has 91 days left to expiry, the 91-day T-bill rate will be used. If the contract has 100 days left to expiry, the rate will be interpolated based on the 91-day (R<sub>1</sub>) and the 182-day (R<sub>2</sub>) T-bill rates.

For maturities below 91 days, the closest available risk-free rate (R<sub>1</sub>) used for the purpose of interpolation is the average interbank rate of the previous week as published by the Central Bank of Kenya.

E.g. If a contract has 15 days left to expiry, the relevant risk-free rate (R<sub>n</sub>) will be interpolated based on the previous week's average interbank rates (R<sub>1</sub>) and the 91-day T-bill rate (R<sub>2</sub>).

## Determination of Expected Dividends

Dividends for the year will be estimated based on historical data and will be updated as the relevant listed companies make dividend announcements.

E.g. If ABC Ltd paid a dividend of KES 2.00 on 27<sup>th</sup> November 2018, then an amount of KES 2.00 will be assumed to be paid on 27<sup>th</sup> November 2019. If the company subsequently announces a dividend payment of KES 2.50 on 20<sup>th</sup> November 2019, the theoretical price will be adjusted to reflect the dividend announcement.

## 2.2 Equity Index Futures

The theoretical price will be calculated as follows:

$$F = S \times e^{(r-d)\frac{t}{364}}$$

Where;

$F$	–	Futures price (theoretical)
$S$	–	Spot price
$r$	–	Risk-free rate
$d$	–	Index dividend yield
$t$	–	Time to maturity

The spot price is the closing price of the underlying security as published by the Exchange.

The risk-free rate will be determined as outlined in section 2.1 above.

## Determination of Index Dividend Yield

The dividend yield will be determined as follows:

$$\frac{\sum_{i=1}^n (f_i \times d_i)}{\sum_{i=1}^n f_i}$$

Where;

$n$	–	Number of index constituents
$f$	–	Free float market capitalisation of each constituent counter
$d$	–	Previous year's average dividend yield of each constituent counter

## Settlement of Mark-to-Market Profits/Losses

Clearing Members are responsible for collecting and settling the daily mark-to-market profits/losses incurred by Trading Members and their clients. The pay-in and pay-out of the mark-to-market settlement amount is done on T+1 and is directly debited or credited to the Clearing Member's settlement account at the settlement bank.

### **Final Settlement Price**

On expiry of the futures contract, the Clearing House will mark all positions to the final settlement price and the resulting profit/loss will be settled in cash. The final settlement price of all contracts shall be the closing price of the underlying asset (spot price) on the expiry day.

The final settlement profit/loss is computed as the difference between trade price or the previous day's settlement price, as the case may be, and the final settlement price of the relevant futures contract.

Open positions in futures contracts cease to exist after the contract expires.