

CDS (Credit Default Swap) White Paper

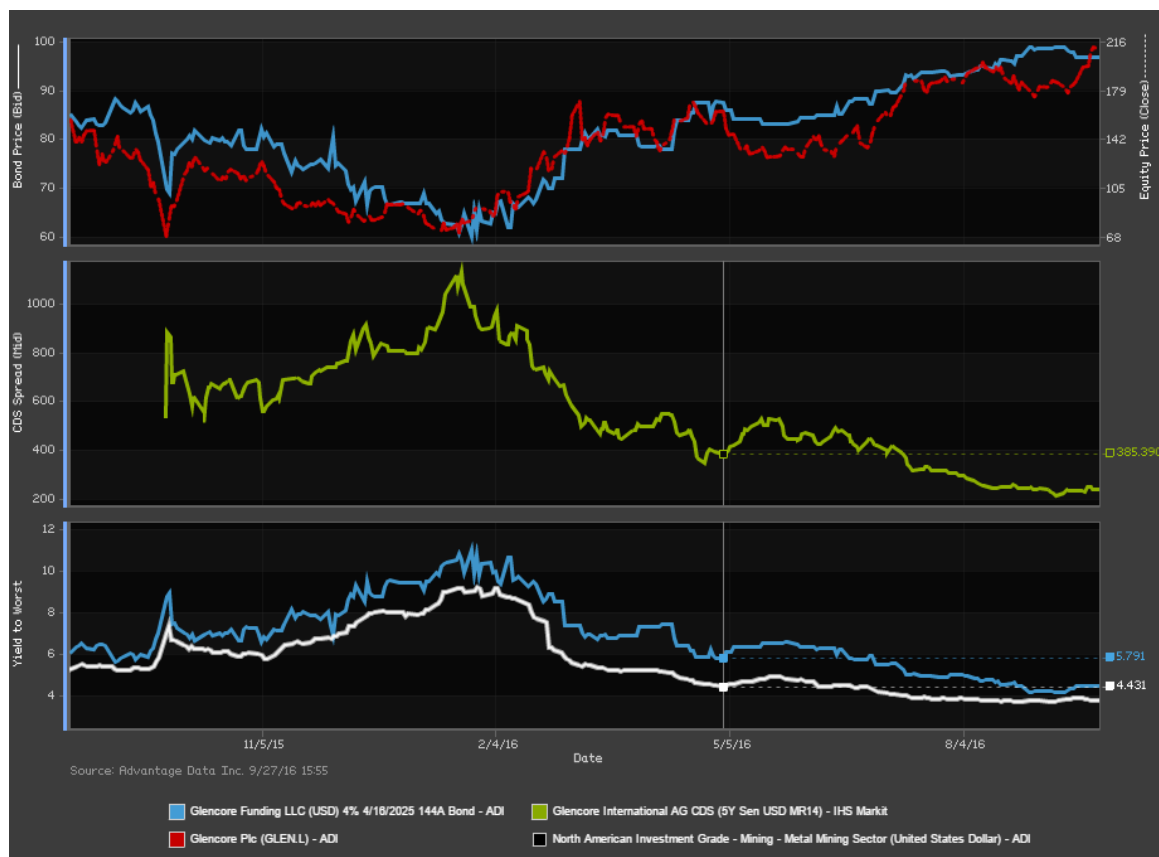
Overview

AdvantageData (ADI) draws upon the **highest-quality sources** of financial market data available, worldwide. For CDS, these sources include actual bid-ask CDS market prices and trades from CDS data pioneer *GFI*, along with a range of popular theoretical and trade-based prices from *IHS Markit*, a mainstream CDS provider.

Objectives

To provide the best actionable CDS price quotes, available anywhere; to utilize world-class sources. To allow **fast and efficient comparisons with extensive bond, loan, middle market loan, equity, and ETF data**, using a premiere in-house charting tool, including algorithms for efficient extraction of outliers. To analyze the CDS data using a range of efficient tools and reports, including credit curves, constructed in-house.

An example of ADI charting tool output for historical Glencore bond vs equity pricing, CDS spread and ADI proprietary NAIG bond index data is as follows.



CDS Pricing Sources

GFI Group, Inc.

As the pioneer in providing CDS data at the inception of the CDS (Credit Default Swap) asset class over fifteen years ago, GFI's experience is long-standing, and highly respected in the marketplace. Internationally recognized as the No. 1 inter-dealer broker in credit derivatives, GFI has repeatedly topped competitors in *Risk Magazine's* annual credit derivatives provider surveys. GFI provides data points that consist of actual bid- and ask- positions in the CDS trading marketplace.

IHS Markit

Serving the role of providing mainstream valuations, CDS pricing from Markit stresses carefully constructed averages of CDS prices from a wide range of sources. These include theoretical calculations as well as actual market trades. ADI provides end-of-day Markit CDS prices for over 2,500 entities, along with major credit indices.

Functional Features

Single CDS names / CDS Index pricing pages display CDS spreads which may be sorted by reference entity/index, term, debt class, currency, and restructuring type. Each of these linked to a particular ADI CDS Universal Identifier, source, and timestamp.

Live Update Mode provides a real-time snapshot of relevant current CDS quotes, using GFI and Markit as data sources.

Description Pages associated with each CDS quote list relevant information pertaining to that quote, including term, debt class, currency, sector, SIC descriptive strings, ticker, recovery rate, and associated reference obligations (e.g., bonds which may be protected against default).

Charting allows advanced, interactive graphical representations with CDS, bonds, loans, and equities, including sliding time-scale control, outlier filter control, overlays of up to four distinct charts, and ability to easily add more securities. (Curves on pages 1 and 5 of this document illustrate the charting.)

IHS Markit CDS Movers provides daily, weekly, monthly, quarterly and YTD biggest movers (widening/tightening).

IHS Markit Sector Curves provides current and historical CDS sector and subsector curves.

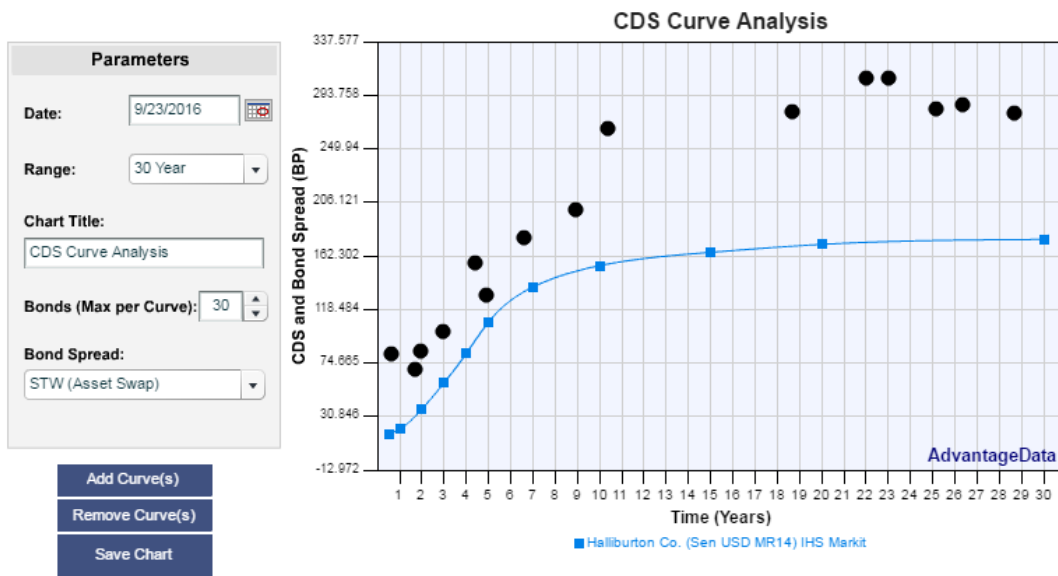
IHS Markit Ratings Curves provides current and historical CDS ratings curves based on Moodys and ADI proprietary ratings.

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IHS Markit Recovery Rates provides senior and subordinated recovery rates for approximately 2,200 companies.

DTCC CDS Volumes provides current and historical CDS volumes for the 1,000 most liquid CDS single names.

Credit Curves plots automatically show all CDS contracts in basis points (bp) as a function of time, as well associated bonds with ASW, Z spreads as well as amount outstanding, on the same graph. *An example of the credit curve facility is as follows:*

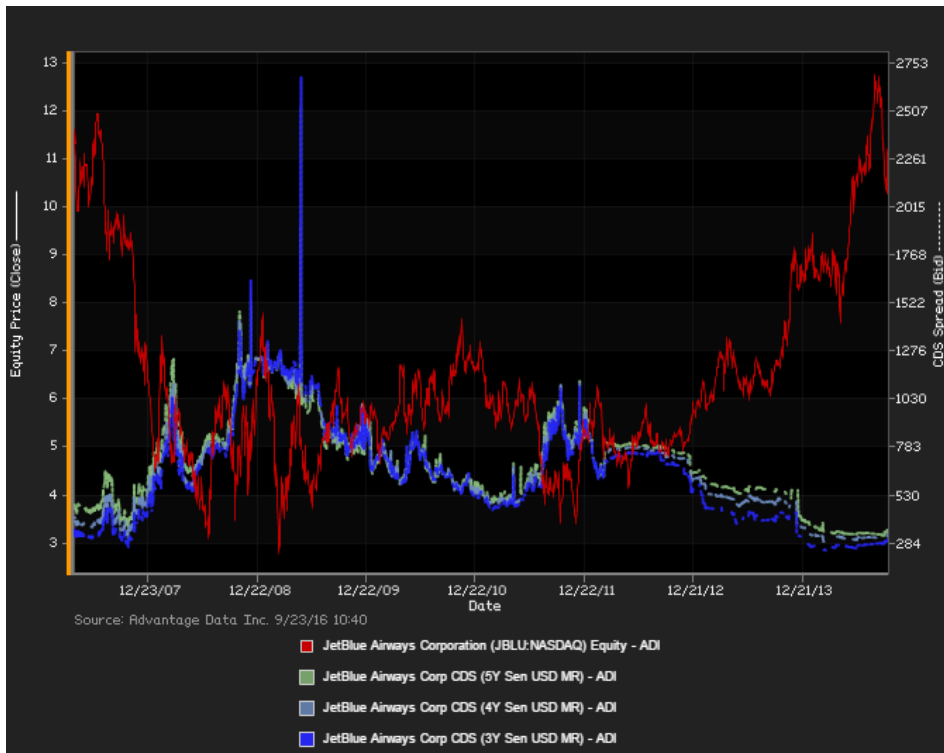


CDS calculator allows views of PV-based valuations of a particular CDS contract, cash-flow scenarios, and credit-curve parameters, including default probabilities.

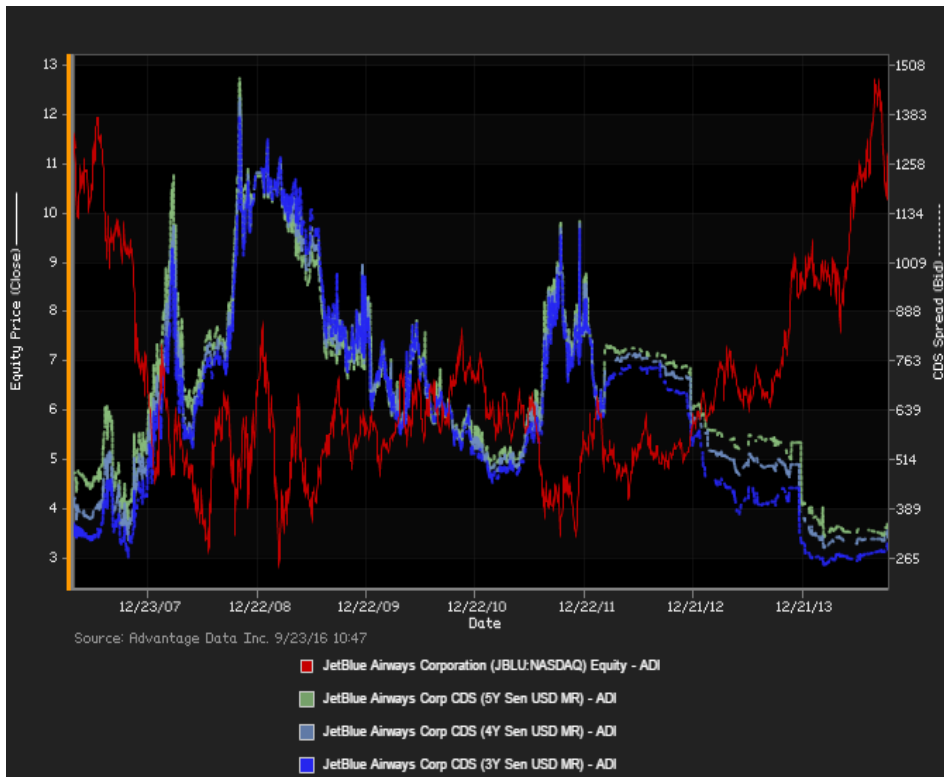
Charting Outlier Control is ADI's proprietary *Median Filter* technology, developed and built in-house, is one of several tools used to remove noise while preserving sharpness of the waveform (see elementary discussion in Wikipedia, "median filter"). While removing single spikes created by an extreme outlier is easily done by filters, the ADI filter is designed to handle the case of a broad-tipped spike, or a cluster of such spikes (referred to in signal processing literature as a "patchy outlier"). A particular implementation of the filter will accommodate patchy outliers as well as maintain its overall spectral response. An example of a set of datapoints with and without outliers is shown below, where the median filter technology is used to 'clean up' the graphical output.

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JetBlue Airways Corp. CDS Prices, No Spike Filtering:



JetBlue Airways Corp. CDS Prices, With Spike Filtering:



Historical CDS Analysis with ADI CDS Pricing

Pre-September 2016 Data Quality Control

Yield-Curve and Credit-Curve Quality

Evaluation of ADI modeled prices proceeds by a sequence of steps:

Assemble Inputs: Observations from the sources summarized above are collected, across multiple criteria, which are ranked in importance. These criteria include, but are not limited to:

- Issuer
- Currency
- Asset Class
- Rating
- Embedded Options
- Amount Outstanding
- OAS (Option Adjusted Spread)
- Duration
- Convexity

Algorithm Quality Control

Algorithms for computed quantities are chosen based upon standards of accuracy and reproducibility. For example, in the calculation of YTM (Yield to Maturity), the best nonlinear-root finding iterative structure is chosen by careful testing. As another example of ADI algorithm control, calculation of Z spread proceeds according to

$$Z = Z(P, C_n, r_n),$$

more specifically by solving

$$P = \frac{C_1}{1 + r_1 + Z} + \frac{C_2}{(1 + r_2 + Z)^2} + \frac{C_3}{(1 + r_3 + Z)^3} + \Lambda + \frac{C_n}{(1 + r_n + Z)^n}$$

where P is the bond price, C_n is the n th cash flow, and r_n is the n th rate.

Solving this for Z is a nonlinear equation root-finding problem, which typically uses an iterative procedure such as **Newton's method**. As a particular example of ADI's quality control, the efficiency and accuracy of a determination of Z using Newton's method is compared with the output of the **Secant Method**, which proceeds iteratively by modifying each successive approximation until a sufficiently small error is attained.

By M.F. Brown, Head of Research

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