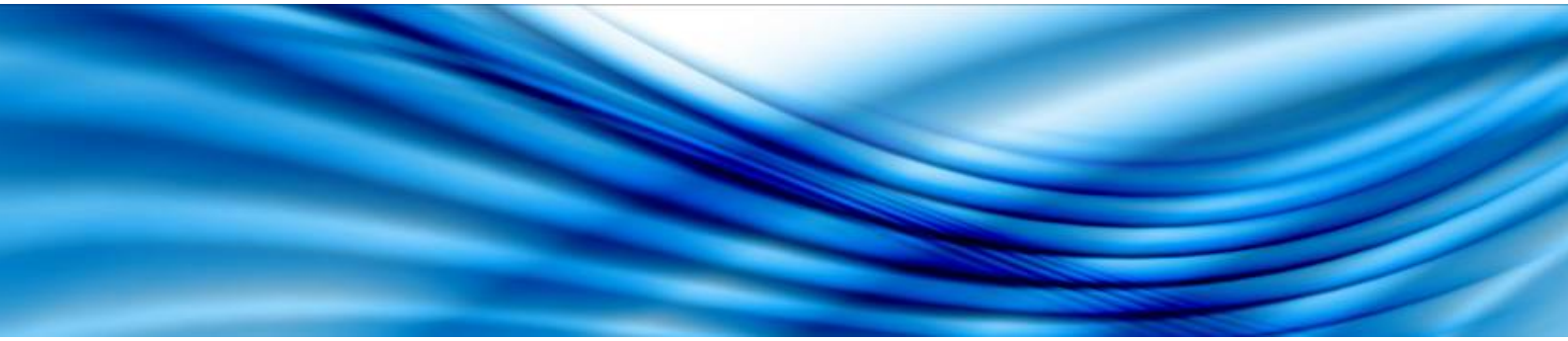
S&P/ASX 200 VIX Futures and Options Consultation



Consultation Paper and Request for Comment

14 February 2011

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1 Purpose of the Consultation Paper

1.1 Background Information

In September 2010 the Australian Securities Exchange (ASX) in conjunction with Standard and Poor's (S&P) launched an Australian equity volatility index - the S&P/ASX 200 VIX (ASX code: XVI).

The S&P/ASX 200 VIX is an end-of-day index that reflects the market's expectations for volatility in the Australian benchmark equity index, the S&P/ASX 200.

Modelled on the Chicago Board Options Exchange (CBOE) VIX®, the S&P/ASX 200 VIX uses settlement prices for S&P/ASX 200 (XJO) put and call options to derive a weighted average of the implied volatility being incorporated into the options. Two maturities are used with the nearby having at least a week until expiry. The volatility of the options closest to maturity is interpolated with that of the options farthest from maturity to arrive at a constant 30 day indication of expected volatility in S&P/ASX 200.

Immediately post launch, market feedback included a number of requests for derivatives to be made available over the S&P/ASX 200 VIX.

1.2 Proposal

In response to market feedback, ASX proposes to list derivative products in the form of futures and possibly options on futures over the S&P/ASX 200 VIX.

These products will:

- Enable hedging of equity volatility exposures;
- Facilitate spread trading between realised and implied equity volatility;
- Provide portfolio diversification benefits through the provision of volatility as a tradeable asset class that exhibits low correlations to traditional asset classes;
- Enable market participants to trade anticipated changes in equity market volatility; and
- Provide potential arbitrage opportunities between S&P/ASX 200 VIX derivatives and the XJO Options used to derive the S&P/ASX 200 VIX.

1.3 Purpose of this paper

The purpose of this paper is to enable market participants to provide feedback on the proposed contract design for S&P/ASX 200 VIX Futures and Options bearing in mind the proposed trading platform and associated rule framework for that trading platform.

1.4 Due Date for submissions

Submissions in response to the S&P/ASX 200 VIX Futures and Options Consultation should be made no later than Friday 4 March 2011. All submissions will be treated in strict confidence. Please forward all enquiries and submissions to:

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2 Proposed Contract Specifications

2.1 Background

Whereas the S&P/ASX 200 VIX reflects market expectations for volatility over the next 30 days, a futures contract over the index would reflect the market's expectations for volatility in the 30 day period forward from the expiry date of the contact. This is due to the volatility index being a reflection of market expectations of volatility and not the forward value of an underlying tradeable asset. Consequently, volatility index futures are not tied to an underlying asset by a typical arbitrage relationship such as that found in an equity index future and the underlying basket of equities.

The relationship between the S&P/ASX 200 VIX and any futures contract is further complicated by the non-static relationship between the index and the implied volatilities of the options used to calculate the index. The S&P/ASX 200 VIX is the square root of the weighted sum of the implied volatilities across two index option expiry months. Therefore, the relationship between the index and the implied volatilities of the underlying index options is not fixed but dynamic.

The US experience has been for CBOE Volatility Index® (VIX®) futures to exhibit less volatility than the index itself with the futures chain creating a curve connecting the VIX to the long term mean. This can also be thought of as shorter dated futures more closely tracking the VIX compared to longer dated contracts. In practical terms, if the VIX is above its long term mean then futures prices are likely to show a downward slope towards the long term mean and if the VIX is below its long term mean then futures prices are likely to show an upward slope towards the long term mean. The relationship between the VIX and future will also reflect market expectations for volatility. For instance, the future may trade above the index value if volatility is expected to increase before the futures expiry.

2.2 S&P/ASX 200 VIX Futures

Contract Name: S&P/ASX 200 VIX Futures

Contract Code: To be determined.

Underlying Index: S&P/ASX 200 VIX.

Contract Multiplier: AUD1,000 times the S&P/ASX 200 VIX value.[1]

Minimum Price Interval: 0.05 points, or AUD50.

Contract Months: Futures contracts to be listed over the spot and next calendar months.[2]

Trading Hours: 9:50am to 4:30pm Sydney time.

Trading Platform: ASX Trade24.

Expiry Day: Trading to cease at 4:30pm on the Tuesday 30 days prior to the third Thursday of the calendar month following the contract expiry month.[3]

[1] At the time of writing S&P/ASX 200 VIX has had a 52 week high of 34.23 and 52 week low of 12.16, although as previously mentioned the futures contract is not tied to the index via a typical arbitrage relationship and may readily trade away from the index.

[2] Any S&P/ASX 200 VIX Futures and Options would have a dependency on an active XJO Options market in the relevant underlying month so as to provide a reference price and facilitate some degree of dynamic hedging/arbitrage activity. Although XJO Options are available up to six financial quarter months ahead and two non-financial serial months ahead, activity is often concentrated in the two serial months and the two nearest quarter months. Given that S&P/ASX 200 VIX Futures would reflect the market's expectation for volatility in the 30 day period forward from the expiry date of the contact, two futures contracts are proposed to be listed to match the availability of active XJO Option months.

Settlement Timing and Method: As the S&P/ASX 200 VIX is an end-of-day index, expiry will be the index settlement value for the S&P/ASX 200 VIX as calculated by Standard and Poor's at the close of trading on the Expiry Day. The contract will be cash settled the next business day.

2.3 S&P/ASX 200 VIX Options

Contract Name: S&P/ASX 200 VIX Options

Underlying: S&P/ASX 200 VIX Futures of the same expiry month.

Style: American. Options may be exercised on any business day up to and including the Last Trading Day. Upon exercise, the holder will receive an underlying S&P/ASX 200 VIX Futures contract at the strike price.

Contract Size: AUD1,000 times the S&P/ASX 200 VIX value.

Minimum Price Interval: 0.05 index points, or AUD50.

Strike Intervals: 1 index point (AUD1,000).

Contract Months: Put and Call options available on existing S&P/ASX 200 VIX Futures contracts.

Trading Hours: 9:50am to 4:30pm Sydney time.

Trading Platform: ASX Trade24.

Last Trading Day: Trading to cease at 4:30pm on Expiry Day of the underlying futures contract.

Expiry Day: Same as that of the S&P/ASX 200 VIX Futures: Trading to cease at 4:30pm on the Tuesday 30 days prior to the third Thursday of the calendar month following the contract expiry month.

[3] The XJO options expire on the third Thursday of the XJO contract expiry month. By having the S&P/ASX 200 VIX Futures expire exactly 30 days prior to the XJO expiry, the VIX settlement price is calculated using a single XJO expiry month (rather than an interpolation of two expiry months). This use of a single expiry month will enable simpler management of any hedge/arbitrage positions in the underlying XJO contract.

3 Invitation to comment

ASX invites submissions from potential users of S&P/ASX 200 VIX Futures and Options in respect to the following points:

3.1 The S&P/ASX 200 VIX methodology

Although the core index methodology is representative of that developed by Chicago Board Options Exchange (CBOE) for the CBOE Volatility Index, there is scope to tailor the S&P/ASX 200 VIX to local conditions. As part of this consultation ASX welcomes feedback on the S&P/ASX 200 VIX methodology that would underpin any futures or options contract. Details of the S&P/ASX 200 VIX methodology are in Appendix 1.

3.2 Contract Specifications

ASX seeks feedback on the proposed contract design including the contract multiplier of $1,000 per index point, the trading hours, the number of contract months available and the expiry day.

ASX also seeks feedback on potential additions to the contract specifications, for example whether block trading facilities would be of interest to users of the contract.

3.3 Trading and Clearing

The choice of trading platform, ASX Trade or ASX Trade24, will be one of the most critical decisions made in the development of any S&P/ASX 200 VIX derivatives. The implications from the choice of platform include, breadth of distribution, the process used to determine option settlement prices and the clearing house associated with each trading platform.

Key relevant characteristics of each trading platform are highlighted below.

	ASX Trade	ASX Trade24
Key relevant products	Equities, Index Options (XJO), ETOs, Warrants	SPI Futures and Options
Night session capability	No	Yes
ASX Clearing Corporation subsidiary	ASX Clear Pty Ltd	ASX Clear (Futures) Pty Ltd
International hubs	Nil	Chicago, London, Singapore, Hong Kong.
Same platform as the XJO options used to derive index	Yes	No
Option settlement process	Derivative Pricing System	Skew committee

For the purposes of this consultation paper ASX is proposing to list the new contracts on the ASX Trade24 platform due to the broader distribution to futures participants this platform offers. However if your preference is for the contracts to be listed on the ASX Trade platform, please indicate your reasons for this preference.

By extension, for the purposes of this consultation paper ASX is proposing that the new contracts be cleared by ASX Clear (Futures) Pty Ltd. However if your preference is for the contracts to be cleared by ASX Clear Pty Ltd, please indicate your reasons for this preference. In considering this aspect please note that both of ASX's clearing houses are migrating to CME SPAN as their margining system. As a result there will be no difference in margining approach following this migration.

Phase 3 of the CME SPAN project will enable margin offsets between the two clearing houses meaning that such offsets will potentially be offered between volatility index derivatives and XJO options irrespective of the clearing house used for volatility index derivatives.

3.4 Listing of Options

Any derivative contract ASX lists over the S&P/ASX 200 is likely to take the form of a futures contract. However there is the potential to also list options, as a result, ASX is seeking feedback as to whether to list options in addition to futures on the S&P/ASX 200 VIX.

3.5 Use of an end-of-day index as the underlying

The S&P/ASX 200 VIX is an end-of-day index that uses settlement prices of S&P/ASX 200 (XJO) Put and Call options as inputs to the index calculation. Provision of a real-time version of the index is dependent on the receipt of continuous and credible quotes for a range of strikes in the near term, next term and on occasion third term XJO Options.

At this point in time ASX is of the view that the index is best delivered as an end-of-day index until such time as there is confidence that any real time inputs will result in a credible index.

ASX seeks feedback on whether an end-of-day index is regarded as suitable for use as an underlying where the index itself is not tied to an asset by a usual cost of carry arbitrage relationship and further complicated by the non-linear relationship between the index and the implied volatilities of the options being used to calculate the index.

4 Further Information

4.1 Data Vendor Codes

Data Vendor	Code(s)
Bloomberg	SPAVIX [index] DES <go> SPAVIX [index] HP <go> SPAVIX [index] GP <go>
Thomson Reuters	.AXVI
IRESS	XVI.ASX

4.2 ASX's S&P/ASX 200 VIX web page

http://www.asx.com.au/products/indices/types/sp_asx200_vix_index.htm

4.3 S&P/ASX 200 VIX Fact Sheet

http://www.asx.com.au/products/pdf/VIX_fact_sheet.pdf

4.4 Option Settlement Price Methodology

The S&P/ASX 200 VIX uses XJO index option settlement prices to calculate the implied volatilities. For further details on the XJO settlement price methodology, please see:
http://www.asx.com.au/products/pdf/daily_settlement_price_methodology.pdf

4.5 S&P's S&P/ASX 200 VIX web page

http://www.standardandpoors.com/indices/sp-asx-200-vix/en/us/?indexId=sp-asx-200-vix

5 Appendix 1 - S&P/ASX 200 Volatility Index Methodology

5.1 Introduction

The S&P/ASX 200 VIX is an end-of-day index that reflects investor expectations regarding volatility in the Australian benchmark equity index, the S&P/ASX 200 for the next 30 calendar days.

5.2 Index Construction

The S&P/ASX 200 VIX is calculated using S&P/ASX 200 (XJO) put and call option settlement prices.

On most trading days, the two nearest-term expiration months in the XJO options are used in order to bracket a 30 day calendar period. However, to minimise the possibility of any anomalies resulting from trading in the expiring options during the last few days before the near term options expire, the index calculation will use the next term and third term option settlement prices.

The overnight RBA rate, 1-month, 2-month and 3-month BBSW rates are used to interpolate the risk free rates for each maturity.

The index is calculated and published at the end of each trading day.

Calculating S&P/ASX 200 VIX using near term and next term options

Volatility (σ_1) in the near term options is interpolated with the volatility (σ_2) in the next-term options to arrive a single value (σ) with a constant maturity of 30 days to expiration. The S&P/ASX 200 VIX final value is σ multiplied by 100.

$$\sigma = \sqrt{\frac{N_y}{N_m}\left\{T_1\sigma_1^2\left[\frac{N_{T_2}-N_{30}}{N_{T_2}-N_{T_1}}\right]+T_2\sigma_2^2\left[\frac{N_{30}-N_{T_1}}{N_{T_2}-N_{T_1}}\right]\right\}}$$

S&P/ASX 200 VIX = σ * 100

where:

σ = 30-day implied volatility

σ_1 = Near term volatility derived from the near term options

σ_2 = Next term volatility derived from the next term options

N_y = Number of days in one year

N_m = Number of days in one month

T_1 = Time to expiration (in years) of the near term options

T_2 = Time to expiration (in years) of the next term options

N_{T1} = Number of days between the current day and the expiration date of the near term options

N_{T2} = Number of days between the current day and the expiration date of the next term options

Calculating time to maturity

The time to maturity *(T)* is measured in years. It consists of three parts:

N_1 = Fractional number of days remaining from the calculation time (5:00 pm) until midnight of the current day

N_2 = Number of days between the current day and the settlement day

N_3 = Fractional number of days from midnight of the day prior to expiry to the settlement time (12:00 noon) on the expiry date.

$$N_1 = \frac{\text{minutes remaining until midnight of the current day}}{24 * 60}$$

$$N_2 = \frac{\text{minutes from midnight to settlement on expiry}}{24 * 60}$$

$N_T = N_1 + N_2 + N_3$

$T = N_T / N_Y$

where:

N_y = Number of days in one year

N_T = Number of days until option expiration

Calendar days are used in the day count calculations.

Interpolating Risk Free Rates

The RBA overnight rate (R_{on}), BBSW 1-month rate (R_{1m}), and BBSW 2-month rate (R_{2m}) are used to obtain the near term (R_1) and next term (R_2) risk free rates.

$$R_1 = \frac{N_y}{N_{T_1}}\left\{T_{on}R_{on}\left[\frac{N_{1m}-N_{T_1}}{N_{1m}-N_{on}}\right]+T_{1m}R_{1m}\left[\frac{N_{T_1}-N_{on}}{N_{1m}-N_{on}}\right]\right\}$$

$$R_2 = \frac{N_y}{N_{T_2}}\left\{T_{1m}R_{1m}\left[\frac{N_{2m}-N_{T_2}}{N_{2m}-N_{1m}}\right]+T_{2m}R_{2m}\left[\frac{N_{T_2}-N_{1m}}{N_{2m}-N_{1m}}\right]\right\}$$

where:

R_1 = Near term risk free rate

R_2 = Next term risk free rate

R_{on} = RBA overnight rate

R_{1m} = BBSW 1-month rate

R_{2m} = BBSW 2-month rate

N_{on} = Number of days remaining until the midnight of the next business day

N_{1m} = 30 days, as the interpolation uses a one-month BBSW rate

N_{2m} = 60 days, as the interpolation uses a two-month BBSW rate

N_{T1} = Number of days between the calculation time (5:00 pm) on the current day and 12:00 noon on the expiration date of the near term options

N_{T2} = Number of days between the calculation time (5:00 pm) on the current day and 12:00 noon on the expiration date of the next term options

N_y = Number of days in one year

T_{on} = N_{on} / N_y

T_{1m} = N_{1m} / N_y

T_{2m} = N_{2m} / N_y

Note: This interpolation of Risk Free Rates works when the near term and next term expirations are bracketed by the overnight to 1-month and 1-month to 2-month interest rate maturities, respectively. If the option expirations fall outside this brackets, then corresponding BBSW rates will be used. For example, if the near term expiration is between 1 and 2 months, then 1-month and 2-month BBSW rates will be used to interpolate the near term risk free rate R_1; if the next term expiration is between 2 and 3 months, then the 2- and 3-month BBSW rates will be used to interpolate the next term risk free rate R_2.

Calculating Implied Volatilities

The S&P/ASX 200 VIX uses XJO option settlement prices to determine the implied volatility inputs for the index calculation. Only options with non-zero settlement prices are included in the computation. The prices are provided by the ASX on daily basis. For more information on the methodology to determine option settlement prices, please see:
http://www.asx.com.au/products/pdf/daily_settlement_price_methodology.pdf

For the near term and the next term, respectively, implied volatilities are calculated using both puts and calls. The general formula is:

$$\sigma^2 = \frac{2}{T}\sum_i \frac{\Delta K_i}{K_i^2} e^{RT} Q(K_i) - \frac{1}{T}\left[\frac{F}{K_0} - 1\right]^2$$

where:

σ = Implied volatility

T = Time to expiration

F = Forward index level

K_i = Strike price of the i^{th} out-of-the-money option

ΔK_i = Interval between strike prices

K_0 = First strike below the forward index level (F)

R = Risk-free interest rate to expiration

$Q(K_i)$ = Settlement price of each option with strike K_i

The at-the-money strike, K, is the strike price at which the difference between the call and the put prices is the smallest. The formula used to calculate the forward index level is:

$F = K + e^{RT} (C_k - P_k)$

where:

F = Forward index level

K = The strike price at which the difference between the call and the put prices is the smallest

T = Time to expiration

R = Risk-free interest rate to expiration

C_K = Settlement price of calls at strike K

P_K = Settlement price of puts at strike K

Next, K_0 is determine where K_0 is the strike price immediately below the forward index level, F.

The options in the volatility calculation are selected as follows;

- All options are sorted in ascending order by strike price.
- At strike K_0, select both the call and put. Use the average price as the option price.
- Select call options that have strike prices greater than K_0.
- Select put options that have strike prices less than K_0.

Generally, ΔK_i is half the distance between the strike on either side of K_i and is calculated as:

$$\Delta K_i = \frac{K_{i+1} - K_{i-1}}{2}$$

At the upper and lower edges of any given strip of options, ΔK_i is simply the difference between K_i and the adjacent strike price.

About ASX

ASX is a multi-asset class, vertically integrated exchange group, and one of the world's top-10 listed exchange groups measured by market capitalisation.

ASX's activities span primary and secondary market services, central counterparty risk transfer, and securities settlement for both the equities and fixed income markets. It functions as a market operator, clearing house and payments system facilitator. It monitors and enforces compliance with its operating rules, promotes standards of corporate governance among Australia's listed companies and helps to educate retail investors.

ASX's diverse domestic and international customer base includes issuers of securities and financial products, investment and trading banks, fund managers, hedge funds, commodity trading advisers, brokers and proprietary traders, market data vendors and retail investors.

By providing its systems, processes and services reliably and fairly, ASX generates confidence in the markets that depend on its infrastructure. This is integral to ASX's long-term commercial success.

More information on ASX can be found on our website, www.asx.com.au

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