Qontigo's New Granular Fixed-Income DTS-Style Risk Model for Axioma Risk

Innovations to Better Capture Spread Risk

Modeling potential losses of a credit-risky bond portfolio based on granular, issuer-level return data is notoriously difficult. A myriad of data quality concerns arises, driven by a vast, frequently illiquid market for which evaluated pricing is often stale, inconsistent or simply missing, while many issuers have only a small number of bonds outstanding. Constructing issuer spread term structures from bond prices is therefore challenging. Advanced modeling techniques are required to trim outliers and infer term structure shapes from limited and noisy data, so that the ultimate spread return time series used to measure volatility reliably captures issuer risk and not noise. It is also essential to have an issuer spread curve quality measure to assess when the issuer-specific data is of insufficient quality to produce reliable curves and a market currency-region-sector-quality curve serves as a more reliable proxy for risk assessment.

With the introduction of Axioma Risk's new granular fixed-income risk model derived from thousands of issuer spread curves, Qontigo provides portfolio and risk managers with an unprecedented ability to analyze fixed-income portfolios with credit-risky assets from a bottom-up issuer level perspective. Coverage includes corporate, Euro-sovereign, emerging market hard currency and agency bonds. Major challenges that arise in other fixed-income risk models, such as thin sector factors, strong sensitivity to ratings migration, volatility estimates dominated by noisy data instead of risk signals, etc., have been addressed through sophisticated data processing and advanced curve-construction techniques. Key innovations of the risk model include:

> **Risk Entity:** New issuer-classification scheme that maximizes the number of relevant bonds used to construct issuer spread curves, while separating out bonds with different risk characteristics.

> **Issuer Curves:** New methodology allows the construction of over 11,000 full term structure issuer curves on a daily basis with a 15-year history, leveraging sophisticated outlier detection to produce robust, market-consistent spread curves that are stable through time. Aggregation of issuer spread curves when grouped by currency, region, rating and sector, combined with a smoothing algorithm, allows for the introduction of over 6,000 `cluster curves' for use when an issuer curve is not available.

> **Issuer-Specific Risk:** The issuer-specific risk is captured natively in the granular model by directly measuring the spread volatility of issuer spread curves. The noise introduced with other sector-average models with spread residuals as specific risk is greatly reduced in this approach.

> **DTS with Issuer Risk Factors:** By using relative returns applied to the individual issuer spread curves, bond-specific duration times spread (DTS) exposure naturally pairs with the issuer spread volatility risk factor. Here the exposures are computed as price sensitivities to relative changes in spread at key nodes, which is approximately the negative of spread duration x OAS (i.e., DTS). Moreover, through the use of relative return shocks to the credit spread curve, the DTS framework can also be used in historical and Monte Carlo simulations.

Clearly Superior Results

These innovations allow the new granular fixed-income risk model to deliver superior results along a number of dimensions, as highlighted in Figure 1. Chart 1a shows a backtest for monthly returns of a European investment grade benchmark portfolio. The predicted two-sided 99% risk confidence interval is also plotted. The results show that the predicted risk tracks the realized return volatility well, and that the 99% risk boundary captures the extreme returns accurately with three relatively small exceedances over the 146 months. Chart 1b illustrates the flexibility of using the DTS framework for both historical and Monte Carlo simulations, and the ability to capture fatter loss tails with the historical returns.

Figure 1: Results highlighting some of the advantages of the new granular fixed-income risk model and issuer spread curves.
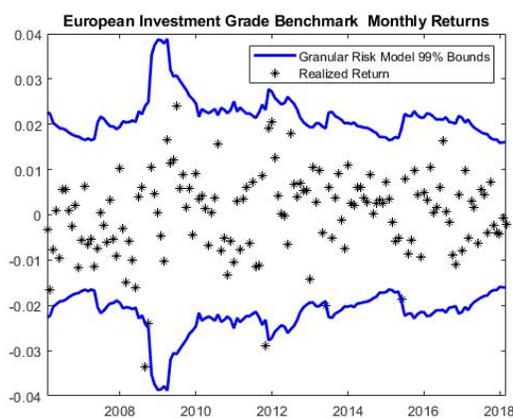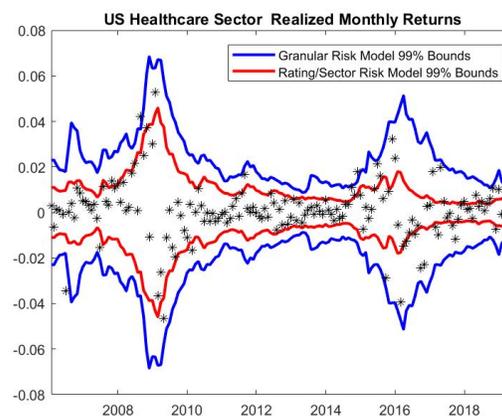
(a) European investment grade backtest
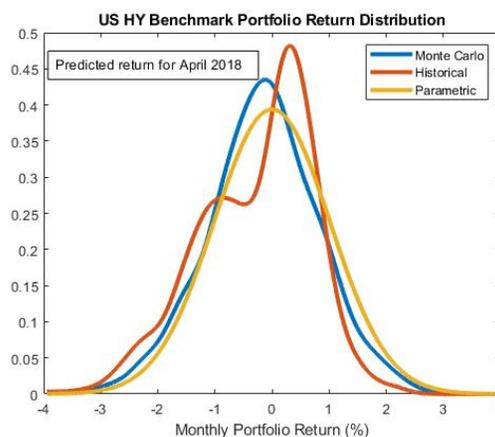
(b) DTS-based historical simulation

(c) Total return US high yield back test

(d) Active return US high yield back test

Chart 1c shows a backtest for a US high yield portfolio of monthly total realized returns, compared with the predicted two-sided 99% risk confidence interval since January 2006 for two risk models—one using DTS exposures and relative returns for volatility (blue), and one using duration as exposure and absolute returns

(ABS) for volatility (green). Statistical tests show that the realized returns are much more consistent with the DTS-model predicted volatility than the absolute return model volatility, which understates risk heading into a crisis and persistently overstates risk in the aftermath. Finally, Chart 1d shows a similar backtest for the active risk and return of a US high yield health care portfolio relative to a US high yield benchmark. In this chart, the granular issuer curve DTS risk model (blue) clearly captures risk more accurately, with a statistically significant link between realized returns and predicted volatility. In comparison, a traditional rating/sector-based DTS risk model (red) without the issuer-specific risk component substantially underestimates risk and is strongly rejected as an accurate predictor of risk by the statistical tests.

Unprecedented Coverage and Flexibility

With over 17,000 spread curves produced daily and more than 15 years of history, Qontigo's new granular risk model for Axioma Risk delivers unprecedented levels of spread risk coverage. For example, over 94% of the Global Agg bonds that are within scope of the coverage of the new spread risk model (corporate, etc.) can, in fact, be mapped to issuer-specific spread curves, while the remaining bonds can be fully covered by cluster curves. Multiple risk-analysis options include linear parametric or full-repricing Monte Carlo simulation based on multi-variate Normal or fat-tailed distributions with full customization for covariance estimation (return period, look-back period, half-life, Newey-West correction, etc.). And for historical simulations, the ability to define multiple time periods from which to sample is available. In all cases, the risk models are delivered in a customizable DTS framework in which the user can select the transition threshold between absolute spread change returns and relative (log) spread change returns.