

MARKET NOTICE

Johannesburg
Stock Exchange

Tel: +27 11 520 7000
www.jse.co.za

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Relates to:

- Equity Market
- Equity Derivatives
- Commodity Derivatives
- Interest Rate and Currency Derivatives
- Cash Bonds Market
- Bond ETP Market

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SUBJECT: EDM Implied Volatility MTM Process

Name and Surname: Mzwandile Riba

Designation: Head - Data Solutions

1. Introduction

The JSE makes use of trade data as the primary basis for marking at-the-money (ATM) implied volatility to market. The expiries for both single stock options and index options are marked using the same algorithm with a few differences in the eligibility criteria used for qualifying input data. The process ideally tries to incorporate as much market information as possible. Calculations are automated within the JSE's in-house **Valuation Input System (VIS)**. VIS obtains trade information from the JSE trading engine and in turn uses this in its calculations. It is thus highly critical that the information captured by trading members be captured accurately. This is especially important in the case of off book or "report only" trades.

It is of paramount importance that the methodology adopted by the Valuations team remains objective, efficient and transparent to all stakeholders in the Equity Derivatives Market (EDM). This notice serves to inform all market participants of the current methodology and seeks to also obtain insights from EDM participants regarding the input data.

2. Description of the Mark-to-Market Methodology:

The Valuation Input System (VIS) receives trade data from the JSE trading engine. For each trade, the data includes the following:

- Traded premium

- Underlying futures reference price
- Strike Price
- Expiry Date
- Traded implied volatility

VIS then calculates a “**Skew Adjusted ATM volatility**” by considering the following calculated inputs

- $Moneyness = \frac{Strike}{Underlying\ Futures\ Ref}$
- *Skew Adjustment = Linearly Interpolated Skew Adjustment Given Expiry and Moneyness*
 - For example:
90% Strike JUN20 ALSI skew adjustment = 2.11%
- **Skew Adjusted ATM Volatility = Traded Volatility – Skew Adjustment**

For each expiry considered within each listed contract, the volume-weighted average (weighted by number of contracts traded) of the skew adjusted ATM volatilities is computed and applied as the mark-to-market (MTM) ATM volatility. The qualifying criteria for trades are different for single stock and index options.

For index options, this includes:

- Trades of **500 contracts** or more
- Strikes of moneyness from **95% to 105%**

For single stock options, the qualifying criteria are as follows:

- Trades of **100 contracts** or more
- Strikes of any moneyness

When options are traded for the first time against an expiry, such as Anyday expiries, standard monthly expiries or far dated standard expiries being listed for the first time, this first option trade or trades are used as the primary source for MTM information regardless of trade size or moneyness. The appropriate skew adjustment will be calculated for each trade of this nature and applied.

3. Marking ATM volatility in the absence of trade data:

In the absence of any trade data being recorded against any expiry, the JSE uses a “sticky strike” methodology to mark the ATM implied volatility to market. In a this scenario, the methodology assumes that the shape of the skew remains static around absolute strikes while the relative ATM strike (100% strike) will shift along the skew by the change in the absolute value of the underlying.



This is similar to assuming that the new underlying level is a traded strike whose moneyness is calculated relative to the previous closing level of the underlying futures contract. This moneyness is then used to calculate its related “skew adjustment” as for all new option trades.

4. Weekly Implied Volatility Surface Adjustment

On a weekly basis, the Valuations team conducts an adjustment to the volatility surfaces used for index options and single stock options. The data is sourced from third party vendor provider, SuperDerivatives (Ice Data). The JSE applies the same volatility surface for all index options. This includes the ALSI, DTOP and DCAP contracts. The surface remains constant for the week, including the tenors, which are used to interpolate for each applicable expiry (by dividing the actual days to expiry by 365).

The single stock surface is taken as an average of surfaces for 5 major stocks (NPN, FSR, SOL, AGL and SHP) which represent 5 major industry groups. The JSE has historically used a static skew for single stock options. The updated process which was developed and deployed within VIS incorporates weekly adjustments to account for any changes that may have occurred over the period.

5. March 2020 Global Volatility

The recent volatility experienced in the market necessitated a different approach to the process as discussed. One of the interventions that had to be considered was the removal of the current maximum limits applied to daily changes to the ATM implied volatility. These are set at absolute moves of **2%** for index ATM implied volatility and **6%** for single stocks. The decision that was taken to move away from these limits allowed for more appropriate adjustments as suggested by observed trade data. The deviation from the automated process has led to a review in order to implement this approach on a longer term basis.

One of the downsides of the heightened levels of risk aversion and pricing uncertainty in the market was the reduction in liquidity in option trades. Pricing has continued to be unfavourable with wider bid and offer spreads

persisting although the situation continues to improve. These liquidity challenges do in turn mean that the amount of data available to inform appropriate MTM levels is also reduced. The JSE has thus sought proxies such as observed changes in the implied volatility of the S&P500 Index and other appropriately liquid global indices and markets. The appropriateness of this exercise will vary with time and market conditions.

The challenges for single stock options have been even more pronounced than for index options. The Valuations process has had to refer stocks to their changes in realised volatility resulting from the risk off sentiment. References were also made to trade data from related stocks experiencing similar challenges to their operational environments and thus earnings. In the possible wake of a reduction in risk aversion, adjustments to the implied volatilities of similar magnitude, will have to be made in the opposite direction. The Valuations team continues to observe trade data which may fall outside the automated qualifying criteria to better inform the MTM process.

6. Consultation on changes to the existing methodology

Since the introduction of VIS for the EDM and FX derivatives markets in the past year, the Valuations team has continued to receive valuable input from various stakeholders. The JSE values all input received in this regard as this is important to ensuring that valuation methodologies applied remain appropriate given the challenges faced by all market participants.

Following the various sets of feedback received and in attempting to capture the general themes, the following suggestions are made as possible changes to the existing methodology. In order to garner as much value from this exercise as possible, the JSE encourages that all stakeholders receiving this note provide feedback on the various suggestions raised and others they may have.

1. Reduction of the number of contracts:

The existing minimum contract size allowable for the MTM process for index options is 500 contracts. The purpose of setting this number, through consultation, was to establish a minimum trade size that creates sufficient market maker competitiveness to establish a fairer reflection of market levels. Having observed this MTM process since its deployment to the production environment, we believe that this does not capture sufficient liquidity for the MTM process. A consideration is made to reduce the number of contracts for this requirement:

- a. Reduce the minimum requirement to **200** contracts
- b. Different number?

2. Widen the moneyness range for allowable trades:

The moneyness currently allowed is designed to minimise the impact of the difference in the skews observed in the market. The new process of frequently updating the volatility surface has been a better representation of the market although not perfect. This is especially the case for index options. The current range considered for index options includes trades whose strikes range from **95% to 105%** of their underlying futures price. A wider range will have the effect of capturing more trades for the MTM process

- a. Widen the moneyness range for qualifying index option trades to **90% to 110%**

- b. Different range size?

3. Upward adjustment or removal of the maximum limit for daily moves:

The levels established for maximum moves were put in place as a mechanism to protect against incorrect, adverse moves caused by booking errors by members which could lead to large variation margin calls not informed by true market levels. The adverse market conditions observed during March necessitated for a move away from applying the caps due to the large daily moves observed in the market. The larger than normal adjustments to the ATM volatilities were executed via manual intervention from the Valuations team. VIS allows for enhancing this methodology to using the **daily trading range (high vs low)** to determine if the underlying future price is within this range as a sanity check. The suggestions regarding the move limits are as follows:

- a. Remove the maximum moves limitation allowing **all** legitimate trades to affect MTM changes accordingly
- b. **10%** moves for both index options and single stock options
- c. Adjusting the cap to a different level?

4. Use of on screen quotes (JSE delta options):

The VIS development team has automated the capture of on screen quotes via the use of JSE “delta options”. In the past, the JSE Nutron system would publish an anchor strike and allow members to put up bids and offers against this to determine the closing MTM volatility. VIS allows for the active use of delta options across various strikes and expiries. The process is currently configured to run from **17h00 to 17h05** with a random snapshot being taken during this time. For the adopted moneyness range as described above, the following are proposals for methodologies that can be adopted going forward, incorporating the use of on screen quotes in addition to trades:

a. Use a combination of on screen quotes and trades for the MTM process in the following way:

- i. For a particular contract expiry, compute the best **skew adjusted** bid and the best **skew adjusted** offer based on all eligible quotes. Quotes can only be comparable once they have been converted to apply to the ATM strike (closing level of underlying future) using the prevailing skew.
 1. Calculate the **volume weighted** ATM volatility from trade data
 2. Where the number established from trade data is within the bid and offer spread, apply this number as the MTM level
 3. Where the **bid volatility** is higher than the volume weighted number, use the bid volatility as the MTM level (this also applies to the case where only a bid exists)
 4. Where the **offer volatility** is lower than the volume weighted number, use the offer volatility as the MTM level (this also applies to the case where only an offer exists)
 5. Where there are no trades, the previous closing level of the ATM implied volatility for the particular contract expiry is used as the starting basis.
 6. Where no trades or screen quotes exist, the sticky strike method is used to adjusted the previous closing ATM volatility to establish the MTM level

b. Establish the most appropriate time for running this process:

The current time configured for running the process (**17h00**) was chosen to coincide with the close of the cash equity closing auction and the time when the MTM snapshot for **ALSI futures** is taken.

- i. Keep the current time for running the process
- ii. Run the process earlier at **16h00**

c. Establish the most appropriate duration for quotes to be on screen:

Currently the snapshot window has been configured to run for the 5 minutes from 17h00 to 17h05 on a given trading day.

- i. Keep the current duration required for quotes to be up on screen
- ii. Extend the duration to **30 minutes** for quotes to be on screen
- iii. A different duration?

d. Minimum quote size for eligible trades:

A minimum quote size should be established in order to incentivise the quoting of values that are representative true market levels

- i. Minimum quote size of **50 contracts** for index options
- ii. Minimum quote size that is in line with established minimum trade sizes allowable in the computation of the volume weighted ATM volatility
- iii. A different number of contracts?

5. More frequent changes to the implied volatility surface:

VIS has allowed for the incorporation of a more flexible implied volatility surface. This is adjusted on a weekly basis. The market volatility observed recently has raised the possible need to both capture more agile changes in the levels of the ATM implied volatility and consider more frequent changes to the implied volatility surface for index and single stock options:

- a. Automation a daily adjustment to the VIS implied volatility surface for single stocks and index options
- b. Retain the current process that runs once a week

7. Responding to The Consultation

All interested market participants are invited to respond to this methodology consultation. All responses should be made with respect to the numbered proposals, and should include the details of the respondent, as well as their role in the equity derivatives market.

Responses should be directed in writing to valuations@jse.co.za no later than **Wednesday, 20 May 2020**.

This document is not confidential and should be distributed as widely as possible to all stakeholders.