**Core Analytical Functionality Specification Document**

**I. Executive Summary:**

In this document, we synthesize all of the aforementioned ideas and technical specifications we discussed so far regarding the core analytical function of ReSolve’s FinTech App. We start by presenting the main interface of this financial analysis app and closely introduce how each functional tab in the main interface help users to achieve their desired analytical outcome.

**II. Conceptual Design Overview:**

The Main interface of the app is succinct in design and contains the following five tabs and some miscellaneous things.

Miscellaneous things could be ads from other third-party financial companies & institutions, or it can be some important news & information from ReSolve that we want our users to know. This could be a window for us to demonstrate our company values, ideas, thoughts, comments regarding markets,etc. to the users.

The five tabs provide the major functions of this app. They include: **Discovery, Portfolio Construction , Analysis, My Account(Data Management),** and **About Us***.*

1. **Discovery** tab leads user to a tutorial teaching them the functions of the App in detail.
2. **Portfolio Construction:** 
   1. ***Time-series import and Basic Inquiry:*** Import time-series from Tiingo and ReSolve’s proprietary database via API keys. There will be a sourcing of end-of-day proprietary data for futures and indices from ReSolve’s SQL database as well as sourcing end-of-day data for securities, mutual funds and ETFs from Tiingo.Users can inquiry the relavant information regarding the market data (E.g. the High,Low,Volume,Volatility,etc. of a single stock).
   2. **Portfolio construction:** Using these data to create portfolios out of given scope of assets by i) specifying target weights by user themselves, ii) Find target weights via optimization by using ***Portfolio optimization*** function under **Analysis** tab.
   3. **Plots and tables:** Produce plots and tables of the portfolios assuming static target weights through time using ***Performance examining*** and ***Visualization*** functions under **Analysis** tab. Once users have registered, all of the plots, tables and charts can be easily saved in their personal account and are easily exportable in appropriate format with customable specifications.
3. **Analysis** tab allow users to conduct professional analysis of their portfolio, including the following functions:
   1. ***Portfolio optimization:*** given a universe of assets and a target time horizon, solve for the optimal portfolio using full in-sample covariance matrix and either full in-sample average returns (if required by the target optimization) or user specified expected returns under constraints like long-only and/or sum-to-1 constraints.

***RMK for a.:***

* There are a series of optimization creterias user can choose from, including: *Equal Weight, Inverse volatility weighting, Inverse variance weights, Hierarchical Risk Parity weighting, Equal Risk Contribution weighting, Maximum diversification weighting, Maximum decorrelation weighting, Maximum Sharpe ratio weighting, Mean-variance given Target return or Target volatility.*
* The result/output of optimization is an array specifying optimal target weight for each asset in the portforlio.
  1. ***Performance examining:*** Examing the performance of the portfolio by reporting to users with various financial ratios and performance evaluators and output the result into table and charts.

***RMK for b.:***

* Performance evaluators are functions *like* ***“***Block Bootstrapping”. Block Bootstrapping for ranges of expected performance statistics, and a log-cone of expected range of performance trajectories, and then producing the graph showing the visualization of the result.
  1. ***Returns based style analysis:*** given a benchmark and explanatory assets, find the closest tracking portfolio by using ElasticNet regression with cross-validated norm parameters, including options for long-only and/or sum-to-1 constraints.
  2. ***Visualization***: ploting the performance of constructed portfolios and other assets & indicies, allowing users to compare their constructed portfolios with various other financial assets. The plots are produced assuming static target weights through time, with portfolios rebalanced back to target weights at fixed intervals (i.e. monthly to be specified by user).
  3. ***Backtesting:*** Backtest users’ strategies, recomputing target weights according to a target optimization at each rebalance period. This function allows Registered Advisors to use ReSolve’s internal backtests methods to check and modify their portfolio accordingly.
  4. **My Account (aka Data Management)** tab allows Registered Advisors to save i) portfolio as synthetic assets (E.g. they might save a portfolio of 100% stocks + 100% 10-year Treasury bond futures as a “Returned Stacked Stock+Bonds” strategy); ii) any series they create in the Analysis tab. It should also allow users to manage their customized data series, including reviewing and modifying their saved historical portfolios and adjustments, etc.

**RMK:**

* Different types of users will have access to different types and different scopes of data. E.g. Internal ReSolver employees will have access to all backtests and simulation data whereas the external users can not. Registered Advisors will have access to a mix of internal and external data with some limitation on internal data.

1. **About Us** tab will provide some introduction to ReSolve, which could directly lead user to the official website of ReSolve.

In closing, this document serves as a blueprint for the core analytical functionality of ReSolve’s FinTech App adhering to the demands of financial professionals. The desiging idea is subject to change based on further comments and feedbacks.