



## CTT Advisors ETF Arbitrage Trading Strategy Overview

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# Executive Summary

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- Market neutral, ETF arbitrage trading strategy **capitalizing on advanced technologies and electronic in the credit space**
- **Fully automated, electronic trading model and infrastructure** encompassing electronic order and execution management, pricing engine algorithm, and real-time risk management
- **Robust data infrastructure harnessing security tic data** to provide order stack pricing data on the breadth of liquid securities in the corporate bond market
- Performance results on 3 historical back tests and live trading showed **75%+ winning trades**
- Trading strategy managed by CTT Advisors with **deep experience in the fixed income markets**
  - Corporate and municipal bond trading
  - Arbitrage trading
  - Electronic trading and market making
  - ATS
  - HFT trading system design and development

# Market Observations

- **SIFMA Releases Electronic Bond Trading Platform Report For U.S. Corporate and Municipal Securities – Feb 2016**
  - Several new entrants are offering or plan to offer electronic trading related services to challenge established players, seven of the 19 platforms interviewed have entered the market in the last 2 year, and four more platforms plan to launch in 2016.
  - Enhancements are being made to established trading protocols and several new protocols are emerging to promote price discovery, including live order books, session based trading and independently determined midpoint pricing.
  - The survey found that 14 platforms offer "all-to-all" trading which highlights efforts to increase market participation among a diverse universe of investors.
  - The 19 electronic trading platforms surveyed offer 42 electronic trading protocols that have been structured in a variety of ways to address the differing demands of market participants.
  - Electronic trading platforms are increasingly targeting larger sized trades and providing various methods to protect anonymity and to better protect investors. Platform innovation is also primarily occurring within the corporate bond market, while the municipal market is likely to shift more gradually due to its significant number of issues and CUSIPs and high direct retail participation.
- **"Intercontinental Exchange Inc. is making a multibillion-dollar bet that corporate bonds are increasingly going to be traded on electronic exchanges and other marketplaces..." – Oct 2015**
  - <http://news.morningstar.com/all/dow-jones/us-markets/201510266527/ice-to-buy-interactive-data-for-52-billion.aspx>
- **Anatomy of Market Timing with Moving Averages – Aug 2015**
  - **Abstract:** Our analysis offers a new and very insightful reinterpretation of the existing rules and demonstrates that the computation of every trading indicator can equivalently be interpreted as the computation of the weighted moving average of price changes. This knowledge enables a trader to clearly understand the response characteristics of trading indicators and simplify dramatically the search for the best trading rule.
  - [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2585056](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2585056)
- **"...We believe the secondary trading environment for corporate bonds today is broken, and the extent of the breakage is masked by the current environment of low interest rates and low volatility, coupled with the positive impact of QE on credit markets..." – Blackrock, Sep 2014**

**BLACKROCK RECOMMENDATIONS;**

  - More "all to all" trading venues – not just "dealer-to-customer" or "dealer-to-dealer"
  - Adoption of multiple electronic trading (e-trading) protocols – not just request for quote (RFQ) or central limit order book (CLOB)
  - Standardization of selected features of newly-issued corporate bonds
  - Behavioral changes by market participants recognizing the fundamentally changed landscape
- **"It is striking that the dramatic technological advances that have transformed the equity markets over the past decade have had only a modest impact on the trading of fixed income securities " – Mary Jo White, SEC Chairman, Jun 2014**

# Trading Methodologies

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The CTT trading model combines the use of trading logic, real-time and historical data, and electronic infrastructure to generate two-sided orders across market ATSS (Market Axess, Trade Web, Bondpoint, TMC, MTS Bonds, NYSEBonds, and the UBS Advisor Network).

The model is fully automated and executes trades electronically via an API interface. As such, **there is no human input determining when to open or close positions.**

A few relative aspects of the model are provided below;

- Price Valuation – orders generation based on statistical analysis of real-time and historical prices and considers order size, limits, volatility, and risk exposure
- Market Making – on large number of securities based on model factor inputs including price valuation, statistical regression, risk/exposure, order size, bid/ask spread, and volatility
- Hedging – use of LQD ETF and pairs trading
- Risk – exposure is determined and limited through automation (included in model factor inputs) at the industry, sector, and individual security levels

# Algorithm Illustration

The trade algorithm considers intraday order stack data, macro and micro factors, and trends to determine entry/exit levels. Orders are generated based on model factor logic and sent electronically to the corporate bond market electronic exchanges (ATS). The model is designed to be flexible such that it can be deployed in a market neutral strategy (currently deployed in this manner for ETF arbitrage), to make two sided markets with skew towards the long or short side, and for other asset classes deploying similar methodologies.

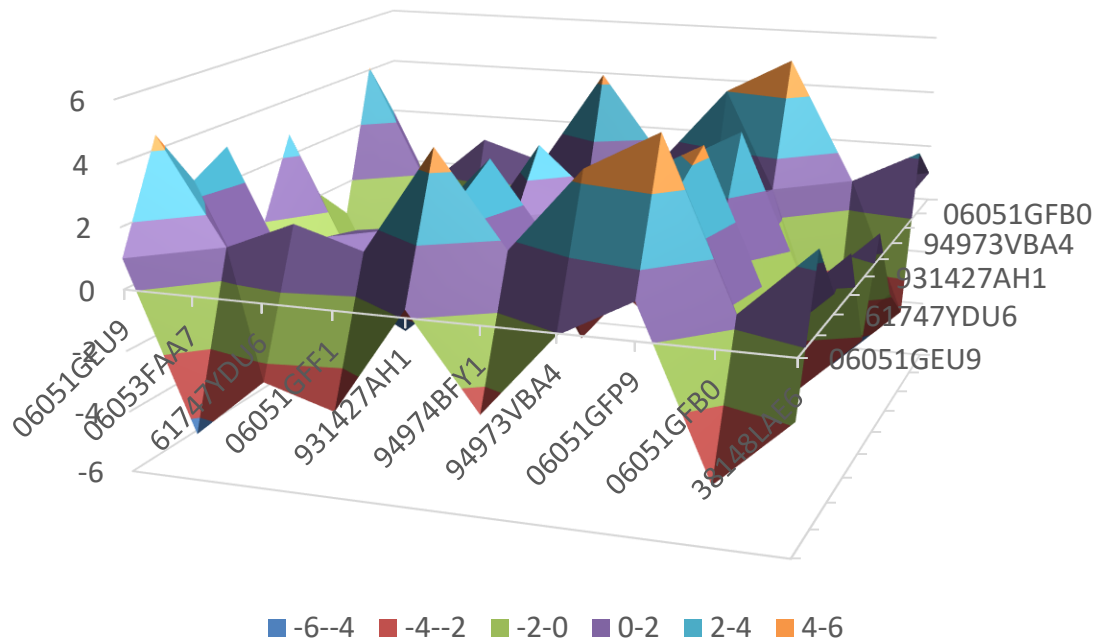
The screenshot displays a trading platform interface with three main components:

- Order Book (Top Left):** A table showing market data for various securities. Columns include Contract, Bid Price, Ask Price, Ask Size, Last Price, Change, Chg %, High, and Low. Visible contracts include LQD, HF, VCIT, HYG, AGG, IYF, and IYW.
- Spreadsheet (Top Right):** An Excel spreadsheet titled "IB Trade Prod IV - Excel" showing order status and details. It includes columns for Order Name, Status, Order Date, and Last Error.
- Market Making Table (Bottom):** A detailed table for market making operations. Columns include Description, Coupon, Maturity, Sector, Amt Outsta, No Trade, ABS Risk, Risk, Saw, Spd to, Min Spd, Min Spd, Spd to, Sign, Mkt: M, Bid/Ask, Bid Size, My Bid, My Ask, Offer Size, Mkt Bid, Bid Amt, Mkt Ask, Ask Amt, and Spread to Top Bid. The table lists various corporate bonds and ETFs.

# Model Analytics

Historical order stack data for each security in its ETF (1,200+ securities in LQD) is stored and analyzed creating a relative value price cube. The Cube is then analyzed in real-time using the embedded trading model logic which then generates price levels/orders that are sent to the ATSS for execution...

## Price Cube



# Performance

- Live Trading: Realized PnL for 2017 - ~85% winning trades, 34% gross profit and 25% net profit on 500k capital base
- Back Testing/Paper Trading: Three historical back tests were performed covering 60 trading days each showing similar results (~72% winning trades)
- Previous Back Test, Live Trading, and Paper Trading results are provided showing;
  - #Trades: 597 Trades
  - % Winners: 74.3%
  - Avg ROI: 31%
  - Avg Leverage: 2.73x

Realized PnL	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Total 2017
Cash + Accrued	7,339	7,658	6,139	17,903	(2,040)	37,000
Hedge	(3,388)	2,420	1,312	13,915	19,002	33,261
Gross	3,952	10,078	7,451	31,818	16,962	70,260
Fees (actual-IB/BNP)	(1,216)	(6,096)	(5,094)	(4,989)	(3,639)	(21,034)
Net	2,735	3,982	2,356	26,829	13,324	49,226
# Trades (Closed)	7	30	31	29	25	122

Realized PnL 2017							
Stats 2017	#	Notional	Avg PnL	%	Gross PnL	Gross ROI	Net ROI
Winners	106	25,197	0.315	85.5%	79,467		
Losers	18	2,988	(0.308)	14.5%	(9,207)		
Total	124	28,185			70,260	35.6%	25.0%

Trading Results	Backtest	Live Jun 1 - Oct 9	Live + Paper Oct 13 - Pres
Avg Capital Use ('000)	2,500	100	100
# Bonds in Simulation	488	488	89
Simulation Trd Notional ('000)	100	100	100
Trade Entry (sigma)	3	2	2
Trade Exit (sigma)	2	2	2
Leverage	5	1.66	1.66
# Trades	368	79	150
# Winners	264	59	121
# Losers	104	20	29
% Winners	72%	75%	81%
Simul Days	59	91	166
Trades/Day	6	0.87	0.90
Trading Days/Yr	251	251	251
Gross PnL ('000)	\$ 164	\$ 8	\$ 28
Sharpe		0.79	1.26
Gross ROI	28%	22%	43%

#### Trading Rules

Last 60 Days deployed new market making logic boosting #trades, Sharpe, and ROI

Trades executed at Mid b/w Bid/Offer in Simulation

Exit at 1 sigma gain or loss

Max exposure to a CUSIP is +/- 100



# Set Up and Funding

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- Prime Broker – Interactive Brokers
  - Execution
  - Data
  - Fund Accounting
  - Risk
- Structure managed by CTT Advisors
  - Use of CTT advisory account at Interactive Brokers
  - CTT will co-manage Investor(s) and CTT proprietary account
    - CTT Proprietary Account: \$200k
    - Investor Account: \$1MM (minimum)
- Funding/Leverage
  - Investor USD 1MM (minimum)
  - Interactive Brokers Portfolio Risk & Reg T: 30% margin
- Advisor Fee Structure
  - 5%/25% in traditional management model or
  - First loss model
    - CTT account absorbs first losses and is made whole on losses first
    - 50%-50% PnL split on profits after losses/expenses covered