TURQUOISE DERIVATIVES TRADING SERVICE DESCRIPTION

Version 2.1

5 January 2012

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1. About this Document

The objective of this document is to provide an understanding of Turquoise's most relevant Technical, Operational and Business features relating to the Turquoise Derivatives trading platform. A similar document is separately available for the Turquoise Equity market.

This document is not intended to be used as a Technical Specification for the development of any software application.

Both this, the Turquoise Derivatives Trading Service Description, and the Turquoise Equities Trading Service Description, as well as all Technical Specification documents, can be found on the Turquoise website: http://www.tradeturquoise.com/tq_resources.shtml

For any feedback or queries about this document please contact derivatives@tradeturquoise.com

1.1. Revision History

Date	Version	Sections updated	Notes
1 March 2011	**1.0**	All	Published internally
1 May 2011	**1.1**	All	Published externally
1 September 2011	**1.2**	3.7; 3.8; 11.2; Appendix B	Additional notes on strike price generation and strategies. Definitions of Maker-Taker pricing updated. FTSE Options circuit breaker parameters added
23 September 2011	**2.0**	All	Links added to new website documentation, information added to accommodate launch of FTSE100 Options. Section 4.7 "On request" service added. Terms and Acronyms section replaced with link to Glossary document
22 November 2011	**2.1**	All	Terms updated to match new Rulebook, Glossary and trade cancellation procedures
5 January 2012	**2.2**	11	Added link to tariff schedules

1.2. Other Related Documents

1.2.1. Technical

TQD 001 Addendum SOLA 1.0 to SOLA 2.0: Sail, HSVF & FIX

TQD102 Connectivity Guide

TQD200 FIX Business Design Guide

TQD201 FIX Specification

TQD300 SAIL Business Design Guide

TQD301 SAIL Specification

TQD320 SAIL Drop Copy

TQD401 HSVF Market Data

TQD601 Guide to Certification (SAIL)

TQD701 BItS Clearing Station (BCS) User Manual

TQD702 BItS Clearing Station (BCS) Application Data Layouts

TQD703 BItS Clearing Station (BCS) Technical Notes

TQD801 BItS Trading Station (BTS) User Manual

1.2.2. Rulebook

Turquoise Derivatives - Rulebook

1.2.3. Derivative product specific

Turquoise Derivatives - Glossary

Turquoise Derivatives – Tariff Schedule

Turquoise Derivatives - Market maker obligations and incentives

Trading and clearing software fees

1.2.4. Membership

Membership Application Form (combined Cash and Derivatives)

Membership Agreement

Turquoise Derivatives – Market Making Agreement

1.2.5. Market data

Information License Agreement

Information License Application Form

2. About Turquoise

2.1. Turquoise the Firm

Turquoise Global Holdings Limited ("TGHL") is an investment firm authorised by the Financial Services Authority of the United Kingdom.

Initially founded by a consortium of nine investment banks, TGHL is now majority owned by the London Stock Exchange Group (LSEG). In addition to LSEG, its shareholders now include twelve of the leading investment banks.

TGHL was established to engender greater competition in the secondary trading of European equities, and offers a combination of innovative services, superior technology and competitive pricing. With the integration of EDX in May 2011, Turquoise extends its services to include equity and index derivatives, a market characterised by a lack of competition and high costs.

2.2. Turquoise Services

TGHL operates a Multilateral Trading Facility ("Turquoise") with two discrete trading platforms; one for cash equities and another for derivatives. Members of Turquoise can access both equity and derivatives platforms providing they have the appropriate post-trade arrangements in place.

The Turquoise Equity platform offers the secondary trading of Pan-European and US equities, Exchange Traded Funds, Global Depositary Receipts, American Depositary Receipts, Exchange Traded Currency funds and Exchange Traded Commodity funds.

The Turquoise Derivatives platform offers trading of single stock, index and dividend derivatives based on Pan-European and International Order Book (IOB) equities.

The Turquoise trading platforms are hosted in the data-centres of the LSEG and have interfaces common to other markets of LSEG, ensuring that customers accessing other LSEG markets can enjoy access to Turquoise with minimal incremental cost or effort.

2.3. The Derivatives Value Proposition

Turquoise's derivatives offer Member firms new and innovative features in addition to the highly successful market models used for its existing Norwegian and IOB business developed alongside Members.

- **Recognised system:** Robust and ultra-fast SOLA platform developed by TMX Group and currently used on BOX, Montreal Exchange and IDEM.
- **Performance:** Average response time of 690 microseconds (orders) and 870 microseconds (bulk quotes) makes SOLA one of the fastest derivatives platforms in the world.
- **Unique trading opportunities:** Matching engine in the same data-centre as those for LSE and Turquoise cash markets creates a unique latency arbitrage opportunity across UK and Pan-European cash and derivatives markets.
- **Setup cost:** No membership fee and leveraging of existing LSEG networks, resources and processes minimises (and in some cases eliminates) setup and development costs.
- **Fees:** Intelligent, tailored and competitive fee models on a product basis. Introduction of maker-taker based pricing means that, for the first time in Europe, rebates on passive derivatives flow can be accrued. Significant reductions on aggressive trade fees.
- **Clearing and margining:** With its IOB offering and cooperation with Oslo Børs, Turquoise is already "Primary-market" on multiple markets. Combined with upcoming Pan-European Index and Stock contracts, Members can improve operational efficiency and net margin payments across geographies, all though one clearer - LCH.Clearnet.

3. Products

3.1. Overview

Turquoise intends to offer a full range of Pan-European Index and Single Stock derivatives products.

The cash equities underlying Turquoise's Derivatives contracts are typically available for trading on the Turquoise and London Stock Exchange cash markets.

Underlying Type / Market	Single Stock	Index	Dividend
Norway	**Futures and Options** on the Norwegian stocks	**Futures and Options** on OBX	
Russia and IOB	**Futures and Options** on the most liquid IOB DRs[1]	**Futures and Options** on FTSE RIOB	**Futures** on the most liquid IOB DRs[1]
Pan-European[2]	**Futures and Options** on the most liquid European single stock underlyings	**Futures and Options** on European benchmark indices	
UK	**Futures and Options** on FTSE100 constituents[2]	**Futures and Options** on FTSE 100	

[1] **I**nternational **O**rder **B**ook **D**epository **R**eceipts
[2] products to be launched in 2012 subject to FSA approval

For a current list of all products traded on Turquoise Derivatives, as well as full Contract Specifications, please refer to the Turquoise Derivatives website.

3.2. Fungibility

Turquoise is the Primary-market venue for certain products, such as Norwegian and IOB derivatives.

With the exception of Turquoise's Norwegian derivatives offering (which is run in cooperation with Oslo Børs to create a single Orderbook and clearing link across the two platforms), derivatives contracts on Turquoise are **not** fungible with those offered on other trading venues.

As Turquoise derivatives products are not fungible with those same products on other markets, they will be margined separately until such time margin offset/fungibility becomes available,

Turquoise will endeavour to harmonise corporate action rules and final settlement price calculations to ensure its products are economically identical to the equivalent products listed on Primary-markets.

3.3. Primary-Market Products

Where applicable, Turquoise has deliberately designed its products to be economically identical to the product as traded on the Primary-market but has provisioned for enhancements where possible.

3.3.1. Contract Specifications

Contract specifications are designed to match Primary-market specification (with the possible exception of tick sizes).

3.3.2. Final Settlement Prices

On expiration, Turquoise has designed products so that final settlement prices will always match the Primary-market. Turquoise will source settlement prices on the same basis as the Primary-market.

3.3.3. Corporate Actions Treatment Rules

The Turquoise Rulebook has been harmonised with regard to the treatment of corporate actions on Primary-markets. Additionally, Turquoise will use the Primary-market's methodology as the basis of setting the reference price required to calculate adjustments to derivative contracts and open positions. The corporate action rules are set out in the Rulebook available from the Turquoise website.

3.4. Contract Specifications

Detailed contract specifications for each product are provided on the Turquoise website detailing the following on a product by product basis where applicable:

Parameter	Options	Futures	Parameter	Options	Futures
Contract underlying	✓	✓	Series code convention (description)	✓	✓
Underlying ISIN	✓	✓	Month code convention	✓	✓
Contract description	✓	✓	Contract listing day	✓	✓
Tailor Made functionality (Y/N)	✓	✓	Contract lifetime	✓	✓
Trading platform	✓	✓	Expiration months	✓	✓
Clearing platform	✓	✓	Expiration day	✓	✓
Central counterparty	✓	✓	Settlement style	✓	✓
Trading hours	✓	✓	Daily settlement price*	✓	✓
Opening auction time		✓	Settlement day	✓	✓
Closing auction time		✓	Final settlement price	✓	✓
Quotation display	✓	✓	Final settlement day	✓	✓
Currency	✓	✓	Premium settlement price	✓	
Multiplier	✓	✓	Premium settlement day	✓	
Tick size	✓	✓	Exercise window	✓	
Tick value	✓	✓			

* for Options, shall mean the value against which CC&G calculates variation margin

3.5. Symbology

The following symbology rules apply to derivatives available for trading on Turquoise

3.5.1. Standardised Series Codes

Each instrument is identified by a string of 4-9 characters (excluding Options strike)

- a maximum of six characters designates the Underlying instrument or Index
- one character designates the Expiration Year
- one character designates the Expiration Month (see below)
- (Options only) the following numeric characters designate the strike price
- An additional symbol may also be added to indicate that a corporate action has occurred and the readjustment rules have been applied to that series (see below).

3.5.2. Tailor Made Series Codes

Each instrument is identified by a string of 6-12 characters (excluding Options strike)

- a maximum of six characters designates the Contract Underlying
- one character designates the Expiration Year
- two characters designate the Expiration Day
- one character designates the expiration month (see below)
- (Options only) the following numeric characters designate the strike price
- (Options only) an “A” or “E” designates whether the option is American or European style
- An additional symbol may also be added to indicate that a corporate action has occurred and the readjustment rules have been applied to that series (see below).

3.5.3. Month Code Convention

Turquoise currently uses two separate month coding systems. One system is in use for IOB and Norwegian derivatives, and a separate coding system (international convention) is being used for all other products going forward.

	All other products			Norwegian and IOB		
Month	**Futures**	**Call Options**	**Put Options**	**Futures**	**Call Options**	**Put Options**
January	F	A	M	A	A	M
February	G	B	N	B	B	N
March	H	C	O	C	C	O
April	J	D	P	D	D	P
May	K	E	Q	E	E	Q

June	**M**	**F**	**R**	**F**	**F**	**R**
July	**N**	**G**	**S**	**G**	**G**	**S**
August	**Q**	**H**	**T**	**H**	**H**	**T**
September	**U**	**I**	**U**	**I**	**I**	**U**
October	**V**	**J**	**V**	**J**	**J**	**V**
November	**X**	**K**	**W**	**K**	**K**	**W**
December	**Z**	**L**	**X**	**L**	**L**	**X**

3.6. Corporate Action Identifier

The presence of any of the following additional letters on the end of a series code indicates that a corporate action has occurred and the readjustment rules have been applied to that series. For example, an "R" would indicate that five corporate actions have been applied to a series during its lifetime with the readjustment rules having been applied five times.

Corporate action number	Identifier
1st	**X**
2nd	**Y**
3rd	**Z**
4th	**Q**
5th	**R**
6th	**S**
7th	**G**
8th	**U**
9th	**V**

3.7. Strike Price Generation

Turquoise generates new strikes on Options series according to the following:

- Minimum number of series in-the-money (ITM)
- Minimum number of series out-of-the-money (OTM)
- Always one series at-the-money (ATM)
- A pre-defined interval between each new generated series, called the "Strike Interval".
- The interval between strikes can be varied on a series according to the bid price on the premium of the ATM strike.

Precise details of strike price generation on a product by product basis for existing Turquoise derivatives products can be found in the "Turquoise Derivatives – Strike Price Generation document" on the website.

3.8. Strategy instruments

3.8.1. User generated strategies

On all Orderbook traded Futures and Options, Turquoise has enabled SOLA functionality that allows users to create their own strategy instruments and list them for trading by the rest of the market.

3.8.2. Automatically generated strategies

For Orderbook traded Futures, Turquoise automatically lists "Roll" strategy instruments in addition to enabling user generated strategies.

Typically, Turquoise will automatically generate a roll instrument between the expiring series and each of the other expiries available on the Orderbook.

4. Trading Functionality

4.1. Multilateral Orderbook Trading

The Turquoise Derivatives Orderbook operates with on a Price-Visibility-Time priority basis.

A summary of Orderbook types, and key information on each, is given in Appendix A.

All executed trades in the Turquoise Derivatives Orderbook will contribute to price and quantity updates in the Market Data Feed (HSVF).

The Risk Controls section describes controls applicable to Turquoise Derivatives.

4.2. Block Trading

Turquoise Derivatives allows for the entry of pre-arranged trades between counterparties ("Committed" trade) or with a single counterparty filling both sides of a trade ("Cross/ Two sided" trade).

Such trades are subject to different risk control parameters in addition to quantity and entry requirements.

A summary of block order types, and key information on each, is given is Appendix A.

Block trades do not necessarily contribute price and quantity updates to the Market Data Feed (HSVF). Rather, block trades larger than a Turquoise defined size, will only contribute quantity updates and not a price update.

Currently, across all products, Turquoise has set this quantity threshold at the same level as the minimum allowable block trade quantity (Appendix B), meaning that block trades will not result in updated price data.

A summary of minimum block sizes on a product basis is provided in Appendix B.

4.3. Tailor Made Reporting

Turquoise's Tailor Made service allows reporting of pre-arranged trades in hidden series with tailorable parameters. For example, the exact day of expiration may be specified.

Tailor Made contracts are reported to Turquoise using the MPS Desk (see MPS section).The following needs reporting:

- Underlying
- Instrument
- Counterparty firm (unless performing a two-sided/ cross trade)
- Trader name at counterparty firm (used for confirmation purposes)

In addition, members will also need to report the following "flexible" parameters

- Price/ Premium (configurable to more decimal places, product dependent)
- Expiration (configurable to exact day)
- Option exercise style (European or American style, product dependent)

4.4. Bulk Quoting (product dependent)

Members that have conformed to the Turquoise SAIL API are also able to send Bulk Quotes to the Turquoise Derivatives Orderbook. Bulk quotes may contain up to 280 separate quotes with Turquoise validating each quote within the message. Throttles apply as per rates described in the

SAIL technical specification. Bulk Quoting is a more efficient way of sending quotes to the trading system as only a single message is required as opposed to multiple cancellations and resends of order messages.

Bulk quotes are only valid for the current trading day.

Risk/ exposure protections for Members using Bulk Quoting are described in the Risk Controls section.

4.5. Quoting Obligations for Market Makers

Firms specifically assigned as Market Makers in a certain instrument class will have to meet a set of quoting obligations that are monitored in real-time by Turquoise.

Market Makers should note the following:

- Quotes must be sent using the Bulk Quote message in the SAIL API
- Quotes must meet the instrument size requirements for a minimum instrument specific percentage of the trading hours in a month
- Quotes must meet the instrument spread requirements for a minimum instrument specific percentage of the trading hours in a month
- Market Makers that do not meet their obligations over the month will not be eligible for Market Maker fees for that month and will be required to repay the difference between such fees and the non-Market Maker fees. Consistent failure to meet obligations will result in termination of “Market Maker” status and any associated agreements.

4.6. Request for Quote (RFQs)

Request for Quote (RFQ) allows any Member to broadcast a message to Market Makers in a particular instrument via the HSVF market data feed. Market Makers, as part of their agreement with Turquoise, have an obligation to reply by entering a quote in to the Orderbook for that specific instrument.

RFQs contain:

- Instrument Class
- Instrument ID Code
- Quantity (optional)

4.7. “On Request” listing of additional standardised series

Members may request by phone or electronic communication to Turquoise Clearing for a specific Standardised Futures or Options Series to be listed on the Orderbook if it is not automatically generated in accordance with the parameters described in the relevant Contract Specifications and the Strike Price Generation document. This is known as an ‘On Request’ listing.

Members shall provide the following information:

- The Underlying instrument;
- Whether a Future or Option (Call or Put) Contract;
- The Expiration Month (Expiration Day will always be standardised as per the relevant Contract Specification);
- The Strike Price (for Options only and must be to the same number of decimal places as other standardised series on the same underlying).

5. The Marketplace Service Desk (MPS)

5.1. Overview

Turquoise MPS is a phone based service provided to Member firms and Non-Member IDBs.

NB: MPS is not a broker and only performs its functions with regard to Turquoise's derivatives markets. MPS operates in a completely impartial manner.

MPS performs the following functions:

- inputting all types of anonymous order or pre-arranged trades on behalf of Member firms (this includes "out-of-hours" trade reporting between 07:30 and 17:30 on normal business days)
- acting on behalf of IDBs, who report trades to MPS who in turn confirm with both Member counterparties. This allows IDBs to maintain anonymity amongst their client base.
- processing orders or multi-leg strategies on behalf of Member firms without connectivity
- processing of all tailor made trades
- entering orders on behalf of members who are experiencing IT/connectivity issues

5.2. Restrictions on MPS use

The following restrictions apply to the activity that MPS can perform on behalf of Members:

- Only "Approved Traders" (as appointed by the Member firm) may confirm a trade or submit an order
    - anyone may report a trade but it will not be registered unless an Approved Trader at each Member firm counterparty provides confirmation
- All other circuit breakers that apply to a product series apply to trades inputted by MPS unless otherwise stated in the Contract Specifications.
- MPS will only enter session orders on behalf of members; they will not enter Good-Till-Day (GTD) or Good-Till-Cancelled (GTC) order types.

5.3. Process for using MPS

A customer wishing to use MPS should do the following:

- Contact MPS
- Provide details of the trade
- In the case of a pre-arranged block trade or tailor made trade report, the customer should also specify the counterparty firm and the relevant contact at that firm

MPS will then confirm with the counterparty contact for their side of the trade (the contact will have to be an Approved Trader in order to authorise this confirmation). Only once an Approved Trader for each side of the trade has provided this confirmation, will the trade be executed.

MPS records all audio and written correspondence so that any disputes can be settled easily.

6. Membership

6.1. Eligibility

Members and prospective members are required to satisfy the Membership criteria applied by Turquoise appropriate to the capacity in which they intend to act.

- Must be an EEA regulated investment firm or credit institution (as defined under MiFID); or
- The applicant must show that it is fit and proper; and
- Turquoise Management must be satisfied that the Applicant has or will have sufficiently completed conformance testing prior to conducting business on Turquoise. This also applies to mandatory system upgrades; and
- Turquoise Management must also be satisfied that the Applicant has adequate organisational arrangements and a sufficient level of trading ability and competence and other relevant systems and controls; and
- The Applicant must be a clearing member of a central counterparty approved by Turquoise Management for derivatives trading or have made satisfactory arrangements with an entity in order to guarantee the clearing of any transactions executed on Turquoise.

6.2. Clearing Members

Firms may take membership of Turquoise Derivatives in one of three clearing capacities:

1. **General Clearing Member (GCM)** – is a member of Turquoise and has a direct membership of the Designated Clearing House with respect to Turquoise Derivatives and is also approved to act in a clearing capacity on behalf of Non-Clearing Members (NCMs)
2. **Individual Clearing Member (ICM)** – is a member of Turquoise and has a direct membership of the Designated Clearing House with respect to Turquoise Derivatives. Unlike a GCM, an ICM may only clear its own business. ICMs wishing to become GCMs should contact LCH and Turquoise Market Operations stating their intention.
3. **Non-Clearing Member (NCM)** – is a member of Turquoise but has no direct membership of the Designated Clearing House with respect to Turquoise Derivatives. NCMs must use a GCM to clear their business. The GCM will set up a tri-party "LCH-NCM-GCM Agreement" between themselves, the NCM and LCH.Clearnet (the Designated Clearing House). Only once Turquoise Market Operations has received confirmation from LCH.Clearnet that this agreement is in place, will an NCM be able to begin trading.

The Turquoise Rulebook (available on the Turquoise website) contains further details on requirements and eligibility for each of the above.

6.3. Trading Capacity

Firms may effect transactions on Turquoise in one of three capacities:

1. Broker (acting on behalf of clients)
2. Proprietary trader (house business); or
3. Market Maker

It is the responsibility of each member to ensure that transactions entered into on Turquoise are allocated to the correct Account.

6.4. Market Makers

Firms wishing to act as Market Makers on Turquoise's markets and therefore benefit from pricing incentives and revenue sharing schemes in certain products will need to sign a supplementary agreement. This is done after consultation with Turquoise's Sales Team as well as having satisfied Turquoise that it has the necessary regulatory authorisation and technical capability.

6.5. Documentation

Turquoise membership documentation (covering both cash and derivatives membership) can be requested by contacting Turquoise's Sales Team or by downloading from the Turquoise website: http://www.tradeturquoise.com/tq_joining.shtml

7. Connectivity and Access

7.1. Overview

		Trading	Clearing	Market Data
API and Connectivity	Extranex Hosting VPN NSP	SAIL API FIX 4.2 API	BCS API	HSVF API
API and Connectivity	Vendor Access Network (VAN)	VAN* provided network and applications		

		Trading		Clearing		Market Data
Application	Turquoise solution	BTS		BCS	CC&G FTP site	BTS
Application	External solution	Member In-House GUI	ISV provided GUI*	ISV GUI*		Market Data Vendor*

*See Turquoise website for a full list: http://www.tradeturquoise.com/tq_vendors.shtml

Please refer to the "TQD102 Connectivity Guide" on the Turquoise website for more detail on the connectivity options listed below.

7.2. Physical Connectivity

7.2.1. Extranex

Extranex provides customers of the London Stock Exchange Group, including Turquoise MTF (Derivatives and Equity) Members with a dedicated, resilient and secure point to point connection allowing transmission of data traffic to and from the Group's Trading, Clearing and Information Systems.

A range of service options are available to suit varying customer requirements.

See the London Stock Exchange website or contact Turquoise's technical team for more details:

http://www.londonstockexchange.com/products-and-services/connectivity/extranex/extranex.htm

7.2.2. Hosting

Members may choose to house their servers in LSEG's data centre in close proximity to the Turquoise Derivatives servers.

7.2.3. Virtual Private Network (VPN)

For Members seeking a low cost solution and who are less sensitive to latency, Turquoise will configure and deliver a router to allow trading and clearing access over a standard internet connection.

7.2.4. Network Service Providers (NSP)

As an alternative to using the Extranex network, the Group's services, including Turquoise Derivatives, can also be accessed through accredited NSPs.

Members contract with the NSP for provision of network connectivity but sign agreements directly with Turquoise for access to our trading and information services.

Clients using an NSP connection will have individual service enablements set up on our trading, clearing and information systems. The data and trading feeds (APIs) are in exactly the same format as those received by a direct customer and are subject to the same testing requirements.

A list of all current NSPs for Turquoise Derivatives can be found on the Turquoise website.

7.3. Vendor Access Networks (VANs)

VANs provide a full end to end solution comprising network connectivity and pre-conformed software applications through which their clients can interface with Turquoise Derivatives.

7.4. Vendor Software Solutions

7.4.1. MDVs, ISVs and VANs

A full list of Turquoise Derivatives conformed Front, Middle and Back Office Independent Software Vendors (ISVs), Market Data Vendors (MDVs) and VAN providers can be found on the Turquoise website: http://www.tradeturquoise.com/tq_vendors.shtml

7.4.2. BTS Trading Application

The Borsa Italiana Systems (BItS) Trading Station (BTS) Service allows access to Turquoise Derivatives trading services. In addition, it is also used to access all other London Stock Exchange Group cash, fixed income and derivatives markets.

Turquoise can supply BTS to members as an off-the-shelf ready-made trading application. Using BTS, members can access functionality including order entry, deletion, viewing of Orderbook to five levels of depth and reporting of committed block trades.

BTS is unable to create strategy instruments, enter two sided-cross trades or be used for market making activity such as bulk quoting and market maker protection.

The following BTS documents are available from the Turquoise website:

- TQD801 BItS Trading Station (BTS) User Manual

7.4.3. BCS Clearing Application

Members can develop directly to the CC&G clearing API, however most clearing members will take the Turquoise supplied BCS application to enable them to view reports, perform give ups/ take ups, move trades between accounts and perform other post trade administration.

The following BCS documents are available from the Turquoise website:

- TQD701 BItS Clearing Station (BCS) User Manual
- TQD702 BItS Clearing Station (BCS) Application Data Layouts
- TQD703 BItS Clearing Station (BCS) Technical Notes

7.5. BCS FTP Service

Turquoise clearing reports are available via an FTP site accessible with a user name and password

The following FTP Service documents are available from the Turquoise TAM Team:

- Turquoise FTP Service Manual
- Member Data Service CC&G/ Turquoise (describes member specific reports)
- Public Data Service CC&G/ Turquoise

8. Interfaces and Information Dissemination

8.1. Trading APIs

Turquoise provides two derivatives trading APIs that applications can be developed to. These are:

- FIX 4.2
- SOLA Access Information Language (SAIL) – the SOLA native API

The native SAIL API provides a slight latency advantage over the FIX API along with additional functionality for bulk quoting.

The following FIX and SAIL documentation is available from the Turquoise website:

- TQD200 - FIX 4.2 Business Design Guide
- TQD201 - FIX 4.2 Specification
- TQD300 - SAIL Business Design Guide
- TQD301 - SAIL Specification

8.2. Market Data API

Turquoise provides a single market data API that applications can be developed to. This is:

- High Speed Vendor Feed (HSVF)

HSVF disseminates trades, quotes, request for quotes, market depth, trade cancellation, strategies, bulletins, instrument keys, instrument summaries and administrative messages for all order-book traded derivatives on Turquoise. HSVF uses a TCP/IP broadcast interface. Users may subscribe to:

- **Level 1 data** – best bid and ask price and aggregate size, last trade price and size and other market data as detailed in the documents listed below.
- **Level 2 data** – level one data augmented with a further four levels of price depth and size

The following HSVF documentation is available from the Turquoise website:

- TQD401 - HSVF Market Data

Members wishing to redistribute market data must do so under the terms of the ILA and should refer to our Tariff Schedule, or contact the Turquoise Sales team for more information.

8.3. Clearing API

Turquoise provides a clearing API (using CC&G clearing engine) that applications can be developed to for the purpose of allowing clearing processing and trade administration. This API is:

- BCS Clearing Gateway (BCS API)

The following BCS API documentation is available on request from Turquoise TAM Team:

- BCS API Specification

9. Clearing and Market Operations

9.1. Transaction reporting and MIC

Every series on Turquoise has an associated ISIN code. This ISIN is a unique identifier that can be used for transaction reporting purposes.

Each series can also be identified by its unique series level code, described in the symbology section.

The Market Identifier Code (MIC) for Turquoise derivatives is TRQD.

9.2. Central Counterparty Protection

All Future and Option Contracts traded/reported on Turquoise will have LCH.Clearnet acting as Central Counterparty.

At the point of trade, LCH.Clearnet will novate the trade by assuming a long position against the short counterparty to the trade, and a short position against the long counterparty.

9.3. Margining

Initial margin is calculated and collected by LCH.Clearnet using London SPAN V 4.0 which is a portfolio based margining system. There are three major inputs to the London SPAN margin calculation, Positions, Prices and Parameters (determined by LCH.Clearnet and reviewed on a continual basis). Any change to any one of these parameters will result in a change to the margin requirement.

Turquoise use CC&G to calculate daily variation margin of a members' profits or losses using the Daily Settlement Price to mark-to-market open positions. The collection/return of variation margin is administered by LCH.Clearnet.

9.4. Account Structure

Members can request the following types of account from Turquoise Derivatives Market Operations.

- Client account
- House account
- Market Maker account (for members under provision obligations and able to use bulk quote protection)

Market Operations will supply the member with a "Static Data Form" upon request, on which account set up requirements can be specified. The member can then segregate business as required.

9.5. Market Operations and Clearing Processing Timetable

Times may vary depending on market conditions	
Market Operations opens	**07:30**
Clearing closes (read-only access available in BCS)	**18:00**
Clearing batches begin (BCS inaccessible)	**18:45**
Clearing reports available	**19:00**

Market Operations closes	**19:00**
Official closing prices disseminated (can be amended over-night)	**21:00**

All times are London times

Until clearing closes at 18:00 daily, members are able to perform trade administration such as give ups/ takes ups, position transfers and close outs in the clearing system and by contacting Turquoise Market Operations.

9.6. Clearing reports

Members can extract reports summarising their activity on Turquoise Derivatives from the clearing API and clearing applications (including the CC&G FTP Server).

For more detail on these reports and how to access them, please refer to the Connectivity and Access section,

9.7. Exercise and Assignment guide

Currently, Turquoise offers two Options styles on its derivatives markets with the following exercise windows:

		Exercise window	
Option style	**Exercise**	**Open**	**Close**
American style	Any business day from trade date until day before expiry	07:30	18:00
European style and American style	Expiry day only	18:10	18:40

All times are London times

Turquoise applies the following automatic exercise rules on expiration:

Market	Index Options	Stock/ DR Options
Norway	All series that are in-the-money by more than the exercise fee payable	All series that are 1% or more in-the-money
IOB	All series that are in-the-money by more than the exercise fee payable	All in-the-money series
UK	All in-the-money series	All in-the-money series

Manual exercise can be performed through the member's clearing application (for example on a Norwegian series that is less than 1% in-the-money)

10. Risk Controls

10.1. Price Controls on multilateral Orderbook Trades

Circuit breakers will activate and trigger a 60 second suspension of trading when a trade occurs at a price level deemed to be an unacceptably large percentage margin away from static or dynamic control prices defined by Turquoise.

Turquoise can set separate circuit breakers against the static control price with respect to both orders and trades.

The acceptable margin can be configured both above and below the control price separately if required however Turquoise has chosen to use the same figure above and below for all products to date.

Definitions of control prices are as follows:

- **Static control price** – the previous day closing price as determined by Turquoise and CC&G OR a manually inputted price;
- **Dynamic control price** – the last traded price in the current session

Levels set by Turquoise are detailed in Appendix B.

Price controls on Orderbook trades can be overridden by contacting the Turquoise MPS desk subject to approval.

For Stop Loss and If Touched orders, the incoming order price cannot be outside the price control thresholds detailed in Appendix B. Additionally if, when triggered, the price on such an order violates on of the control parameters, the incoming order is deleted and the circuit breaker suspension is triggered.

10.2. Price Controls on Block Trades

Block trades electronically submitted to Turquoise will be subject to the following controls:

- Where the price of the block falls outside the real-time bid/ ask spread, Turquoise defines a minimum acceptable quantity for the trade.
- Turquoise sets a maximum permitted percentage deviation from the real-time bid/ ask spread for such block trades.
- Any block trade at a price more than this percentage below the bid/ above the ask, will not be processed.
- Where the price of the block falls inside the real-time bid/ ask spread, the trade is subject to normal order quantity controls as detailed in 10.4..

Product specific settings are in detailed in Appendix B.

Price controls on block trades can be overridden by contacting the Turquoise MPS desk.

10.3. Price Controls on Tailor Made Trades

All Tailor Made trades are processed by the Turquoise MPS Desk with open interest kept separately from Orderbook and block trading open interest. Tailor Made trades are therefore not subject to any price controls.

10.4. Order Quantity Controls

Turquoise can apply a maximum permitted number of lots for single orders, combination orders or block orders. Product specific settings are detailed in Appendix B.

10.5. Position Controls

Turquoise monitors positions and may place limits on their size. The Designated Clearing House will request margin on all positions and it is each member's responsibility to meet their margin requirements.

GCMs interested in placing position controls on their NCMs, or any member interested in placing position controls on an account level should contact their back office ISV.

10.6. Cancellation on Disconnection

Members should be aware of the following;

- When conducting the login procedure, SOLA allows for the member to specify an "inactivity interval" which indicates the number of system "heartbeats" that must be missed before the Member is considered disconnected. This only applies to "While Connected" orders and not to GTD or GTC orders.
- If the inactivity interval is set to "0" then the user is never considered to be disconnected
- **"Good Till Day" and "Good Till Cancelled" orders will not automatically cancel on disconnection**
- Turquoise therefore strongly recommends the use of "While Connected" orders for Members that are concerned about cancellation on disconnect.

10.7. Global Cancellation of orders and bulk quotes

Members wishing to remove all their orders from the Orderbook in one go should contact the Turquoise MPS desk who can perform this action.

A specific Global Cancellation message, applying only to quotes placed using the Bulk Quote message, can be sent by Bulk Quote users and will pull all quotes related to a specific trader on all instruments in the same class. The Trader ID and instrument Group ID are used to specify which quotes to cancel. Separate orders will not be cancelled.

10.8. Order Modification

A member may modify any order still on the Orderbook. The following modifications will affect price and time priority:

Modification	Price priority	Time priority
Quantity decrease	Maintained	Maintained
Quantity increase*	Maintained	Lost
Price change*	Lost	Lost

*results in deletion of original order and entry of a new order with new price time priority and associated order number

10.9. Order Cancellation

A Member may cancel any order still on the Orderbook by sending a cancellation message to the trading system or by contacting the Turquoise MPS desk.

10.10. Trade Cancellation

Trade cancellations are performed through Turquoise Market Operations and are set out below. Specific cancellation rules for Norwegian and Russian products are explained in the individual areas relating to these products in the Rulebook. For more details refer to the Turquoise

Summary:

Turquoise reserves the right to forcibly cancel any trade without the permission of either Counterparty.
Circumstances under which this can occur may include, but are not limited to:

- An error (technical or operational) on the part of Turquoise or its systems;
- Material breach of any law, any Rule of Turquoise or any Rule of an affiliate company of Turquoise (such as the Designated Clearing House) ;
- Turquoise judges that cancellation of the trade would be in the interests of the market;
- For Dividend Derivatives, where a transaction occurs on the basis of material or erroneous info.

If a request cancellation has come from a member. Turquoise will always request cancellation from the other Counterparty on behalf of the member seeking the cancellation.

No Trade will usually be considered for cancellation if the request to cancel is received more than thirty minutes after the Trade has executed.

No Trade in any Future Contracts are considered for cancellation unless they have triggered a system level Circuit Breaker (see Price Controls).. In the event that an executed Trade has triggered a Circuit Breaker, only the portion of the Trade that executed beyond the Circuit Breaker threshold will be considered for cancellation.

No Pre-Arranged Trade of any type, in any instrument is considered for cancellation. This is because both Counterparties must have independently confirmed the exact same details for the Trade to have been accepted by Turquoise. Where both Counterparties wish to make adjustments to a Pre-Arranged Trade that has already been Registered, the Rules for Re-Registration apply.

If none of the above stipulations have been violated, a Trade may be considered by Turquoise for cancellation.

If the Counterparty does not agree to cancel, Turquoise will:

- Calculate a theoretical Option Premium for the time of the trade using a standard Black-Sholes Options pricing model with the following inputs:
  - the price of the Underlying on the Primary Market at the time of the trade;
  - a volatility estimate taken from polling other non-affected market participants or, in the absence of such information, volatility data used by Turquoise's Clearing System to calculate the previous evening's End of Day Price;
  - The market interest rate used by the Turquoise Clearing System for the product in question
- Define a "Fair Market Spread". This Fair Market Spread will be 15% either side of the obligated spread for Market Makers
- In the absence of an obligated spread, the Fair Market spread will be 30% either side of the theoretical Option Premium.
  Turquoise will then adjust the Trade to the upper or lower limit of the Fair Market Spread.

A Member that is perceived to be cancelling Trades with higher than average regularity will be warned once by Turquoise. If the activity continues they may be ejected from the market.

Turquoise defined thresholds are market and product specific.

10.11. Drop Copy

The drop copy feature allows drop copy participants to receive a copy of all order acknowledgements and trade notifications that belong to a specific Member.

Drop copy messages are all sent using the SOLA Access Interface Language (SAIL), even where the Member's original order protocol was FIX.

SAIL messages included in the drop copy are:

Message
Order Acknowledgement
Order Modification Acknowledgement
Order Cancellation Acknowledgement
Order Cancellation Notice
Execution Notice*
Leg Execution Notice*
Execution Cancellation notice*
Leg Execution Cancellation Notice*

* contains "Maker-Taker" flag

For more information on drop copy functionality please refer to the following document on the Turquoise website

- TQD302 SAIL Drop Copy

10.12. Bulk Quoting Protection

Bulk quoting protection is a Turquoise Derivatives provided function that will result in an automatic cancellation of all quotes in a particular instrument class.

The feature protects only assigned Market Makers against any "excessive" trades due to the following:

- Technical problems at participant's end preventing normal market updates
- Quoting errors at participant's end due to erroneous underlying price information
- Unintentionally being "swept" by another Market Maker

10.12.1. System Protection Methodology

- Users may opt for one of two types of bulk quoting protection:

  - **Standard protection:** If protection is triggered on an instrument class, quoting will be restarted and counters (detailed below) reset the next time the Market Maker sends a bulk quote message to any instrument in the class.
  - **Advanced protection:** If protection is triggered on an instrument class, any subsequent quote update is rejected and quoting can only be resumed after the Market Maker has sent a new "Market Maker protection subscription" (RP) message

- Once protection is triggered, Turquoise will automatically cancel all quotes posted by the trader on all instruments in the class and send a "Notice of cancellation of all quotes" (NP) message.
- Bulk quoting protection is active on all quotes sent using the Bulk Quote message functionality
- Turquoise provides five protection counters which can be set by firms specifically assigned as Market Makers in a specific instrument class
- Any number of counters can be activated simultaneously
- Traders must define a "Time Interval"
- The protection counters are reset in the event that the time elapsed between any two trades is longer than the user defined "Time Interval".

Protection counters are listed and described in the table below:

Counter type	Counter change condition (applies to all trades in any instrument of the class)	Trigger for bulk quoting protection
Trade counter	Increases by 1 with each execution of a trade of at least N lots (where N is a user defined number)	User defined number of trades of at least N lots in size
Volume counter	Increases by the trade volume of every execution	User defined volume
Value counter	Increases by the trade value of every execution	User defined value
Delta volume counter	**Increases** by trade volume of every bought call option, sold put option and bought future; and **Decreases** by trade volume of every sold call option, bought put option and sold future	User defined net volume
Delta value counter	**Increases** by trade value of every bought call option, sold put option and bought future; and **Decreases** by trade volume of every sold call option, bought put option and sold future	User defined net value

11. Tariff Models

11.1. Overview

Turquoise operates several markets with tailored pricing models. Up-to-date fee schedules are available on the Turquoise website: http://www.tradeturquoise.com/tq_derivatives_fees.shtml.

The different tariff models currently in use on Turquoise Derivatives are detailed below.

Members should note that unless expressly stated, clearing fees and trading fees are bundled together as the "clearing and trading fee".

11.2. Per-Contract Charging

11.2.1. Maker-Taker system

For every trade that happens on the Turquoise SOLA Orderbook, one counterparty to the trade is designated the "Passive/ Maker" side and the other is designated the "Aggressive/ Taker" side.

- **Passive/ Maker side**: Relates to an order that is resting on the Orderbook awaiting the entry of an opposite order against which it will be able to execute.
- **Aggressive/ Taker side**: Relates to an incoming order that instantaneously executes against an opposite order already resting on the Orderbook.

The maker-taker system differentiates charging based upon the above distinction. So:

- The maker in each trade pays a fee to Turquoise equal to the passive fee multiplied by the number of contracts in the trade
- The taker in each trade pays a fee to Turquoise equal to the aggressive fee multiplied by the number of contracts in the trade
- Fees on either side may be positive or negative, a positive fee equates to a payment from the member to Turquoise, a negative fee equates to a rebate payable by Turquoise to the trading member.

NB: *Maker-taker pricing* ***does not*** *apply to block trades or Tailor-made trades.*

Please refer to Appendix C for a worked example

11.2.2. Fee per lot system

Products using this system simply apply one universal fee to each side of the trade based on the number of contracts traded, for example Norwegian Index Futures. This system makes no distinction between "Passive" or "Aggressive" counterparties

Please refer to Appendix C for a worked example

11.3. Per-Trade Charging

11.3.1. Percentage of Futures value system

Some products are charged based on a "percentage of future value" system, for example IOB dividend Futures.

- **Future Value** = (future price traded) x (number of contracts) x (multiplier)

Please refer to Appendix C for a worked example

11.3.2. Percentage of premium value system

Some products are charged based on a “percentage of premium value” system, for example IOB DR Options

- **Premium Value** = (premium) x (number of contracts) x (multiplier)

Please refer to Appendix C for a worked example

11.4. Block Trade and Tailor Made Charging

- Unless otherwise stated, Block Trades are charged at the same rate as Orderbook trades
- Tailor-made trades are always charged at the same rate as block trades

11.5. Fee Caps

- Where stated fee caps apply to Orderbook, block and tailor-made trades
- Fee caps apply on a per trade basis, meaning that the fee paid for a trade may never exceed the stated fee cap in that product line.

12. Contacts

For more information on Turquoise Derivatives, or any services offered by Turquoise, please contact a member of our team.

Department	Telephone	Email
Turquoise Derivatives	+44 (0) 20 7382 7650	derivatives@tradeturquoise.com
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13. Appendix A – Order Types

13.1. Order Types for Electronic, Anonymous Orderbook Trading

	Order type	Description
Price type	**Limit order**	Enters Orderbook at specified price and will execute at that level or better. Residual is retained on order-book (unless designated as an **immediate order**) until withdrawn or traded
	Market order	Executes at best available price until all volume on opposite side has been traded. Residual is converted to a **limit order** at last price that original order was executed
	Top order	Executes at best available price against any single contra order. Residual is converted to a **limit order** at price just traded
	Stop (loss) order	Order enters book to prevent further loss once either the Last price or Bid or Ask (as selected) reaches a stated trigger price. Entering order can be set as limit order by entering a specific order price. Alternatively, it can be set as a market order by leaving the order price field blank. Residual is retained on order-book
	If-Touched order	Order enters book seeking to capitalise once either the Last price or Bid or Ask (as selected) reaches a stated trigger price. Entering order can be set as limit order by entering a specific order price. Alternatively, it can be set as a market order by leaving the order price field blank. Residual is retained on order-book
Quantity type	**Minimum quantity order**	Tries to execute at the specified price for at least the stated 'Additional Quantity' (AQ). If the AQ cannot be immediately filled, the order is rejected. If the AQ is filled, the residual is retained on the Orderbook and can trade without further quantity constraints.
	Iceberg/ disclosed quantity order	Enters book as **Limit order** for only the 'Additional Quantity' (AQ) visible, and any balance is held "in reserve". The visible quantity is assigned time-priority at the point of insertion in relation to other displayed orders, whilst the reserve quantity is assigned time priority in respect of other non-displayed orders. When this disclosed/ AQ amount has been traded, the system refreshes the visible quantity from the reserve quantity.
Duration type	**Day order**	Remains on the book and cancelled at end of the day unless traded or deleted
	Good Till Day (GTD)	Remains on the book and cancelled at the end of the day specified in the GTD field unless traded or deleted. **Turquoise MPS will not enter this order type on behalf of members.**
	Good Till Cancelled (GTC)	Remains on the book until expiration unless traded or deleted. **Turquoise MPS will not enter this order type on behalf of members.**
	Immediate order (FAK/ IOC)	Immediately executed against any existing orders at the specified price of better, up to the stated volume. Residual volume is deleted
	While connected order	Remains on the book until participant disconnection or front end failure unless traded or deleted

13.2. Order Types for Pre-Arranged Block Orders

<table>
<tr><th></th><th>Order type</th><th>Description</th><th>Effect market data</th><th>Matching requirements</th></tr>
<tr><td rowspan="2">Price type</td><td>Committed order (interbank)</td><td>Matching facility to support reporting of executions negotiated between different members for the purpose of trade publication and clearing. Orders must specify the intended counterparty and do not interact with the anonymous multilateral order-book. Orders stay in the committed book until the end of the day unless matched or deleted</td><td rowspan="2">Order is not disseminated. Below a certain quantity threshold determined by Turquoise on a product specific basis, a committed trade or two-sided trade leads to price, quantity and high/low updates in the market data feed. Above that threshold, only quantity is updated</td><td>Both sides must enter a committed order with opposing buy and sell sides, same price, same quantity and the correct counterparty or the orders will not match.

Committed orders not matched by the end of the trading session are automatically deleted.</td></tr>
<tr><td>Two-sided order (cross/ intrabank)</td><td>Trade is pre-arranged by one member acting on behalf of each side and reported to Turquoise. Order does not interact with the order-book</td><td>Matching not required as order details are entered by one participant only</td></tr>
</table>

N.B. Prearranged blocks can be reported to the Turquoise MPS desk any time between 07:30 and 17:30

14. Appendix B – Controls

14.1. Price and Quantity Restrictions

			Orderbook price control		Block price control		Orderbook quantity control		Block quantity control	
		Product	**% from static control**	**% from dynamic control**	**Minimum quantity for outside spread**	**Allowable % from bid/ask**	**Single order maximum**	**Combo order maximum**	**Single and combo order minimums**	**Single and combo order maximums**
Index	**Futures**	FTSE 100	+/- 7.5% for orders +/- 3.5% for trades	+/- 1.5%	250 lots	+/- 7.5%	500 lots	2500 lots	250 lots	5,000 lots
		FTSE RIOB	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
		OBX	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
	Options	FTSE 100	-	-	250 lots	+/- 7.5%	500 lots	2500 lots	250 lot	5,000 lots
		FTSE RIOB	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
		OBX	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
Stock	**Futures**	UK stock								
		IOB DRs	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
		Norwegian stock	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
	Options	UK stock								
		IOB DRs	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
		Norwegian stock	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots
Div	**Fut**	IOB DR dividends	-	-	1 lot	-	50,000 lots	50,000 lots	1 lot	50,000 lots

15. Appendix C – Tariff Model Examples

<table>
<tr><th></th><th>Tariff system</th><th>Example tariff parameters</th><th>Example instrument</th><th>Quantity traded</th><th>Futures price/ Options premium traded</th><th>Counterparty A fee (passive side)</th><th>Counterparty B fee (aggressive side)</th></tr>
<tr><td rowspan="2">Per contract</td><td>Fee per lot</td><td>£0.20</td><td rowspan="3">Index future</td><td rowspan="4">600 lots</td><td rowspan="4">£2.00
(100 multiplier)</td><td colspan="2">= £0.20 x 600 lots
= £120 per side</td></tr>
<tr><td>Maker-Taker</td><td>-£0.05/ £0.20</td><td>= -£0.05 x 600 lots
= -£30 (rebate)</td><td>= £0.20 x 600 lots
= £120</td></tr>
<tr><td rowspan="2">Per trade</td><td>Percentage Futures value</td><td>0.3%</td><td colspan="2">= 0.3% x 600 lots x £2 x 100
= £360 per side</td></tr>
<tr><td>Percentage premium value</td><td>0.1%
min £0.10, max £1.00 per contract</td><td>Stock option</td><td colspan="2">= 0.1% x 600 lots x £2 x 100
= £120 per side
Trade fee min = £0.10 x 600 lots = £60
Trade fee max = £1.00 x 600 lots = £600</td></tr>
</table>

16. **Appendix D - Terms and Acronyms**

Removed to website document "Turquoise Derivatives – Glossary"