SAFCOM Margins Explained

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Date:	31 Oct 2012
Version:	2.0

Margining Methodology

Introduction

This document aims to provide a short but comprehensive summary of the margining methodology used by all of the JSE derivatives markets. Full technical specifications and examples can be obtained by contacting the Risk Manager. This holds for equity derivatives, currency derivatives, commodity derivatives and interest rate derivatives.

What is Margin?

The JSE derivatives markets use a portfolio scanning model to calculate the amount of margin required for any portfolio containing derivatives positions, i.e. financial, currency or commodity futures and/or options on futures. The JSE's model requires certain parameters to be able to perform the calculation. All of these parameters are calculated using a Value-at-Risk (VaR) calculation. For some of these VaR calculations, the log returns of market variables are assumed to be normally distributed.

Margin Parameters

To calculate the amount of margin you should pay to the exchange for your positions you need the latest margin parameters. Any margin parameter changes are published in a notice to all our members

- **Initial margin** is the amount of money determined by the clearing house on the basis specified by the risk management committee and held in respect of the aggregate position of a member or a client. Initial margin shall be paid to or by a member or client whenever the risk of loss changes with respect to the aggregate position (good faith deposit). This margin is reinvested at a competitive rate and at close out of the positions of the client/member the initial margin is paid back plus the interest earned for the period. The initial margin may be reduced or increased based on changes in the margin parameters

- **Variation Margin** is paid by the members or clients on a daily basis as the result of the mark to market process of the clients/members position. Mark to market refers to the present loss/profits of the position.

- **Additional margin** may be required by the Clearing member from his members and by the members from their clients.

- The member may require the client to deposit **retained margin** with him which may be used to furnish initial and additional margin requirements.

- The client may have to top up his account with the member with **maintenance margin**. The client has to pay an amount of money to restore additional margin when the additional margin has been used to meet payments of variation margin.

How is the initial margin on a portfolio calculated?

Portfolio Scanning

JSE's margining uses a Portfolio Scanning method. The basis of Portfolio Scanning is that the whole of a participant's portfolio on the Exchange is valued ("scanned") at a number of points over a wide range of market moves. The range is chosen to cover (almost) all conceivable market moves within the next day. The lowest of the portfolio values is identified, from this is found the greatest loss which the participant could suffer on the next day. His margin, due in cash on the next morning, is then set equal to this greatest loss.

RMCO

The responsibility for setting margin parameters - the extent of the market moves - lies with the Exchange's Risk Management Committee, RMCO. Each Clearing Member has a seat on the RMCO. The Clearing Members underwrite the Exchange, and therefore have a direct interest in its risk management.

RMCO expresses its attitude to risk in the fundamental margining parameter, the "Risk Parameter". This is measured in standard deviations ("Sds") and has been set at 3.5 Sds since the margining methodology was introduced. This is done under the assumption of normality which means that stock price dynamics can be modelled with geometric Brownian motion.

The Risk Parameter determines the width of the range over which prices are scanned. An underlying assumption is that prices are log normally distributed. Given the standard deviation of such a distribution - in other words, the volatility of the price - the price move corresponding to 3.5 Sds can be found. The scanning range then covers moves up and down of this amount from the mark-to-market price.

The Risk Parameter of 3.5 Sds corresponds to a confidence level of 99.95%. The chance that larger moves will occur in practice - which means that margins will be insufficient to cover losses - is, at 3.5 Sds, and under the assumption of log normality, 1 in 2,000 days, or 1 in 9 years.

Should, however, it appear during an arbitrary day that such a larger price move is going to happen, the Exchange can resort to the next line of defence. This is the "intra-day margin call", in which all positions are marked-to-market and margins recalculated, resulting in cash calls for immediate settlement.

Initial Margin Requirements

Given the mark-to-market price of a futures contract and its volatility, the 3.5 Sd price-move is found each day. This is converted to the gain or loss on a one-contract short or long position.[1] In finance, this process is called Value-at-Risk (VaR). It is defined as:

"In economics and finance, Value at Risk (VaR) is the maximum loss not exceeded with a given probability defined as the confidence level, over a given period of time."

The time frame is called the holding period. Equity derivatives and currency derivatives use a 1 day holding period. Thus, if the VaR on the ALSI futures contract is R18,000 at a 1-day holding period and a 99.95% confidence level, there is only a 0.05% chance that the value of the ALSI contract will move by more than R18,000 from one day to the next. At R10 per point it means that the ALSI can change by 1,800 points from one MtM day to the next, before the initial margin will be insufficient to cover potential losses.

This figure gives a "theoretical" margin requirement, which is an un-rounded amount which would tend to fluctuate from day to day. In order that margins are round figures which are not subject to too frequent changes, RMCO lays down certain "Trigger Steps" for each contract. The process is illustrated in the graph below.

Sample periods are chosen to encompass a decent sample of historical price movements. Deciding on an appropriate sample period is, however, by no means trivial; by choosing a sample period that is too small one runs the risk of ignoring meaningful market data, whilst by choosing a sample period that is too large one runs the risk of placing too much emphasis on data from too far back. In order to avoid the problem of ignoring meaningful market data, the JSE uses a sample period of 750 trading days (translating to about 3 years) for equity derivatives, and 2001 trading days (translating to about 8 years) for all other derivatives. IMR's for new contracts are calculated by looking through to the underlying cash instrument or by obtaining proxy contracts.

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[1]   This is not usually equal to the price move because, for example, the share index contracts are defined on 10 times the underlying index.

The Triggering Process
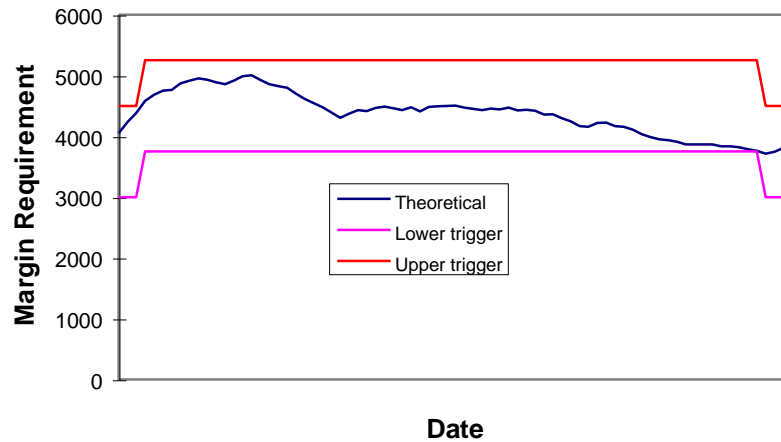
The actual Initial Margin Requirement ("IMR") is initially set to be the multiple of the Trigger Step above the theoretical value. If on a subsequent day the theoretical value moves above this "Upper trigger", the IMR is moved up a step. If the theoretical value moves under the trigger steps below (the "Lower trigger"), the IMR is moved down a step.

Please note that the methodology for calculating the initial margins for the interest rate derivatives market is different. This methodology is explained in the document "Initial Margins for Interest Rate Derivatives" which can be found at http://www.jse.co.za/Markets/Interest-Rate-Market/Initial-margin-volatility-skew.aspx.

Also note that some commodity contracts have daily price limits, limiting the daily movement of prices. This has an effect on the initial margin required for these contracts. If the limit is reached on two similar contracts on two consecutive days the price limits are increased to 150% of the original limit and the extended limits will remain in place until the daily movement on all like contracts is less than the original limits. Extended price limits also result in increased initial margin requirements for those periods when the extended limits apply.

Adjusting Initial Margins for Liquidity and Concentration Risk

The JSE classifies the liquidity of shares traded on the cash exchange into 3 groups. A liquidity rating of 1 is given to the very liquid instruments and 3 to illiquid instruments. Futures on single names are classified accordingly. The initial margin required is adjusted according to the table below. This is also shown graphically. The initial margins calculated using the VaR methodologies are multiplied by the appropriate margin factor as shown. Highly concentrated positions are also adjusted as shown.

Liquidity Rating		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
3	2	2.684521	3.928324	6.274398	8.433277	9.511071	9.835002	9.949161	10.00589		10.02
2	1.2	1.742451	2.724644	4.584617	6.703902	7.974339	8.35733	8.567661	8.632931		8.63
1	1	1.167901	1.628874	2.369143	3.125875	3.704345	4.114506	4.294166	4.507414		4.565
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100

Concentration risk

Concentration risk = Position / Shares in Issue
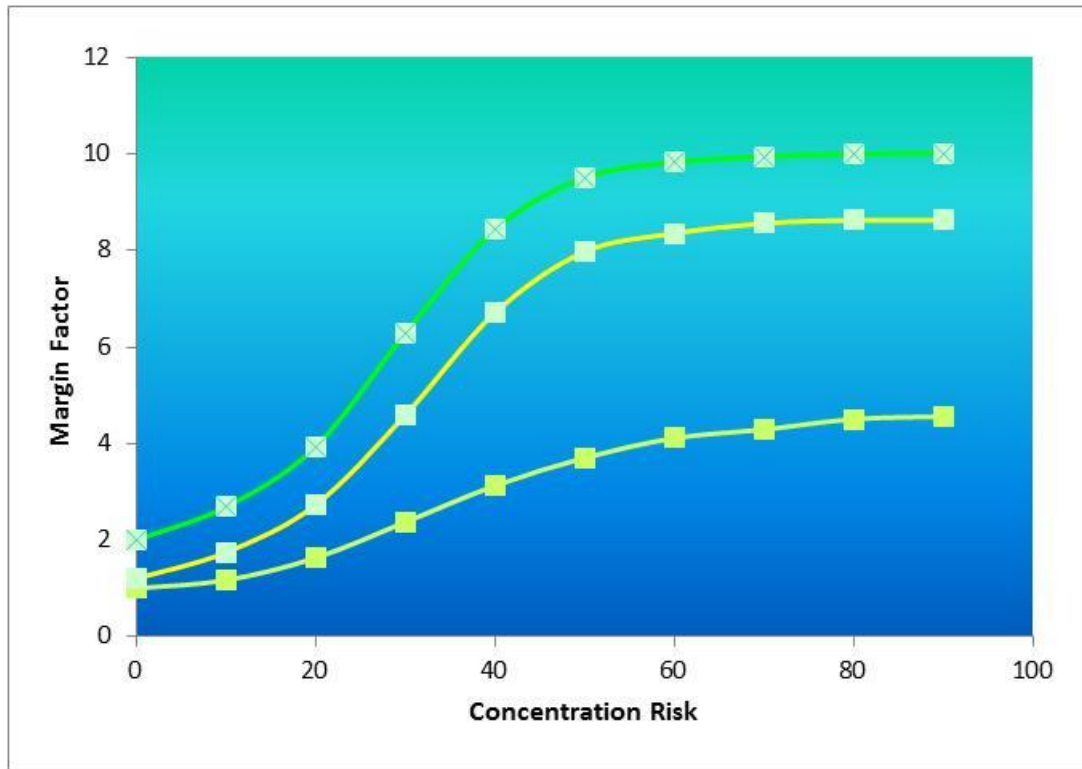
Volatilities

The process of finding IMR's requires a volatility for each contract on each day. The volatility to be used has been defined by RMCO as the larger of the long-term volatility trend and the overnight market volatility.

The long-term volatility trend is calculated as the 750-day (three year) exponential volatility, of daily historical closing prices for equity derivatives. Currency, interest rate and commodity derivatives use 2001 daily historic closing prices equating to 2000 returns. The overnight market volatility is derived from the implied volatilities of at-the-money options quoted on the futures, where these exist.[2] Where options exist on more than one expiry month, a weighted linear regression is performed to allow for the term-structure of volatility in finding the overnight volatility.

If options do not exist on a contract, the contract's own 30 day exponential historical volatility is used as a surrogate for the overnight market volatility.

Volatility Scenarios

The description above has concentrated on Price Scenarios - i.e. the construction of the different prices (and in particular the extreme prices) at which portfolios are scanned.

Where portfolios contain options, they are also scanned over varying volatilities. There are two sets of scenarios, known as "Volatility Up" and "Volatility Down". These are found from the market volatility plus or minus the Volatility Scanning Range, or VSR; a margining parameter set by RMCO for each series of contracts. The VSR is in essence the "volatility of volatility" on a 1-day time horison.

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[2]   In fact, "exist" is defined as an open interest of 1,000 or more on a futures contract.

In addition, and adjustment is made for the effect (the "Range Price Volatility Effect", or RPVE) which large price moves would have on volatilities. Volatilities in both volatility scenarios are increased for prices far from the market. (To the extent, this also allows for the risk arising from the so-called "Volatility Smile".) The RPVE is more marked for the shorter contracts. Since the introduction of volatility surfaces, the correct volatility is found from the appropriate surface or skew/smile. Linear interpolation is used in all markets across strikes and also across time for Can-Do products with non-standard expiry dates.

Volatility Scenario
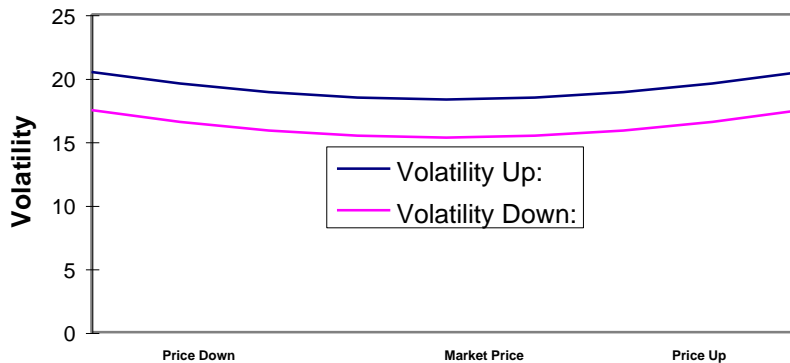
Offsets and Spreads

Offsets are allowed between positions in all expiry months in each series of contracts. Each expiry has a RMCO defined parameter, its Class Spread Margin Requirement or CSMR. This is calculated from a statistical analysis of correlation and the Risk Parameter.

For a simple "long March, short June" position the process is quite easy. The net margin will be the positive difference between the two positions' IMRs (the effect of offsetting), plus each of their CSMR's (the effect of spreading), as shown in the example below:

Contract	Position	IMR/Contract	IMR	CSMR/Contract	CSMR	Total Margin
March	+10	R3,500	R35,000	R1,000	R10,000	
June	-10	R4,000	R40,000	R1,000	R10,000	
			R5,000	+	R20,000	R25,000

Where a position contains options or a less straightforward mix of contracts, the calculation becomes more complicated. The effect, however, is always to attempt to optimise the use of capital by minimising the amount of margin due. This is achieved by bringing into the process only that portions of positions for which offsetting and spreading produces a net benefit.

In addition to offsetting between contract months, offsets are allowed between net positions in groups of contracts which show sufficient correlation, for example the ALSI/DTOP or ZAUS/ZAEU or WMAZ/CORN or GOLD/PLAT groups – groups are published when new IMRs are published[3]. The calculations follow the same approach as above; the relevant margin parameters are the Series Margin Requirements, or SSMR's.

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[3] http://www.jse.co.za/Markets/Currency-Derivatives-Market/Intial-Margin-Requirements.aspx
http://www.jse.co.za/Markets/Commodity-Derivatives-Market/Initial-Margin-Requirements.aspx
http://www.jse.co.za/Markets/Interest-Rate-Market/Initial-margin-volatility-skew.aspx
http://www.jse.co.za/DownloadFiles.aspx?RequestedNode=DownloadableDocuments/Safex/Margin_Requirements