MARKET NOTICE

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☐ Equity Market
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☐ Interest Rate and Currency Derivatives
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SUBJECT: **MARK-TO-MARKET METHODOLOGY FOR THE COMMODITY DERIVATIVES MARKET**

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The methodology described in this document is effective from **5 April 2017**. Where there is any conflict with a previously published methodology definition, notes or guide, the methodology defined in this document will be applicable. Any queries can be directed to valuations@jse.co.za.

1) INTRODUCTION

The JSE determines mark-to-market (MTM) valuation on a daily basis for all listed instruments at the Exchange. This guide provides the methodology used for the valuation of derivative contracts listed on the Commodity Derivatives Market. This incorporates agricultural, metal and energy derivatives for either cash settlement or physical settlement, where appropriate.

The JSE's valuation role is not to provide an economic fair value of a listed instrument where fundamental valuation approaches are included. The JSE's valuations are based solely on market data and specifically on the last traded price principle wherever possible. The closing price ultimately reflects the prevailing trading price of a security listed for secondary trading.

Notwithstanding the methodology presented in this guide, the JSE reserves the right to make a final decision regarding the valuation of any listed security. In particular, the JSE may deviate from this methodology in the event of non-standard market hours, technical issues with pricing systems, or observed anomalies in market data.

2) DAILY MTM VALUATION PROCESS

Standard futures contracts on the Commodities and Global derivative markets are priced by the JSE using a standardised mark-to-market (MtM) methodology. This methodology is an attempt to reflect the price levels at which individual contracts are trading at the closing time of the particular market.

The methodology is based on two key principles:

- A snapshot approach which prices all instruments at a point-in-time in order to preserve any prevailing spread relationships between contracts

- A time-weighted average approach which reduces the risk of individual pricing anomalies skewing the closing price

The methodology is applied as follows:

1. Take a full "market watch" snapshot of all futures contracts during every minute interval across the last 5 minutes of the trading session. The snapshot will be taken at a random time during each minute.
2. Determine five resultant snapshot prices for each contract using the last trade / higher bid / lower offer approach:
   - Start with the last traded price, using the previous day's MtM where there is no trading activity for the day
   - If the best on-screen bid is greater than the last traded price, then set MtM = Best Bid
   - If the best on-screen offer is lower than the last traded price, then set MtM = Best Offer
3. Calculate an average snapshot price for each contract using an arithmetic average of the five snapshot prices. This is the time weighted average price for the contract
4. Apply the rounding convention applicable to that contract

The table below shows a hypothetical calculation for an individual contract:

Snapshot	Random Time	Last Trade	Best Bid	Best Offer	MtM	Method
11:55-11:56	11:55:21	1 805.00	1 804.00	1 804.80	1 804.80	Lower Offer
11:56-11:57	11:56:04	1 805.00	1 806.00	1 806.80	1 806.00	Higher Bid
11:57-11:58	11:57:28	1 806.00	1 805.00	1 805.80	1 805.80	Lower Offer
11:58-11:59	11:58:29	1 806.00	1 805.50	1 806.50	1 806.00	Last Trade
11:59-12:00	11:59:21	1 809.00	1 807.00	1 808.80	1 808.80	Lower Offer
					1 806.28	TWAP
					1 806.00	MTM

3) OPTIONS VOLATILITY MTM PROCESS

The JSE calculates the MtM for listed options using a Black-76 model. The two key inputs to this algorithm are the price of the underlying future (as defined in the previous section), and the volatility. A flat volatility skew is applied to all contracts, and the JSE publishes a single At-The-Money (ATM) Volatility applicable to an individual futures expiry, and all derivative options.

The determination of the ATM Volatility is a two-step approach, considering all on-screen trades for the day, as well as applicable quotes near the end of the day. Both steps only consider market activity in options that are classified as "at-the-money", based on the options' strike price relative to the MtM of the underlying future.

3.1 At-the-Money Options

Where a particular future has a daily price limit, any option strike within a one price limit range of the future's MTM will be considered at-the-money. Note that the standard daily price limit will be used to identify at-the-money options even in the event that extended price limits are in force for that particular contract. For contracts that do not have absolute price limits, any option strikes within a 5% range of the futures MTM will be considered at-the-money.

3.2 Onscreen Option Trades

At-the-money options traded onscreen over the last hour of the trading session will be considered for valuation of ATM volatility. If the total volume traded is at least 40 contracts across all at-the-money strikes (including both call

and put options), then the ATM volatility will be set to the volume-weighted average volatility of all eligible deals. The volume-weighted average traded volatility is rounded to the nearest 25 basis points.

On trading days when the futures market is locked at the price limit and options match on premium, the resulting trades and system calculated volatilities will be excluded from the VWAP calculation. Delta option trades will continue to be considered as normal.

3.3 Delta Option Quotes

Volatility bids and offers on delta options will be considered in the ATM volatility process. In order to be considered, the order must meet the following criteria:

- At-the-money strike
- Minimum quantity of 40. If there are two orders for the same strike and at the same volatility (i.e. call and put – both Bids or both Offers) that have a combined quantity of 40 or more, then these will be considered.
- Quoted for a continuous period of no less than 15 minutes during the time window 11:30 to 11:45, or 16:30 to 16:45 (i.e. the 30 minute window ending 15 minutes before market close)

The JSE will aim to publish a list of all orders that meet the qualifying criteria to market participants during the last 15 minutes prior to market close, on a best endeavours basis. Should the JSE fail to publish an eligible order in this manner for any reason whatsoever, that order may still be considered for ATM volatility purposes.

Any eligible order will be rounded to the nearest 25 basis points before being considered for daily valuations.
Any order that is partially filled and as a result does not meet the continuous 15 minute period requirement will not be considered as an eligible order for ATM volatility purposes.

3.4 ATM Volatility Methodology

The final methodology applied to determine the closing ATM volatility is as follows:

- Start with the previous day's ATM volatility
- Where there is eligible onscreen traded volatility the ATM volatility is set to this
- Where there is an eligible delta option quote with a higher bid then set the ATM volatility to this
- Where there is an eligible delta option quote with a lower offer then set the ATM volatility to this

Where options on a particular future trade for the first time on a day, but there are no eligible onscreen option trades or delta option quotes, then the JSE will use the all available trade statistics for the day to determine the ATM volatility.

> ***AN EXAMPLE**: If the VWAP calculation for WMAZ was 25% and there is a **better volatility bid** of 26% in at least 40 contracts (the 40 contracts can consist of a single or multiple quotes aggregated based on **same strike and same volatility**), then the MTM will move to 26%.*
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> *If for the same contract the VWAP calculation was 25% and a **lower volatility offer** of 23% is on screen throughout the required period, then the MTM will move to 23%. Since quotes across the defined strike range will be considered during the 15 minute period including the orders quoted in the depth, should this improve on the VWAP calculation the MTM will be amended.*
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> *Again considering the above scenario where **40 contracts are offered at 23% and 10 contracts traded during the 15 minute period**, the 10 will **not** be included in the VWAP calculation.*

4) OPTION CLOSEOUT FOR PHYSICALLY-SETTLED GRAIN MARKET PRODUCTS

The MTM processes on option expiration day for all expiries of physically settled grain market products will be as follows:

- The time-weighted average price for futures MTM will be determined 45 minutes earlier than usually, typically in the 11:10 to 11:15 window. This will be the case for all expiries.
- The JSE will aim to publish the futures MTM price specific to the option expiry month at least 30 minutes prior to market close, on a best endeavours basis. MTM prices for other expiries will be included in the normal end of day pricing products.
- Long position holders of options will be able to exercise or abandon any option up to 11:45 on the day
- For the remaining 15 minutes of trade until 12:00, the option exercise and abandon functionality will be disabled to allow option sellers the opportunity to manage their exposure
- Should trading hours for the products change, the above times may be adjusted accordingly.

Should you have any further questions please feel free to contact us: valuations@jse.co.za.

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