

A HOLISTIC (AND PRACTICAL) APPROACH FOR RISK-MANAGING PORTFOLIOS OF EQUITY DERIVATIVES

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Abstract

We consider risk-management of portfolios of listed options in the U.S. markets and its practical implementation. Currently, there are about 9,000 optionable equities and between 500,000 and 1 million options contracts with non-zero open interest reported daily. We present a holistic approach for risk-managing a portfolio in this asset class which is not known a-priori – i.e., a risk-management system which is capable of processing *any* portfolio of open position in the current U.S. market (from those of large firms to individual traders), and can be delivered to any trader’s desktop without knowing his portfolio. This system is based on *computing risk locally* (in the app) and *computing scenarios remotely*, storing them in an FTP server.

The risk engine is based on modeling the joint variations of all $O(9000)$ implied volatility surfaces (IVOLS) and the underlying assets under minimal model assumptions, allowing for a full treatment of IVOLS as statistical risk factors. A PCA/RMT approach is used to reduce the dimension of the problem, enabling the generation of $N \gg 1$ *price-risk-scenarios* which are used to compute risk measures locally (VaR, ES) for any portfolio of listed equity derivatives. We demonstrate a local desktop application (named “Iceberg”) which performs such task. The application fetches nightly the risk-scenarios as a compressed binary file from a remote FTP site. Traders load their portfolios into the local app and generate detailed and accurate risk reports with minimal computational work, based on the price-risk-scenarios. This approach offers complete anonymity and security to the users, since their portfolios are not sent to the cloud but instead analyzed locally on their computers using the downloaded scenarios.