JSPAN TECHNICAL SPECIFICATION

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List of Acronyms

ATM Volatility	At the money volatility
CSG	Class Spread Group
CSMR	Calendar Spread Margining Requirement
EoD	End of Day
IMR	Initial Margin Requirement.
JSE	Johannesburg Stock Exchange
MtM	Marked to Market
P&L	Profit and Loss
PSS	Price Scenario Steps
SSMR	Series Spread Margin Requirement
SSG	Series Spread Group
VSR	Volatility Scanning Range
VSS	Volatility Scenario Step

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1 INTRODUCTION

1.1 About this document

This document provides guidance on the JSE's JSPAN Margin Methodology and the way it is calculated. The JSE's Initial Margin methodology consists of multiple components that are detailed in the JSEC IM Methodology document. The aim of this document is to specify the calculation framework for the JSPAN component.

After a brief introduction the document will present how JSPAN is structured and it will go through all the steps necessary to calculate the actual JSPAN value. It will indicate how and how the report data needed to replicate on a daily basis.

The structure of this document is as follows:

- Section 1 Provides the context for this document
- Section 2 Introduces relevant Reference Data
- Section 3 Introduces the concept of Risk Arrays
- Section 4 Provides a high-level overview of the JSPAN methodology
- Section 5 Is a detailed explanation of the necessary steps to calculate JSPAN
- Section 6 Shows the detailed output of the steps in section 5 applied to a portfolio
- Section 7 Contains an overview of the rounding applied at the various steps of the JSPAN calculation
- Section 8 Contains the input and output data refered to in section 6
- Section 9 Contains technical detail of how to obtain the data from the JSE to calculate the JSPAN requirement on a daily basis

1.2 Introduction to JSPAN

Initial margin (IM) represents the primary prefunded line of defence for JSE Clear (JSEC) in managing the risks associated with clearing financial instruments. IM is calculated at an individual account level. In the event of default the IM posted against the exposures held in a particular account can only be used to satisfy the losses incurred in liquidating the positions held in that particular account.

Account level IM is made up of three distinct components:

1.2.1 JSPAN (Base)

JSPAN is the framework used to calculate the base margin requirement for all derivatives contracts cleared by JSEC except swap futures.

It should be noted that the JSE intends to replace the JSPAN methodology used for the base IM with a Historical Value at Risk methodology at some point in the future.

Liquidation period and large exposure requirements are additional margins added to the base.

1.2.2 Liquidation Period Add-on

The Liquidation period Add-on is additional margin calculated to mitigate the risk associated with positions that will take longer to liquidate than is assumed under the base requirement.

1.2.3 Large Exposure Add-on

The Large Exposure Add-on is additional margin calculated to mitigate the risk presented by exposures which are large enough to put the JSE at risk under extreme but plausible market conditions.

1.3 Markets

The way in which JSPAN is described in this document covers the margin methodology applied to Equity Derivatives, Foreign Exchange Derivatives and common Derivative Products (Futures and Options) traded on the JSE.

It is also worth noting that the JSPAN value produced by the approach in this document is market agnostic. A single margin will be produced based on the client's positions across various markets.

2 REFERENCE DATA

As briefly introduced in the previous section, JSPAN is the framework used to calculate the Initial Margin base requirements for all derivatives. This section describes the parameters that feed into the JSPAN algorithm.

2.1 Instrument Reference Data

The following instrument information is needed to apply the JSPAN algorithm.

2.1.1 Instrument Master ID

The master ID of the instrument ensures that the correct instrument's information can be identified. The Instrument Master ID will be provided by the JSE for each derivative in which a client can have position.

2.1.2 Alpha Code

This attribute states the underlying reference instrument of the derivative.

2.1.3 Expiry Date

This attribute states when the instrument expiries. This is needed when instruments are aggregated per CSG and Expiry.

2.1.4 Contract Size

Contract size refers to the quantity of Futures or Options that are included when a single contract is traded on the exchange.

Futures trade in various contract sizes (1, 10, 100, 1000, 10000) on the JSE. A Future with a contract size of 10 means that there are 10 shares included when determining the value of the Futures contract.

Options on the JSE always have a contract size of 1. However, an Option on a Future with a contract size of 10 means that the Option's payoff is determined by the value of a Future whose price is linked to 10 of the underlying shares.

2.1.5 Contract Size Type

Some JSE contracts are offered in more than one contract size. These contracts are the same in all respects apart from their contract sizes. The JSE uses the Contract Size Type to distinguish between such contracts.

The vast majority of instruments listed on the JSE are only available in a single Contract Size Type, namely Base. Below is an example of those that are available in other contract size types (Mini, Maxi) as well:

Contract Code	Alpha Code	Expiry Date	Instrument Class	Contract Size	Contract Size Type	Old Contract Code
Aug2016 ALSI Fut BASE	J200	Aug 2016	FUTURE	10	Base	ALSI
Aug2016 ALSI Fut MINI	J200	Aug 2016	FUTURE	1	Mini	ALMI
Jan2017 ZAUS Fut Base	$ / R	Jan 2017	FUTURE	1 000	Base	ZAUS
Jan2017 ZAUS Fut MAXI	$ / R	Jan 2017	FUTURE	100 000	Maxi	ZAUM

Table 1 – Instrument Reference Data

Table 1 shows that certain Futures are the same in all aspects except for their contract size (i.e. Mini vs Base). These contracts, in which only the contract size differs, are said to be part of a Mini/Maxi group. They are traded as totally separate instruments on the JSE for various reasons.

2.1.6 Contract Code

The Contract Code is a single field that describes the major aspects of the instrument. It is not needed in order to perform the JSPAN calculation but assists greatly in providing context. The field describes the following aspects of the instrument:

- Expiry Date
- Underlying
- Instrument Class (Option or Future)
- Settlement Type
- Contract Size Type

2.2 JSPAN Parameters

Each futures contract has four parameters associated with it that are exclusively used in the JSPAN margin calculation.

- IMR - Initial Margin Requirement
- CSG - Class Spread Group
- CSMR - Calendar Spread Margin Requirements
- VSR - Volatility Scanning Range

Options on Futures inherit the JSPAN parameters from their underlying Future. Some of these parameters are used in generating a risk array for each instrument. Risk arrays are required for each instrument and are described in section 3.

Over and above the parameters that are linked to the instruments themselves, others are linked to the CSG:

- SSG - Series Spread Group
- SSMR - Series Spread Margin Requirement

Table 2 shows how parameters needed for JSPAN are assigned to individual Future contracts.

Contract Code	Alpha Code	Expiry Date	Instr Class	IMR	CSG	CSMR	VSR
Aug2016 MTN Fut Cash	MTN	Aug 2016	FUTURE	2 570	MTNS	140	3
Nov2016 MTN Fut PHY	MTN	Nov 2016	FUTURE	2 800	MTNQ	140	3
Mar2017 MTN Fut PHY	MTN	Mar 2017	FUTURE	2 700	MTNQ	140	3
Aug2016 ALSI Fut BASE	J200	Aug 2016	FUTURE	28 910	ALSI	4 300	2.5
Aug2016 ALMI Fut Mini	J200	Aug 2016	FUTURE	2 891	ALSI	4 300	2.5
Jan2017 ZAUS Fut Base	$ / R	Jan 2017	FUTURE	1 630	ZAUS	250	2
Aug2016 ALMI Put 48000 Mini	J200	Aug 2016	OPTION				
Aug2016 ALSI Put 48000 Base	J200	Aug 2016	OPTION				
Jan2017 $ / R Call 16 Maxi	$ / R	Jan 2017	OPTION				

Table 2 – JSPAN Parameters

Options are not specifically assigned CSG, CSMR, IMR and VSR values but inherit them from their underlying future contracts.

Table 3 shows the typical link between CSG and SSG. Multiple CSGs can be assigned to a single SSG. An SSMR is assigned to a CSG when it forms part of a SSG.

CSG ID	SSG ID	SSG Name	SSMR
ALSI	1560	ALSI\INDI\FINI\FNDI\RESI\CTOP\DTOP GROUP	9000
MTNQ	1568	MTNQ+MTNS Group	140
MTNS	1568	MTNQ+MTNS Group	140
SABQ	1564	SABQ_Group	250
SBKQ	1566	SBKQ+SBKS Group	65
SOLQ	1596	SOLQ+SOLS Group	160
ZAGB	1562	Currency Futures Offset Group	720
ZAUS	1562	Currency Futures Offset Group	470

Table 3 – CSG\SSG Links

The JSPAN parameters are described below:

2.2.1 IMR

IMR is the **Initial Margin Requirement** and it is designed to cover the loss over the liquidation period that the JSE determined can be incurred on the particular Future contract. It represents the total IM payable on a portfolio involving a single position in the particular contract, no other positions are included. New IMR values are published every two weeks by the JSEC.

The IMR is used as one of the pricing inputs into the contracts risk array and is also used in subsequent steps of the margin aggregation.

2.2.2 CSG

CSG stands for **Class Spread Group** and it represents a group of highly correlated instruments (Options and Futures). Having the instruments in the same CSG means that margin requirements for individual positions can be offset against one another.

2.2.3 CSMR

CSMR stands for **Calendar Spread Margin Requirements**. When trading simultaneously in Futures and Options of the same underlying with different expiries, the margin requirements are lower based on the assumption that the price moves correlate across the contract months. JSPAN is able to adjust the required margin against the net exposure by recognising the risk reducing impact given by

long and short positions in different contracts within the same CSG. The CSMR is the amount of offset.

2.2.4 SSG

SSG stands for **Series Spread Group** and it represents the group to which a number of CSGs can be assigned. Highly correlated CSGs can be grouped together in Series Spread Groups (**SSG**); however, each CSG can belong to only one SSG. This will allow offset of the margin across CSGs.

2.2.5 SSMR

SSMR stands for **Series Spread Margin Requirement**. JSPAN is able to adjust the margin required against the net exposure by recognising the risk reducing impact given by long and short positions in different CSG within the same SSG.

2.2.6 Risk Array

Risk array is an array of contract level Profit and Losses (P&Ls) under various market conditions. It represents how a specific derivative instrument will gain or lose value from the current point in time to a specific point in the Future for a specific set of market conditions which may occur over this time frame.

The smallest (most negative) element of a risk-array for a particular option represents the total IM payable on a portfolio involving a single position in the particular option contract, and no other positions.

Risk Array is required in the first step of the JSPAN margin calculation and is described in more detail in section 3.

2.2.7 VSR

VSR stands for **Volatility Scanning Range.** This parameter is used to determine the extent to which At-the-Money volatilities should be stressed when calculating the risk arrays for Options on the particular Future.

They are used in the calculation of the instrument's risk array but not in the JSPAN margin aggregation. See section 3 for more detail.

3 RISK ARRAYS

A risk array is a group of profit and losses (P&Ls) that can be made on an individual tradable contract. The risk array for a future is obtained by adjusting the price of the future under different scenarios. The risk array of an Option is determined by using the underlying future's risk array as well as adjusted ATM volatilities to revalue the Option with these adjusted inputs.

The adjusted future and volatility scenarios are called "Future Prices Scenarios" and "Volatility Prices Scenarios".

Each contract is exposed to a combination of future price scenarios and volatility price scenarios. The total number of possible permutations is equal to 18 scenarios.

New risk arrays will be published by the JSE at EoD for each tradeable instrument on the JSE's Information Dissemination Portal (IDP).

3.1 Future Price Scenarios

Futures prices scenarios are obtained by adding different portions of the future's IMR to its MtM. This ranges from -100% to 100% of the IMR in 25% increments. This amounts to a total of 9 future price scenarios.

Futures Prices Scenarios								
-1	-0.75	-0.5	-0.25	0	0.25	0.5	0.75	1

The increments of 25% are called the Price Scenario Steps (PSS).

3.2 Volatility Price Scenarios

Volatility price scenarios are obtained by adding different portions of the Future's VSR to its ATM volatility. This ranges from -100% or 100% of the VSR in 200% increments (only 1). This amounts to a total of 2 scenarios.

Volatility Scenarios	
-1	1

This increment of 2 is called Volatility Scenario Step (VSS).

3.3 Risk Array Skeleton

The risk arrays obtained from the Future Prices Scenarios array and the Volatility Prices Scenarios array has the following structure:

	Risk Array 1	Risk Array 2	Risk Array 3	Risk Array 4	Risk Array 5	Risk Array 6	Risk Array 7	Risk Array 8	Risk Array 9	Risk Array 10	Risk Array 11	Risk Array 12	Risk Array 13	Risk Array 14	Risk Array 15	Risk Array 16	Risk Array 17	Risk Array 18
Futures	-1	-0.75	-0.5	-0.25	0	0.25	0.5	0.75	1	-1	-0.75	-0.5	-0.25	0	0.25	0.5	0.75	1
Volatility	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	1	1	1	1	1	1	1

Volatility Prices Scenarios are fixed (increasing from smallest to largest) while Future Prices Scenarios increase from -1 to 1 (smallest to the largest with PSS increments).

In the example above:

- PSS = 0.25
- VSS = 2

These are the parameters within the RTC setup.

Note: The current risk array skeleton will be changed at some point in the future to allow for more granular risk arrays. This will be achieved by changing the PSS and VSS parameters to 0.125 and 0.5 respectively. These parameters will lead to a total of 85 scenario permutations consisting of 17 future scenarios and 5 volatility scenarios.

3.4 Determining the Risk Array

A risk array is calculated in the following way:

1. Valuate each contract at each scenario (price and volatility).
2. Get the latest MtM value of the contract.
3. Subtract the MtM value of the contract from the value of the contract calculated during step 1.
4. The calculated risk array is considered the starting point in the calculation of JSPAN.

For every instrument in the portfolio introduced above is a risk array that caters for all 18 possible scenarios.

The risk arrays will be published daily on JSE's Information Dissemination Portal (IDP).

See section 6.1 Risk Arrays for all risk arrays details for the example portfolio.

3.5 Mini/Maxi Treatment

Each contract has its own risk arrays so 2 or more contracts belonging to a Mini/Maxi Group will have separate risk arrays.

4 METHODOLOGY OVERVIEW

The JSPAN methodology is based on an approach that uses contract-level margin requirements for the positions in a client's portfolio and aggregates them upwards through various steps. Offset may be allowed for margins at the various levels. This causes the final margin amount to be less than the sum of the margin on the individual positions. This happens as follows:

1. A margin requirement is assigned to each individual position which is based on the risk array linked to each contract.
2. Margins are aggregated for positions where the Expiry and CSG of the instruments are the same. This step effectively puts the Future and all of the Options on it into a single CSG\Expiry entity.
3. Margins are aggregated for all CSG\Expiry groups where the CSG is the same. This occurs through a number of sub steps in which offset can be obtained.
4. Margins are aggregated for all CSG groups that are assigned to the same SSG. This occurs through a number of sub steps in which offset can be obtained.

The aggregation hierarchy is illustrated in **Error! Reference source not found.** below.

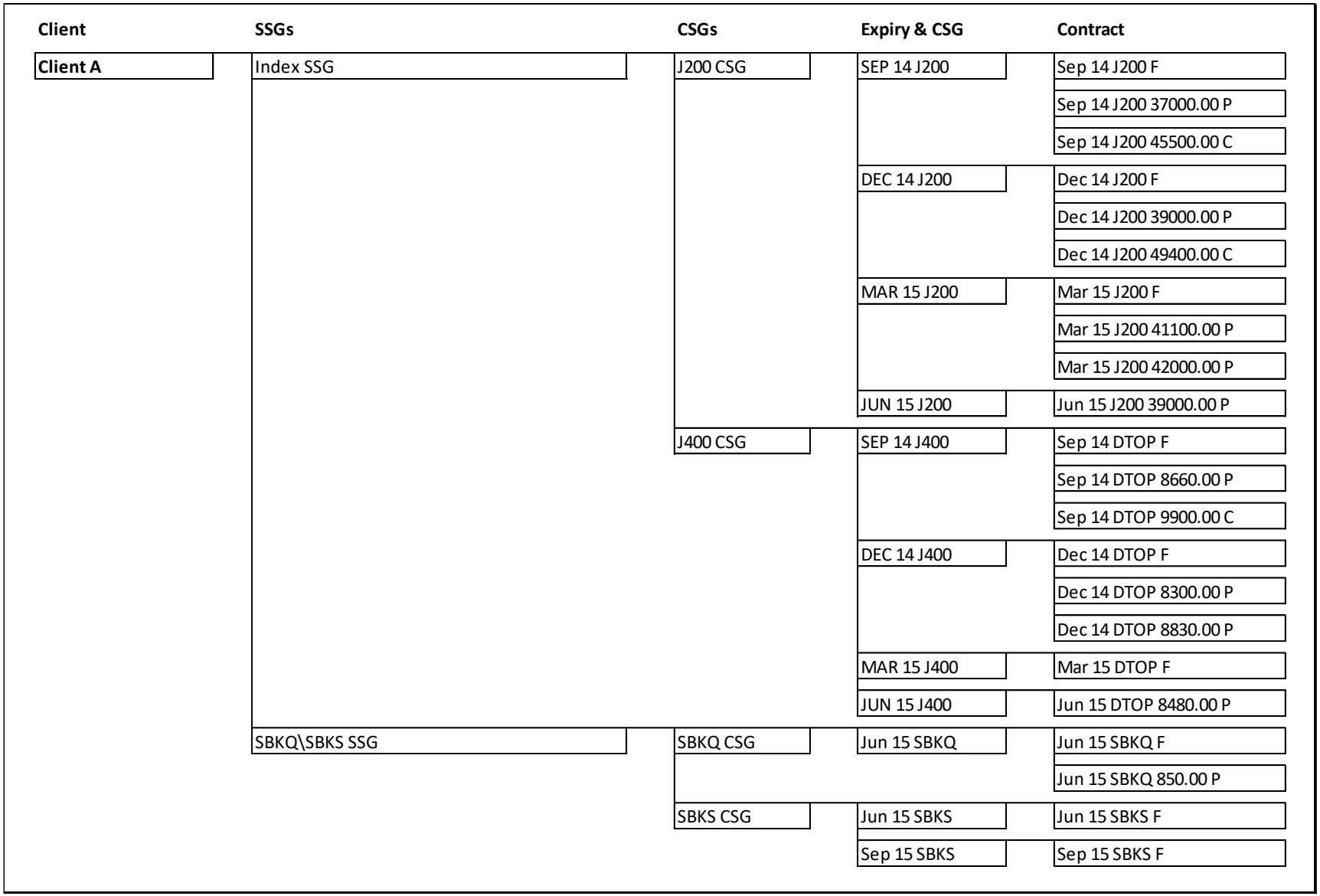

Diagram 1 – JSPAN Overview

5 CALCULATION STEPS

The steps for the JSPAN calculation can be grouped as follows:

1. Risk Arrays
2. Contract Residual Exposure (CREs)
3. Net Residual Exposure (NREs)
4. Deltas
5. Provisional Net Exposure (PREs)
6. Adjusted Net Residual Exposure (Adj NREs)
7. Group Deltas
8. Group PREs
9. Group Adj PREs

The example in section 6 can be referenced for each of the calculation steps.

5.1 Risk Arrays

Risk arrays were introduced in section 4. The entire JSPAN calculation is based on risk arrays.

A risk array is required for each netted position in a client's portfolio. The elements in the risk array must follow the sequence set out in section 3.3. This is also the sequence in which the JSE will publish risk arrays at each EoD.

Risk arrays are published in ZAR to two decimals (cents).

Section 6.1 shows the risk array assigned to each contract in the portfolio in section 6.

5.2 CREs

The first step in calculating JSPAN is the calculation of the Contract Residual Exposures (CREs). This is done by multiplying the net position in each contract with all the elements in its risk array.

Once the multiplication has taken place there must be a CRE array for each item in the portfolio.

All elements in the CRE array are rounded to two decimals (cents).

The CRE results are displayed in section 6.2.

5.2.1 Instruments without a CSG

Certain instruments (e.g. Forward-forwards) might not be assigned a CSG by the JSE. This would be for instruments where JSE Risk does not want their margin to be offset with any other instruments.

Positions in instruments for which no CSG has been assigned need to be specifically catered for within the JSPAN methodology. Positions in instruments without a CSG (and by implication an SSG) need to filter down to all the remaining steps in the JSPAN aggregation. Each of these instruments should effectively be treated as if they had been assigned their own unique CSG and SSG.

5.3 NREs

Net Residual Exposures (NREs) are calculated from CREs due to the CSG linked to each instrument. The number of arrays can be reduced from 9 to 5 (the number of different CSGs with different expiries).

The process to do so consists of summing together the corresponding elements in the CRE array for instruments with the same CSG and same expiry date. This step effectively creates a single row for a Future and all of its Options.

Positions in instruments within a Mini/Maxi Offset group are also aggregated in this way as long as they belong to the same CSG and expiry group.

In the example that is being considered we have the below:

Contract Name	Expiry	CSG
Aug2016 MTN Fut Cash	05-Aug-16	MTNS
Nov2016 MTN Fut PHY	04-Nov-17	MTNQ
Mar2017 MTN Fut PHY	04-Mar-16	MTNQ
Aug2016 ALSI Fut BASE	05-Aug-16	ALSI
Aug2016 ALSI Fut Mini	05-Aug-16	ALSI
Jan2017 ZAUS Fut Base	31-Jan-17	ZAUS
Aug2016 ALSI Put 48000 Mini	05-Aug-16	ALSI
Aug2016 ALSI Put 48000 Base	05-Aug-16	ALSI
Jan2017 $ / R Call 16 Maxi	31-Jan-17	ZAUS

NREs

CSG	Expiry
MTNQ	04-Nov-16
MTNQ	04-Mar-17
MTNS	05-Aug-16
ALSI	05-Aug-16
ZAUS	31-Jan-17

Table 4 – Aggregating CSGs & Expiries per CSG

This was achieved by summing together the CRE arrays of instruments with same CSG and expiry. The number of arrays drops from 9 (one for each instrument) to 5 NREs arrays (See NREs details in 6.3). It means that the example portfolio contains instruments that have a duplicate CSG and expiry.

There are four Futures that have the ALSI as the CSG and the expiry on 05 August 2016 and therefore only one NRE array is necessary for the four. Similarly other CRE arrays are reduced from 2 to 1 (ZAUS as CSG and 31-Jan-2017 as expiry) when calculating NREs.

All NREs are rounded to two decimals (cents).

5.3.1 Mini/Maxi Treatment

In section 2.1.5 we noticed that certain futures are the same in all aspects except for their contract size (i.e. Mini vs Base). Such contracts, in which only the contract size differ, are said to be part of a Mini/Maxi group but are traded as totally separate instruments on the JSE for various reasons.

Each contract has its own risk arrays so 2 or more contracts belonging to a Mini/Maxi Group will have separate risk arrays.

In subsequent steps of the calculation, JSPAN requires an IMR value associated with the aggregated risk array. If the risk array contains positions in instruments from a Mini/Maxi group it means that different futures are represented in the group. Each of these futures will have its own IMR value assigned. The IMR value used for the group must be from the future with the Base contract size type.

Deltas

Deltas are a measure of how many outright Futures contracts the class position behaves like.

Deltas are calculated by considering the difference between two consecutive elements in the NRE array from the same volatility price scenario.

Let's introduce the following notation to make the example clearer.

NRE_i = The value in the "i" position for a specific NRE array and it can be generalised to any array

$IMR_{CSG\ \&\ Expiry}$ = The IMR of a Future of a specific CSG and Expiry and with a Base contract size type.

NRE_{11} = The 11th element for a specific NRE array.

Now that we have introduced the NRE_i notation it is easier to indicate how to perform the Delta calculation.

The Delta is then calculated by normalising the difference between 2 consecutive values in the NRE arrays by the IMR of the instrument and a factor (PSS introduced in section 4).

Using the notation we have just introduced we can write the formula below.

$$\boldsymbol{Delta_i = \frac{NRE_{i+1} - NRE_i}{PSS \times IMR_{CSG\ and\ Expiry}}}$$

$$\boldsymbol{for\ i = 1, .., 18 \qquad i \neq 9, 18}$$

$$\boldsymbol{Delta_9 = Delta_{18} = blank}$$

Where PSS = 0.25

For each CSG with a different Expiry we will have an array that is 18 elements long.

It is important to note the following:

- Delta values are not calculated across different volatility scenarios. This is the reason why the 9th and the 18th elements are blank. When the PSS is changed, other elements will be blank.

The maximum delta value in the delta array also needs to be identified.

Now that we have calculated the Deltas the next step is the introduction of some quantities linked to the Deltas and then calculation of the Provisional Net Exposure (PRE) and all the fields that result from PREs. The deltas just obtained will be used in the calculation of some of these fields.

Delta values are rounded to 2 decimal places.

The results for the portfolio are displayed in section 6.4

5.4 PREs

Provisional Net Exposures (PREs) are arrays calculated from CREs. The total number of PREs is equal to the number of unique CSGs within the portfolio.

The way PREs differ from NREs is that while NREs are calculated by summing together CREs with same CSG and expiry, PREs are calculated by summing together CREs with the same CSG (expiry condition dropped).

PREs

CSG
MTNQ
MTNS
ALSI
ZAUS

In the portfolio we have 5 NREs (different CSG and different expiry) which are reduced to 4 PREs one per each unique CSG.

PRE values are not rounded.

See section 6.5 for PREs details of the portfolio that are based on the CREs in section 6.2 and the NREs in section 6.3.

5.5 PRE Quantities

To proceed in the calculation of JSPAN some quantities need to be introduced. The calculation of these fields is described below and the results can be viewed in section 6.6.

BEFORE	This represents the minimum NRE element per array for each CSG/Expiry combination multiplied by -1. Rounded to 2 decimals
AFTER PLACE	This represents the position of the element in the PRE array with the minimum value for each CSG/Expiry combination.
AFTER	This represents the value of the element in the NRE array corresponding to the AFTER PLACE for each CSG/Expiry combination multiplied by -1.
BENEFIT	This represents the difference between the “BEFORE” and the “AFTER” values. Rounded to 2 decimals
POTENTIAL SLACK	This is equal to the “BEFORE” value in case the “BENEFIT” is zero otherwise it is zero. Rounded to 2 decimals
TOTAL BEFORE	This is the sum across the “BEFORE” values sharing the same CSG. It is calculated per CSG.
TOTAL BENEFIT	This is the sum across the “BENEFIT” values sharing the same CSG. It is calculated per CSG.
TOTAL POTENTIAL SLACK	This is the sum across the “SLACK” values sharing the same CSG. It is calculated per CSG.
ACTUAL SLACK	This is the minimum between the “TOTAL BENEFIT” and the “TOTAL POTENTIAL SLACK”. It is calculated per CSG. Rounded to 2 decimals
OFFSET PROPORTION	This is the ratio between the “ACTUAL SLACK” and the “TOTAL POTENTIAL SLACK”. In case the “TOTAL POTENTIAL SLACK” is zero, it is set to the value of 1. It is calculated per CSG. Rounded to 2 decimals
QUE	The “OFFSET PROPORTION” value calculated for each CSG is assigned to each CSG/Expiry combination.
CSM	This is the product between CSMR, “Max Delta” and “QUE”. It is calculated per CSG/Expiry combination. The CSMR is obtained from the Base Future in the CSG/Expiry combination. Rounded to 0 decimals
TOTAL SPREAD MARGIN	This is the sum across the “CSM” values sharing the same CSG. It is calculated per CSG.

5.6 Adj NREs

Adjusted Net Residual Exposures (Adj NREs) differ from NREs because the number of arrays is reduced due to instruments having the same CSG.

The number of NRE arrays in the previous section is 6. The number of Adj NREs arrays drop to 4 because there are 2 NRE arrays that share the same CSG.

Adj NREs

CSG
MTNQ
MTNS
ALSI
ZAUS

Adj NRE's array elements are calculated for each CSG as the maximum value between:

1. The difference between the CSG's corresponding element in the PRE array and the "TOTAL SPREAD MARGIN" as calculated in PRE Quantities section.
2. The "TOTAL BEFORE" as calculated in PRE Quantities section.

Each element of the Adj NRE array is calculated in the same way.

All NREs are rounded to two decimals (cents).

Adj NREs arrays details are in section 6.7.

5.7 Group Deltas

Group Deltas are calculated for each CSG by determining the difference between consecutive elements in the Adj NREs array and normalising the result by a factor. This factor is the product of the PSS and the minimum IMR per CSG.

Using the notations previously introduced we can write the formula below:

$$\boldsymbol{Group\ Delta_i = \frac{Adj\ NRE_{i+1} - Adj\ NRE_i}{PSS \times IMR_{Min}}}$$

$$\boldsymbol{for\ i = 1, .., 18 \qquad i \neq 9, 18}$$

$$\boldsymbol{Delta_9 = Delta_{18} = blank}$$

Where the minimum IMR per CSG across all expiries is indicated by IMR_{Min} and PSS = 0.25.

Group Delta values are rounded to 2 decimals and can be viewed in section 6.8

5.8 Group PREs

Similarly to the way PREs were calculated, Group PREs are arrays whose elements are calculated as the sum of the elements in the Adjusted NREs arrays which have the same SSG (section 0). Group PREs are calculated per SSG by summing together Adj NREs which have the same SSG.

From section 6 we know that:

CSG	SSG Name	SSG Code	SSMR
MTNQ	MTNQ+MTNS Group	1568	140.55
MTNS	MTNQ+MTNS Group	1568	140
ALSI	ALSI\INDI\FINI\FNDI\RESI\CTOP\DTOP GROUP	1560	9000
ZAUS	Currency Futures Offset Group	1562	470

Table 5 –SSMRs per CSG

There are only two CSGs that are linked to the same SSG:

- MTNQ
- MTNS

Based on the definition of Group PREs they share a Group PRE array. This means that there should be three Group PRE arrays.

Group PRE values are not rounded. They can be viewed in section 6.9.

5.9 Group PREs Quantities

Similarly to the way in which section 5.5 was set out, certain quantities need to be introduced in order to proceed with the calculation of JSPAN. These quantities have the same names as the ones introduced previously and are strongly correlated to them.

BEFORE	This represents the minimum value in the Adj NRE array. This is calculated for each CSG. Rounded to 2 decimals
AFTER PLACE	This represents the position of the minimum element in the Group PREs array. This is calculated for each CSG.
AFTER	This represents the value of the Adj NRE element corresponding to the position of the "AFTER PLACE". This is calculated for each CSG.
BENEFIT	This represents the difference between the "BEFORE" and the "AFTER" values. This is calculated for each CSG. Rounded to 2 decimals
POTENTIAL SLACK	This is equal to the "BEFORE" value when the "BENEFIT" is zero, Otherwise it is zero. This is calculated for each CSG. Rounded to 2 decimals
TOTAL BEFORE	This is the sum across the "BEFORE" values sharing the same SSG. This is calculated for each SSG.
TOTAL BENEFIT	This is the sum across the "BENEFIT" values sharing the same SSG. This is calculated for each SSG.
TOTAL POTENTIAL SLACK	This is the sum across the "SLACK" values sharing the same SSG. This is calculated for each SSG.
ACTUAL SLACK	This is the minimum between the "TOTAL BENEFIT" and the "TOTAL POTENTIAL SLACK". This is calculated for each SSG. Rounded to 2 decimals
OFFSET PROPORTION	This is the ratio between the "ACTUAL SLACK" and the "TOTAL POTENTIAL SLACK". In case the "TOTAL POTENTIAL SLACK" is zero the value is set to 1. This is calculated for each SSG. Rounded to 2 decimals
QUE	The "OFFSET PROPORTION" value calculated per SSF is assigned to each CSG that is linked to the SSG. This is calculated for each CSG.
SSM	This is the product of the CSG's SSMR, "Max Group Delta" and "QUE". This is calculated for each CSG. Rounded to 0 decimals
TOTAL SPREAD MARGIN	This is the sum across the "SSM" values for each CSG that share the same SSG. This is calculated for each SSG.

These quantities are calculated in a very similar way to what was done before. The only difference is that NREs and Deltas are now replaced by Adj NREs and Group Deltas respectively.

The elements for the Group PREs Quantities arrays are available in section 6.10.

5.10 Group Adj PREs

For each SSG a Group Adj PRE array is required. Each element belonging to the Group Adj PREs array is calculated as the max between two quantities:

1. The difference between the corresponding Group PREs element and the "TOTAL SPREAD MARGIN" as calculated in the Group PREs Quantities section
2. The "TOTAL BEFORE" as calculated in the Group PREs Quantities section.

The minimum Group Adj PRE for each SSG is also required.

All Group Adj PRE values are rounded to 2 decimals and are shown in section 6.11.

5.11 Final JSPAN Margin

The JSPAN Margin is defined as the aggregation of the minimum values across the Group Adj PREs. These are shown in section 6.12.

6 EXAMPLE

Section 5 explained how each of the steps in JSPAN is calculated. In this section we will present a detailed example of these calculations. This example is based on a client having a portfolio that includes of the following range of instruments:

- Futures
    - Index
    - Single Stock Equity
    - Forex
- Options on
    - Index
    - Forex

The portfolio is made up as follow:

Contract Code	Alpha Code	Expiry Date	F/C/P	Strike Price	CSG	Contract Size	Contract Size Type	Position
MTN Nov2016 MTNQ Base F	MTN	04-Nov-16	F		MTNQ	100	Base	100
MTN Mar2017 MTNQ Base F	MTN	04-Mar-17	F		MTNQ	100	Base	200
MTN Aug2016 MTNS Base F	MTN	05-Aug-16	F		MTNS	100	Base	-60
J200 Aug2016 ALSI Base F	J200	05-Aug-16	F		ALSI	10	Base	500
J200 Aug2016 ALSI Mini F	J200	05-Aug-16	F		ALSI	1	Mini	-5 000
J200 Aug2016 ALSI Base P 48000	J200	05-Aug-16	P	48000	ALSI	1	Base	-600
J200 Aug2016 ALSI Mini P 48000	J200	05-Aug-16	P	48000	ALSI	1	Mini	60
$ / R Jan2017 ZAUS Base F	$ / R	31-Jan-17	F		ZAUS	1000	Base	2 000
$ / R Jan2017 ZAUS Maxi C 16	$ / R	31-Jan-17	C	16	ZAUS	1	Maxi	10

Table 6 –Example Portfolio

The following JSPAN Parameters are assigned to the futures:

Contract Code	Alpha Code	Expiry Date	CSG	IMR	CSMR	VSR
MTN Nov2016 MTNQ Base F	MTN	04-Nov-16	MTNQ	2 800	140	3
MTN Mar2017 MTNQ Base F	MTN	04-Mar-17	MTNQ	2 700	140	3
MTN Aug2016 MTNS Base F	MTN	05-Aug-16	MTNS	2 570	140	3
J200 Aug2016 ALSI Base F	J200	05-Aug-16	ALSI	28 910	4 300	2.5
J200 Aug2016 ALSI Mini F	J200	05-Aug-16	ALSI	2 891	4 300	2.5
$ / R Jan2017 ZAUS Base F	$ / R	31-Jan-17	ZAUS	1 630	250	2

Table 7 –JSPAN Parameters for example portfolio

Option contracts do not have these parameters directly linked to them. The Options assume the parameters of the underlying Futures contract.

i.e. Aug 2016 ALSI Put 48000 Base will inherit the parameters below from J200 Aug2016 ALSI Base F:

IMR	CSG	CSMR	VSR
28 910	ALSI	4300	2.5

The CSGs in the portfolio are linked to the following SSGs. Each CSG assigned to an SSG also gets an SSMR value.

CSG	SSG Name	SSG Code	SSMR
MTNQ	MTNQ+MTNS Group	1568	140.55
MTNS	MTNQ+MTNS Group	1568	140
ALSI	ALSI\INDI\FINI\FNDI\RESI\CTOP\DTOP GROUP	1560	9000
ZAUS	Currency Futures Offset Group	1562	470

Table 8 –SSGs per CSG for portfolio

6.1 Risk Arrays

Code	CSG	Expiry Date	Strike Price	F/C/P	MTM Price	Value 1	Value 2	Value 3	Value 4	Value 5	Value 6	Value 7	Value 8	Value 9	Value 10	Value 11	Value 12	Value 13	Value 14	Value 15	Value 16	Value 17	Value 18
Aug2016 MTN Fut Cash	MTNS	05-Aug-16		F	178.89	-2570	-1928	-1285	-643	0	643	1285	1928	2570	-2570	-1928	-1285	-643	0	643	1285	1928	2570
Nov2016 MTN Fut PHY	MTNQ	04-Nov-16		F	236.94	-2800	-2100	-1400	-700	0	700	1400	2100	2800	-2800	-2100	-1400	-700	0	700	1400	2100	2800
Mar2017 MTN Fut PHY	MTNQ	04-Mar-17		F	176.22	-2700	-2025	-1350	-675	0	675	1350	2025	2700	-2700	-2025	-1350	-675	0	675	1350	2025	2700
Aug2016 ALSI Fut Base	ALSI	05-Aug-16		F	56 017.50	-28910	-21683	-14455	-7228	0	7228	14455	21683	28910	-28910	-21683	-14455	-7228	0	7228	14455	21683	28910
Aug2016 ALSI Fut Mini	ALSI	05-Aug-16		F	56 017.50	-2891	-2168	-1446	-723	0	723	1446	2168	2891	-2891	-2168	-1446	-723	0	723	1446	2168	2891
Jan2017 ZAUS Fut Base	ZAUS	31-Jan-17		F	19.87	-1630	-1223	-815	-408	0	408	815	1223	1630	-1630	-1223	-815	-408	0	408	815	1223	1630
Aug2016 ALSI Put 48000 Mini	ALSI	05-Aug-16	48 000	P	0.03	0	0	0	0	0	0	0	0	0	17	8	4	2	1	0	0	0	0
Aug2016 ALSI Put 48000 Base	ALSI	05-Aug-16	48 000	P	0.33	1	0	0	0	0	0	0	0	0	174	81	36	15	6	2	1	0	0
Jan2017 $ / R Call 16 Maxi	ZAUS	31-Jan-17	16	C	38 781.01	-38781	-38781	-38781	-38781	-64	40669	81419	122169	162919	-38781	-38781	-38781	-38411	135	40670	81419	122169	162919

6.2 CREs

CSG	Expiry Date	Strike Price	F/C/P	Position	CRE 1	CRE 2	CRE 3	CRE 4	CRE 5	CRE 6	CRE 7	CRE 8	CRE 9	CRE 10	CRE 11	CRE 12	CRE 13	CRE 14	CRE 15	CRE 16	CRE 17	CRE 18	Min
MTNS	05-Aug-16		F	-60	154200	115650	77100	38550	0	-38550	-77100	-115650	-154200	154200	115650	77100	38550	0	-38550	-77100	-115650	-154200	-154200
MTNQ	04-Nov-16		F	100	-280000	-210000	-140000	-70000	0	70000	140000	210000	280000	-280000	-210000	-140000	-70000	0	70000	140000	210000	280000	-280000
MTNQ	04-Mar-17		F	200	-540000	-405000	-270000	-135000	0	135000	270000	405000	540000	-540000	-405000	-270000	-135000	0	135000	270000	405000	540000	-540000
ALSI	05-Aug-16		F	500	-14455000	-10841250	-7227500	-3613750	0	3613750	7227500	10841250	14455000	-14455000	-10841250	-7227500	-3613750	0	3613750	7227500	10841250	14455000	-14455000
ALSI	05-Aug-16		F	-5000	14455000	10841250	7227500	3613750	0	-3613750	-7227500	-10841250	-14455000	14455000	10841250	7227500	3613750	0	-3613750	-7227500	-10841250	-14455000	-14455000
ZAUS	31-Jan-17		F	2000	-510	84	180	198	198	198	198	198	198	-104538	-48606	-21480	-9000	-3534	-1248	-342	6	132	-104538
ALSI	05-Aug-16	48 000	P	60	5	-1	-2	-2	-2	-2	-2	-2	-2	1046	486	215	90	35	13	4	0	-1	-2
ALSI	05-Aug-16	48 000	P	-600	-3260000	-2445000	-1630000	-815000	0	815000	1630000	2445000	3260000	-3260000	-2445000	-1630000	-815000	0	815000	1630000	2445000	3260000	-3260000
ZAUS	31-Jan-17	16	C	10	-387810	-387810	-387810	-387810	-639	406690	814190	1221690	1629190	-387810	-387810	-387810	-384114	1348	406701	814190	1221690	1629190	-387810

6.3 NREs

CSG	Expiry Date	NRE 1	NRE 2	NRE 3	NRE 4	NRE 5	NRE 6	NRE 7	NRE 8	NRE 9	NRE 10	NRE 11	NRE 12	NRE 13	NRE 14	NRE 15	NRE 16	NRE 17	NRE 18	Min
MTNQ	04-Nov-16	-280000	-210000	-140000	-70000	0	70000	140000	210000	280000	-280000	-210000	-140000	-70000	0	70000	140000	210000	280000	-280000
MTNQ	04-Mar-17	-540000	-405000	-270000	-135000	0	135000	270000	405000	540000	-540000	-405000	-270000	-135000	0	135000	270000	405000	540000	-540000
MTNS	05-Aug-16	154200	115650	77100	38550	0	-38550	-77100	-115650	-154200	154200	115650	77100	38550	0	-38550	-77100	-115650	-154200	-154200
ALSI	05-Aug-16	-505	83	178	196	196	196	196	196	196	-103492	-48120	-21265	-8910	-3499	-1235	-338	6	131	-103492
ZAUS	31-Jan-17	-3647810	-2832810	-2017810	-1202810	-639	1221690	2444190	3666690	4889190	-3647810	-2832810	-2017810	-1199114	1348	1221701	2444190	3666690	4889190	-3647810

6.4 Deltas

CSG	Expiry Date	Delta 1	Delta 2	Delta 3	Delta 4	Delta 5	Delta 6	Delta 7	Delta 8	Delta 9	Delta 10	Delta 11	Delta 12	Delta 13	Delta 14	Delta 15	Delta 16	Delta 17	Delta 18	Max Delta
MTNQ	04-Nov-16	100	100	100	100	100	100	100	100		100	100	100	100	100	100	100	100		100
MTNQ	04-Mar-17	200	200	200	200	200	200	200	200		200	200	200	200	200	200	200	200		200
MTNS	05-Aug-16	60	60	60	60	60	60	60	60		60	60	60	60	60	60	60	60		60
ALSI	05-Aug-16	0	0	0	0	0	0	0	0		8	4	2	1	0	0	0	0		8
ZAUS	31-Jan-17	2000	2000	2000	2950	3000	3000	3000	3000		2000	2000	2009	2946	2995	3000	3000	3000		3000

6.5 PREs

CSG	PRE 1	PRE 2	PRE 3	PRE 4	PRE 5	PRE 6	PRE 7	PRE 8	PRE 9	PRE 10	PRE 11	PRE 12	PRE 13	PRE 14	PRE 15	PRE 16	PRE 17	PRE 18	Min PRE
MTNQ	-820000	-615000	-410000	-205000	0	205000	410000	615000	820000	-820000	-615000	-410000	-205000	0	205000	410000	615000	820000	-820000
MTNS	154200	115650	77100	38550	0	-38550	-77100	-115650	-154200	154200	115650	77100	38550	0	-38550	-77100	-115650	-154200	-154200
ALSI	-505	83	178	196	196	196	196	196	196	-103492	-48120	-21265	-8910	-3499	-1235	-338	6	131	-103492
ZAUS	-3647810	-2832810	-2017810	-1202810	-639	1221690	2444190	3666690	4889190	-3647810	-2832810	-2017810	-1199114	1348	1221701	2444190	3666690	4889190	-3647810

6.6 PREs Quantities

CSG & Expiry	Before	After Place	After	Benefit	Potential Slack	CSG	Total Before	Total Benefit	Total Potential Slack	Actual Slack	Offset Proportion	CSG & Expiry	Que	CSM	Total Spread Margin
MTNQ Nov2016	280000	1	280000	0	280000	MTNQ	820000	0	820000	0	0.0%	MTNQ Nov2016	0.0%	0	0
MTNQ Mar2017	540000	1	540000	0	540000							MTNQ Mar2017	0.0%	0	
MTNS Aug2016	154200	9	154200	0	154200	MTNS	154200	0	154200	0	0.0%	MTNS Aug2016	0.0%	0	0
ALSI Aug2016	103492	10	103492	0	103492	ALSI	103492	0	103492	0	0.0%	ALSI Aug2016	0.0%	0	0
ZAUS Jan2017	3647810	1	3647810	0	3647810	ZAUS	3647810	0	3647810	0	0.0%	ZAUS Jan2017	0.0%	0	0

6.7 Adj NREs

CSG	Adj NRE 1	Adj NRE 2	Adj NRE 3	Adj NRE 4	Adj NRE 5	Adj NRE 6	Adj NRE 7	Adj NRE 8	Adj NRE 9	Adj NRE 10	Adj NRE 11	Adj NRE 12	Adj NRE 13	Adj NRE 14	Adj NRE 15	Adj NRE 16	Adj NRE 17	Adj NRE 18	Min Adj NRE
MTNQ	-820 000	-615 000	-410 000	-205 000	0	205 000	410 000	615 000	820 000	-820 000	-615 000	-410 000	-205 000	0	205 000	410 000	615 000	820 000	-820 000
MTNS	154 200	115 650	77 100	38 550	0	-38 550	-77 100	-115 650	-154 200	154 200	115 650	77 100	38 550	0	-38 550	-77 100	-115 650	-154 200	-154 200
ALSI	-505	83	178	196	196	196	196	196	196	-103 492	-48 120	-21 265	-8 910	-3 499	-1 235	-338	6	131	-103 492
ZAUS	-3 647 810	-2 832 810	-2 017 810	-1 202 810	-639	1 221 690	2 444 190	3 666 690	4 889 190	-3 647 810	-2 832 810	-2 017 810	-1 199 114	1 348	1 221 701	2 444 190	3 666 690	4 889 190	-3 647 810

6.8 Group Deltas

CSG	IMR	Group Deltas 1	Group Deltas 2	Group Deltas 3	Group Deltas 4	Group Deltas 5	Group Deltas 6	Group Deltas 7	Group Deltas 8	Group Deltas 9	Group Deltas 10	Group Deltas 11	Group Deltas 12	Group Deltas 13	Group Deltas 14	Group Deltas 15	Group Deltas 16	Group Deltas 17	Group Deltas 18	Max Group Delta
MTNQ	2 700	304	304	304	304	304	304	304	304		304	304	304	304	304	304	304	304		304
MTNS	2 570	60	60	60	60	60	60	60	60		60	60	60	60	60	60	60	60		60
ALSI	28 910	0	0	0	0	0	0	0	0		8	4	2	1	0	0	0	0		8
ZAUS	1 630	2 000	2 000	2 000	2 950	3 000	3 000	3 000	3 000		2 000	2 000	2 009	2 946	2 995	3 000	3 000	3 000		3 000

6.9 Group PREs

SSG	Group PREs 1	Group PREs 2	Group PREs 3	Group PREs 4	Group PREs 5	Group PREs 6	Group PREs 7	Group PREs 8	Group PREs 9	Group PREs 10	Group PREs 11	Group PREs 12	Group PREs 13	Group PREs 14	Group PREs 15	Group PREs 16	Group PREs 17	Group PREs 18	Min Group PRE
MTNQ+MTNS Group	-665 800	-499 350	-332 900	-166 450	0	166 450	332 900	499 350	665 800	-665 800	-499 350	-332 900	-166 450	0	166 450	332 900	499 350	665 800	-665 800
ALSI\INDI\FINI\FNDI\RESI\CTOP\DTOP	-505	83	178	196	196	196	196	196	196	-103 492	-48 120	-21 265	-8 910	-3 499	-1 235	-338	6	131	-103 492
Currency Futures Offset Group	-3 647 810	-2 832 810	-2 017 810	-1 202 810	-639	1 221 690	2 444 190	3 666 690	4 889 190	-3 647 810	-2 832 810	-2 017 810	-1 199 114	1 348	1 221 701	2 444 190	3 666 690	4 889 190	-3 647 810

6.10 Group PREs Quantities

CSG	Before	After Place	After	Benefit	Potential Slack	SSG	Total Before	Total Benefit	Total Potential Slack	Actual Slack	Offset Proportion	CSG	Que	SSM	Total Spread Margin
MTNQ	820000	1	820000	0	820000	MTNQ+MTNS Group	974200	308400	820000	308400	37.6%	MTNQ	37.6%	16054	24454
MTNS	154200	1	-154200	308400	0							MTNS	100.0%	8400	
ALSI	103492	10	103492	0	103492	ALSI\INDI\FINI\FNDI\RESI\CTOP\DTOP GROUP	103492	0	103492	0	0.0%	ALSI	0.0%	0	0
ZAUS	3647810	1	3647810	0	3647810	Currency Futures Offset Group	3647810	0	3647810	0	0.0%	ZAUS	0.0%	0	0

6.11 Group Adj PREs

SSG	Group Adjusted PREs 1	Group Adjusted PREs 2	Group Adjusted PREs 3	Group Adjusted PREs 4	Group Adjusted PREs 5	Group Adjusted PREs 6	Group Adjusted PREs 7	Group Adjusted PREs 8	Group Adjusted PREs 9	Group Adjusted PREs 10	Group Adjusted PREs 11	Group Adjusted PREs 12	Group Adjusted PREs 13	Group Adjusted PREs 14	Group Adjusted PREs 15	Group Adjusted PREs 16	Group Adjusted PREs 17	Group Adjusted PREs 18	Min Group Adjusted PRE
MTNQ+MTNS Group	-690 254	-523 804	-357 354	-190 904	-24 454	141 996	308 446	474 896	641 346	-690 254	-523 804	-357 354	-190 904	-24 454	141 996	308 446	474 896	641 346	-690 254
ALSI\INDI\FINI\FNDI\RESI\CTOP\DTOP	-505	83	178	196	196	196	196	196	196	-103 492	-48 120	-21 265	-8 910	-3 499	-1 235	-338	6	131	-103 492
Currency Futures Offset Group	-3 647 810	-2 832 810	-2 017 810	-1 202 810	-639	1 221 690	2 444 190	3 666 690	4 889 190	-3 647 810	-2 832 810	-2 017 810	-1 199 114	1 348	1 221 701	2 444 190	3 666 690	4 889 190	-3 647 810

6.12 Final JSPAN

SSG	Min Adj NRE
ALSI\INDI\FINI\FNDI\RESI\CTOP\DTOP GROUP	-103 492.20
Currency Futures Offset Group	-3 647 810.10
MTNQ+MTNS Group	-690 254.00
TOTAL	-4 441 556.30

7 ROUNDING

This section gives a summary of how rounding should be applied to the various values that are calculated in the JSPAN methodology. The table below states to how many decimal places each item needs to be the rounded.

Section	JSPAN Measure	Decimals
Risk Arrays	Risk Array element	2
CREs	Position	0
	CREs	2
	Minimum CRE	2
NREs	NREs	2
	Minimum NRE	2
Deltas	Delta values	2
PRE Quantities	Before	2
	Benefit	2
	Potential Slack	2
	Actual Slack	2
	Offset proportion	6
	CSM	0
Adj NREs	Adjusted NREs	2
	Minimum Adjusted NREs	2
Group Deltas	Group Delta values	2
Group PRE Quantities	Before	2
	Benefit	2
	Potential Slack	2
	Actual Slack	2
	Offset proportion	6
	SSM	0
Group Adjusted PREs	Group Adjusted PREs	2
	Minimum Group Adjusted PREs	2

It can be assumed that unless it is specifically stated above, no rounding should take place (e.g. PREs & Group PREs).

8 DATA

The attached file contains all the inputs and outputs mentioned in the example in section 6.

Inputs & Outputs for JSPAN report.xlsx

9 SOURCE DATA FOR JSPAN

The JSE's Real-time Clearing system (RTC) provides an application programming interface called EMAPI which members can use to obtain data needed to replicate the JSPAN calculations.

Note: Please refer to the EMAPI Specifications on the JSE ITAC website for more details; in particular refer to Volume PT01 – Post-trade EMAPI Common and Volume PT02 – Post-trade EMAPI Clearing for details on how to interface to RTC EMAPI.

The following table shows which EMAPI messages can be used to obtain the input data required to calculate JSPAN:

Input Data	EMAPI Message	EMAPI Field
Portfolio / Account	AccountPositionEvent (10032) PositionAccount (10045)	
Risk Arrays	GetRiskArrayReq (10270) GetRiskArrayRsp (10271) The risk array is contained in the sub-message Contract (10272)	
Instruments	TradableInstrument (296)	
IMR	TradableInstrument (296)	10088 = imrOfficial
CSMR	TradableInstrument (296)	10065 = classSpreadMarginRequirement
VSR	TradableInstrument (296)	10061 = volatilityScanningRange
Contract Size Type	TradableInstrument (296)	10130 = contractSizeType
CSG ID	TradableInstrument (296)	10064 = classSpreadGroup
CSG	ClassSpreadGroup (10158)	
SSG ID	ClassSpreadGroup (10158)	9 = ssgId
SSG	SeriesSpreadGroup (10159)	

Note: The calculate JSPAN values are published regularly by RTC in the RiskNodeEvent (10033) message (37 = jspanValue).