



CTT Advisors ETF Arbitrage Trading Strategy Overview

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Executive Summary

CTT manages an ETF arbitrage trading strategy in the high grade corporate bond space and developed and tested its strategy starting in 2013. Back testing and live trading results uncover patterns in price movements and CTT believes that it can effectively pattern price movements in this sector using algorithms developed by its founder.

Highlights of the trading strategy are as follows;

- Market neutral, ETF arbitrage trading strategy capitalizing on price patterns in the credit space
- Fully automated, electronic trading model and infrastructure encompassing electronic order and execution management, pricing logic and analytics, and real-time risk management
- Robust data infrastructure harnessing security tic data to provide order stack pricing data on the breadth of securities in the ETF LQD, which is the most liquid credit ETF
- High grade corporate bond markets are becoming more electronic surpassing 30% by volume in 2018
- Performance results on 3 historical back tests showed 75%+ winning trades
- Performance results in Live Trading in a first loss program showed 80% winning trades
- Trading strategy managed by CTT Advisors with deep experience in the fixed income markets
 - Corporate/municipal bond trading and arbitrage
 - Electronic trading, market making, and hedging
 - Model design and ATS/ECN connectivity developed in house

Market Observations

- **Market Observations**

- Electronic bond trading is gaining traction
 - <https://www.bloomberg.com/news/articles/2018-02-15/electronic-bond-trading-gains-ground-as-market-finally-matures>
- More market participants will need to use automation in order to keep up with market participants
- There are noticeable patterns in price distributions which can provide edge in trading
- By automating the trade process, CTT analyzes price action of every security in the LQD ETF Index and can post prices in real time capitalizing on market mispricings and advantageous spreads

- **“Intercontinental Exchange Inc. is making a multibillion-dollar bet that corporate bonds are increasingly going to be traded on electronic exchanges and other marketplaces...”**

- Aug 2, 2018 - **Intercontinental Exchange** Inc is partnering with BlackRock Inc on a new ... the **electronic corporate bond trading** platform ICE bought from Virtu ...
- <https://www.businesswire.com/news/home/20180529005563/en/Intercontinental-Exchange-Agrees-Acquire-TMC-Bonds>
- Oct 25, 2017 - **Intercontinental Exchange** agreed to acquire **electronic fixed-income trading** venue BondPoint for \$400 million...

- **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.

Trading Methodologies

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 ATs (Market Axess, Trade Web, Bondpoint, TMC, MTS Bonds, NYSEBonds, the UBS Advisor Network, Bloomberg FITS, and others).

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 – order 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, pairs trading, and options
- Risk – exposure is determined and limited through automation (included in model factor inputs) at the industry, sector, and individual security levels

Algorithm Illustration

The trading 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/ECNs). 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 such as municipals and high yield corporate bonds.

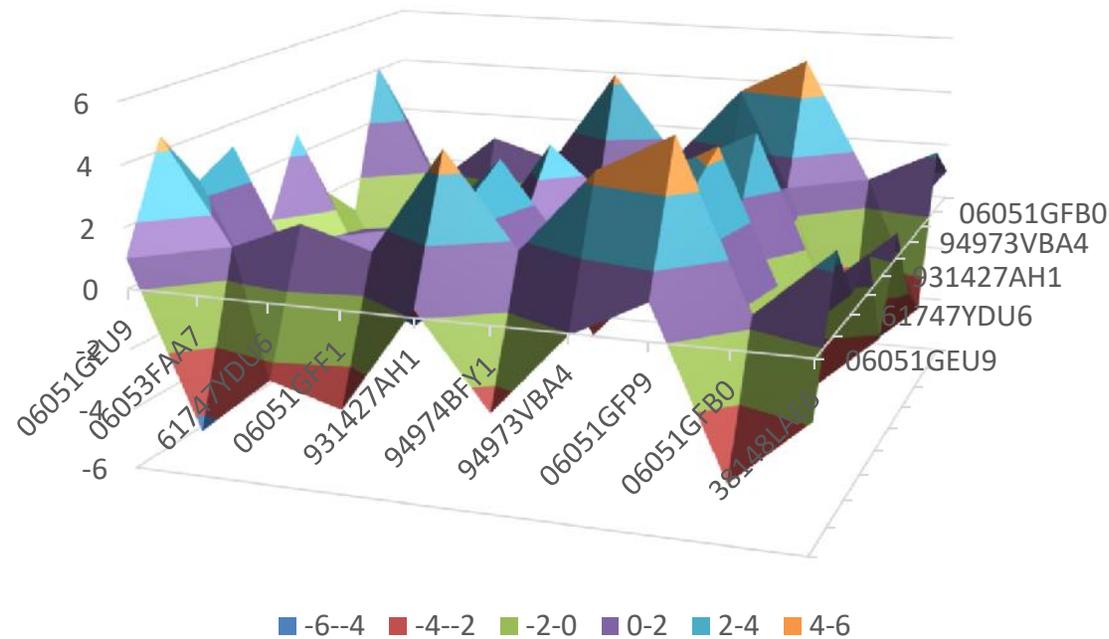
The screenshot displays a trading workstation with three main windows:

- Interactive Brokers (IB):** Shows a 'Position' window with a table of contracts and their prices. The table includes columns for Contract, Bid, Ask, Ask Size, Last, Change, Chg %, High, and Low. Contracts listed include LQD, IEF, VCIT, HYG, AGG, IYV, IVW, ONCL CORP, and T CORP.
- Excel:** A spreadsheet window titled 'IB Trade Prod IV - Excel' is open, showing a table with columns for Symbol, Type, Last trade date, Size, P/C, Multiplier, Trading Class, Exchange, Primary Exchange, Currency, Comb Legs, Leave this, Action, Quantity, Order Type, and Last Price. The table lists various bond symbols like 022995AS2, 023135AS6, etc.
- Market Making:** A large table showing order book data for 'LQD -H/C'. The table has columns for Description, Company, Maturity, Sector, Amt Outside, No. of Trades, ABS Peak, Rev, Avg Bid, Max Bid, Min Bid, Avg Ask, Bid Size, My Bid, My Ask, Offer Size, Mkt Bid, Bid Amt, Mkt Ask, Ask Amt, Spread to Top Bid, and Top Bid. The table lists various companies and their corresponding bid and ask prices and sizes.

Model Analytics

Historical order stack data for each security in its ETF (1,900+ securities in LQD) is stored and analyzed creating a relative value price cube. The Bond Cube is then analyzed in real-time using the embedded trading model logic which then generates price levels/orders that are sent to the ATs for execution. Each node on the Bond Cube is a snapshot of all LQD components pricing at that time. The model then analyses nodes over a minimum 150 days trading data to determine appropriate levels...

Bond Cube



Performance

- Live Trading: Realized PnL for 2017 to 2018 - ~80% winning trades, 30+% gross profit and 14+% net profit
- Back Testing/Paper Trading: Three historical back tests were performed covering 60 trading days each showing similar results (~72% winning trades)
- S&P Corporate Bond Index performance over same period: **-.39%**
- 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**

CTT IG Corp Bond Strategy

	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Tot 2017	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Tot 2018	Tot PnL
Capital	250,000					ROI Gross	47.3%					ROI Gross	22.6%		32.1%	
Leverage	10x					ROI Net	27.1%					ROI Net	7.9%		15.3%	
BNP PnL	3,432	6,222	4,211	31,633	16,567	62,065	(1,582)	(70,580)	2,713	50,541	19,826	10,350	2,888	(65,756)	(51,600)	10,465
Realized																
Unrealized	(8,588)	(1,572)	10,024	(6,341)	(25,214)	(31,691)	(18,675)	99,756	9,081	(102,182)	(52,674)	(47,927)	73,827	70,384	31,590	(101)
Interest/Div	1,068	(2,250)	(7,389)	1,344	5,099	(2,128)	1,353	(4,276)	830	5,022	6,548	7,993	9,044	6,743	33,257	31,129
Gross	(2,872)	8,496	11,940	31,625	91	49,280	(14,221)	29,575	14,590	(43,170)	(24,356)	(28,417)	87,736	15,913	37,649	86,929
Fees	(1,216)	(6,096)	(5,094)	(4,989)	(3,639)	(21,034)	(4,683)	(4,675)	(1,966)	(3,449)	(1,944)	(1,167)	(1,977)	(4,542)	(24,402)	(45,436)
Net	(4,088)	2,400	6,846	26,636	(3,548)	28,246	(18,904)	24,900	12,624	(46,619)	(26,300)	(29,584)	85,759	11,371	13,247	41,493

Funding and Set Up Requirements to Go Live

- Funding
 - Minimum Investment: USD 1MM (minimum)
 - Minimum capital to go live: USD 5 million
- Advisor Fee Structure
 - 2.5%/20% in traditional management model
- Prime Broker: Interactive Brokers or TBD
- Corporate Structure
 - CTT Advisors is a Delaware limited liability company registered under the name Chicago Technology & Trading, LLC
 - CTT will utilize the Advisor infrastructure of Interactive Brokers for its strategy unless it determines to use another prime broker
- Reports
 - Daily reports generated online based on mark to market pricing as determined by the prime broker

Contact Us for More Information

Form more information, please go to www.cttadvisors.com/strategies

Want to have a more detailed discussion or demo of the trading model?

Please contact Paul Constantino, CTT Managing Partner

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Thank You!