

PerformanceAnalytics

Econometric functions for performance and risk analysis of financial portfolios

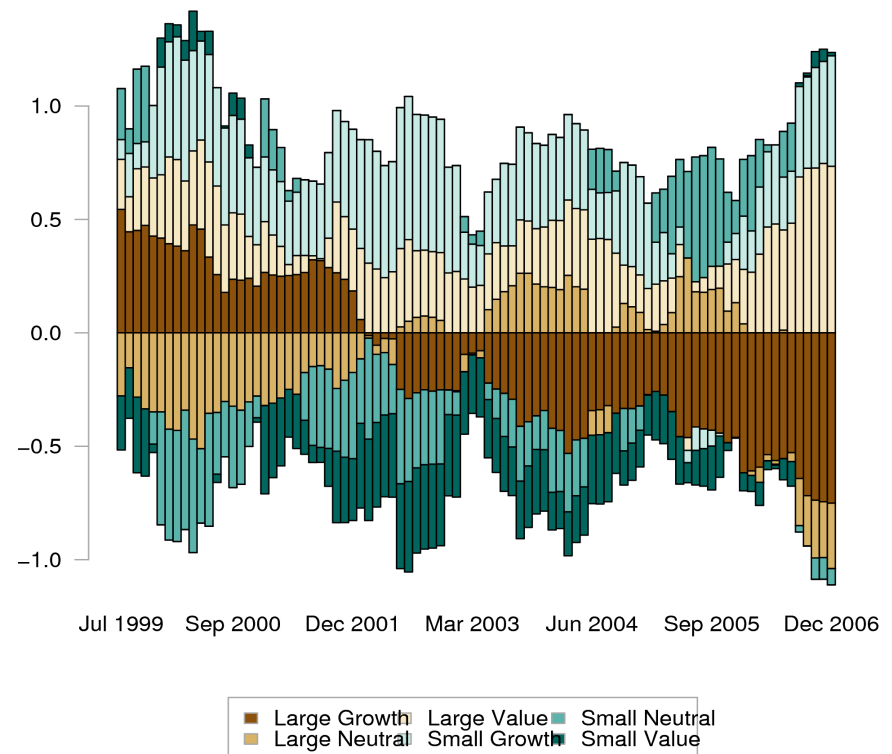
Release 0.9.7.1 – Now on CRAN

- Sharpe's Style Analysis
- Snailtrail chart
- VaR Sensitivity chart
- Modified Expected Shortfall
- Multivariate moments and risk metrics
- Higher co-moments
- Robust data cleaning
- Many fewer dependencies
- Other new functions, bug fixes

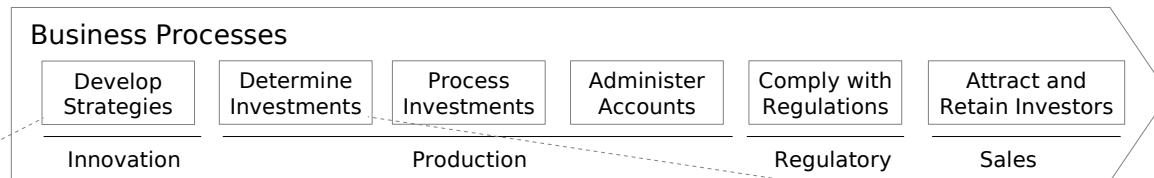
Release 0.9.8 – In Development

- Component VaR and
- Component Expected Shortfall
- Skew-t VaR and ES
- Adoption of xts for time series
- Improved x-axis handling in charts
- Formatted tables in output devices

HAM2 Rolling 36-Month Style Weights



Research Process and Capabilities



Process View



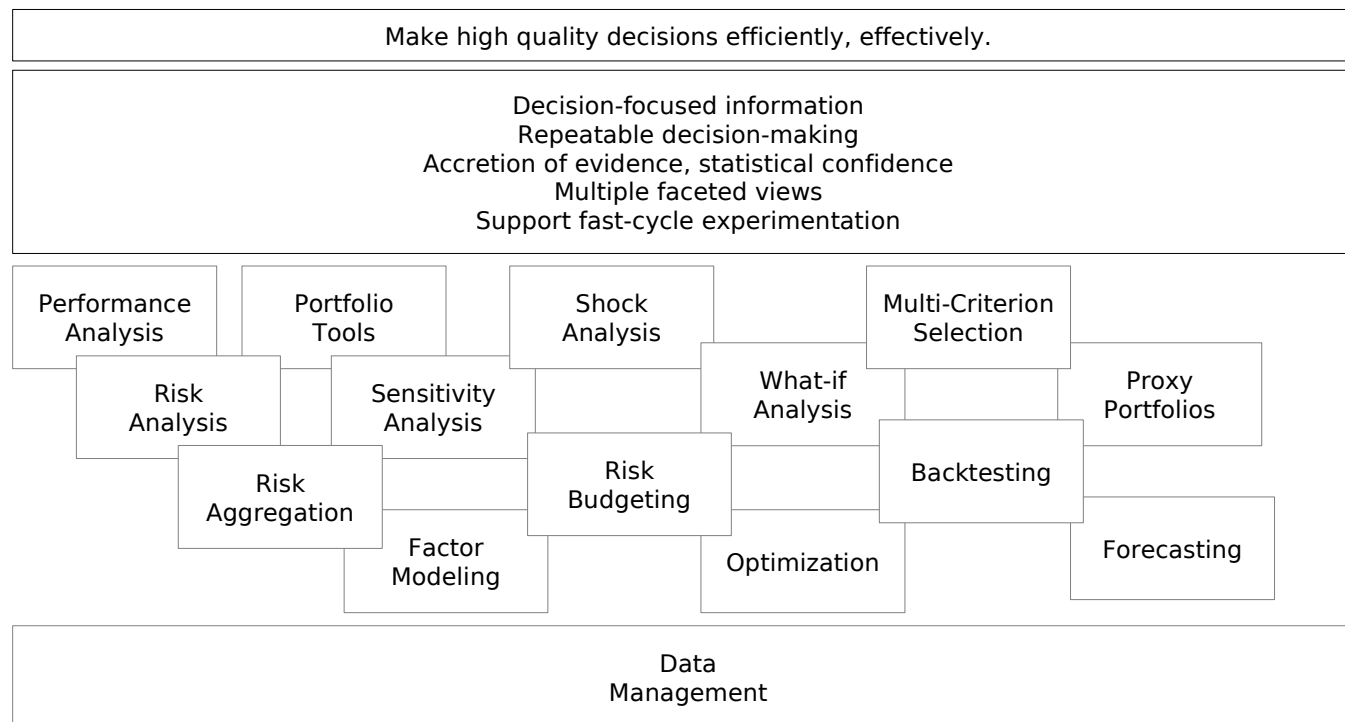
Capabilities View

Strategy Development	Performance Measurement	Performance Attribution	Risk Measurement	Risk Management	Portfolio Construction
<p>What should work?</p> <ul style="list-style-type: none"> • What do we think about the environment? • What scenarios or themes will affect performance and risk? • Can we effectively tilt our portfolio to capture our views on performance? • What is our “neutral” view? 	<p>What has the strategy achieved?</p> <ul style="list-style-type: none"> • How has the strategy performed in the past? • Will returns persist? • Is performance on track with our expectations? • How does performance look in context of risk? • How did the strategy compare to its peers? • What is a suitable benchmark for evaluating performance? • Are there reasons to suspect valuations? • How confident are we in our assessment? 	<p>How has the strategy achieved it?</p> <ul style="list-style-type: none"> • How does the strategy generate returns? • Are we skilled or lucky? • Are we deviating from what we’ve done in the past? • How confident are we in our assessments? 	<p>What risks are being taken?</p> <ul style="list-style-type: none"> • What risks does the strategy take? • What is its sensitivity to the risks? • Is the nature and level of risk appropriate for the strategy? • What risks does the aggregate portfolio contain? • What is our exposure to extreme risks? • What happens to the strategy if...? • What happens to the broader portfolio if...? 	<p>What can we do about risk?</p> <ul style="list-style-type: none"> • Is the nature and level of risk appropriate for the strategy? • What risks does our portfolio contain? • What is an appropriate level for each risk? • What should we do about them? • What should we hedge? • What should we use to hedge? • How much to hedge? • What are the costs and benefits of hedging strategies? • How much should we be willing to pay for insurance? 	<p>What is the best use of our capital?</p> <ul style="list-style-type: none"> • Is the strategy a diversifier? • What are our objectives for return and risk? • How do we deploy our capital to best meet those objectives? • Can we design a portfolio that is expected to outperform? • Can we design a portfolio for a particular objective? • Is the level of diversification appropriate?

Research Technology

The processes identified are implemented to help a manager or analyst make high quality decisions, and require a interlocking set of technology tools

Tools View



Functional Architecture

Required technology tools can be broken down functionally to aid the assessment of what is already provided in R

Application/Reporting	Statementing	Attribution Reporting Tables	Risk Analysis Graphics	Screening
Portfolio	Profit & Loss	Portfolio	Account Hierarchy	
	Position		Transaction	OMS Connections
Optimization/Sizing		Sizing/Allocation		
	Risk Budgeting	Weighting	Optimization	
Modeling/Analytics	Return Forecast Valuation Price Transformation	Signal Generation	Risk Forecast Risk Measurement	Backtesting Distribution Fitting Shock Simulation
Instrument	Contract Specifications	Instrument Specifications	Corporate Actions	
Time series	Calendars	Period Aggregation	Date Alignment	
	Timezones	Extended date/time indexing		
Data	Real-Time	Historical	Database Connections	

Map of R Packages

R's traditional strength is in modeling and analytics, but there have been many recent improvements in time series and data interfaces.

Application/Reporting

plot.xts, PerformanceAnalytics, quantmod, RMetrics

Portfolio

fPortfolio, portfolio, backtest, PortfolioReturns (unreleased)

Optimization/Sizing

fPortfolio, portfolio, BLCOP, Brutus (unreleased), RonIdp

Modeling/Analytics

Rmetrics, TTR, PerformanceAnalytics, etc. (most R packages fit here)

Instrument

Time series

fCalendar, zoo, xts, timeSeries, its, irts

Data

RBloomberg, OpenTick, InteractiveBrokers, tseries (Rmetrics), quantmod

Gaps in Available Functionality

Despite the wealth of finance-focused packages, there is a clear need for an extensible framework to encourage collaboration and encourage innovation.

Application/Reporting

- time series graphics including stacked bar, area, etc.
- formatted tables for device display

Portfolio

- portfolio model and class
- instrument and currency-aware Profit & Loss calculation
- backtesting framework

Optimization/Sizing

Modeling/Analytics

Instrument

- instrument specification model and class with multi-currency support

Time series

- price and return awareness, fungibility

Data

- logical historical data model for multiple asset classes
- account hierarchy
- tick-data containers?

Opportunities for Collaboration

Organizing development around a shared non-proprietary set of test cases would provide a check against the development and requirements.

- Cases are generally useful as vignettes
- Represent different modeling paradigms
- Does not require divergence of 'secret sauce'

Test Case 1: Ten stocks in a portfolio rebalanced quarterly using Markowitz optimization and historical moments

- Framework lends itself to a factor model approach as published in Haugen (1996)
- Returns-oriented framework

Test Case 2: Ten stocks in a Turtle model using published rules for entry, exit, trading size, and money management

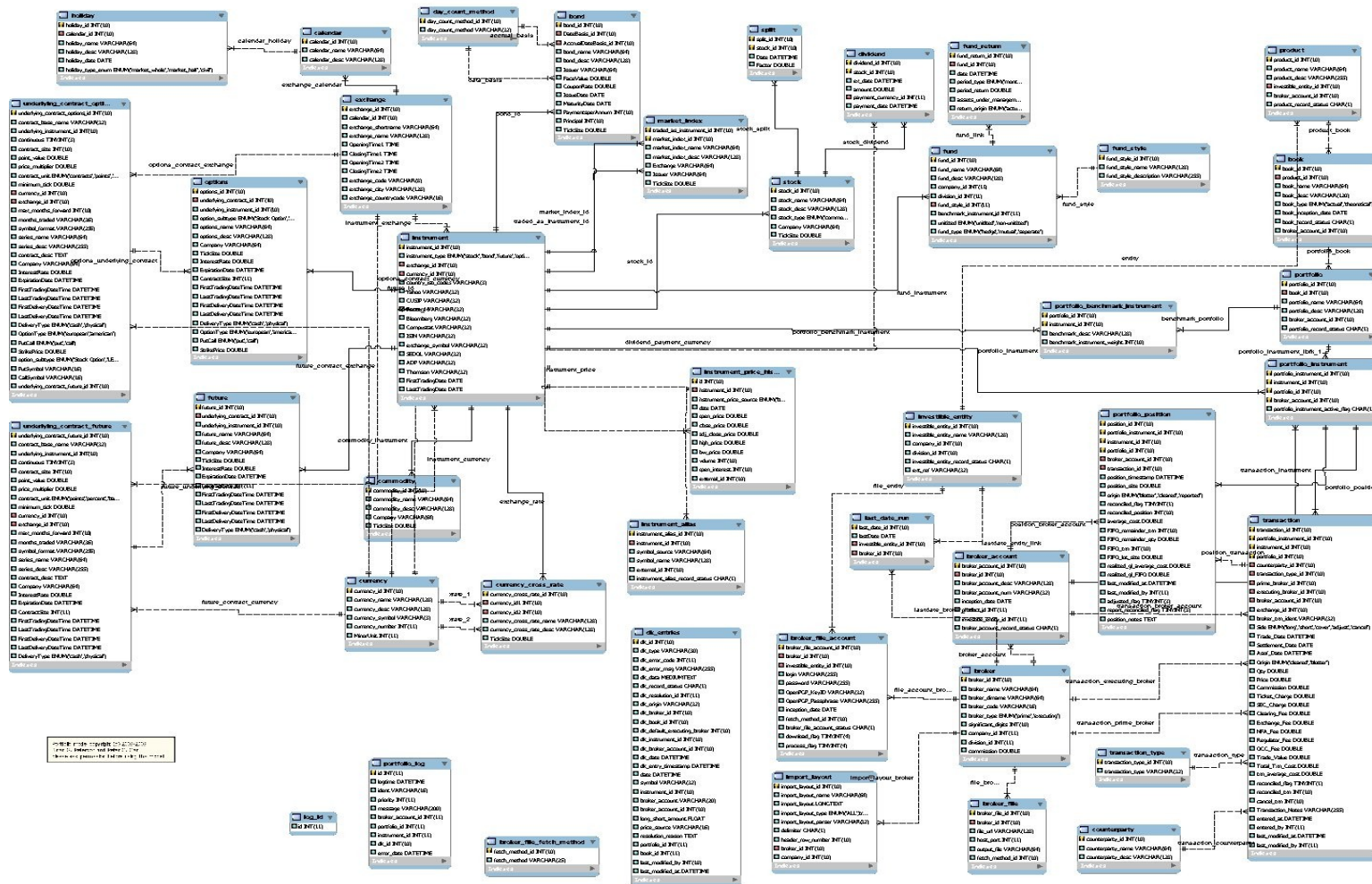
- Published in Curtis Faith's book and OriginalTurtles.org
- Price-oriented framework

Other ideas?

- Look at strategies from "What Works on Wall Street?" noting that those don't seem to work any more...

Opportunities for Collaboration

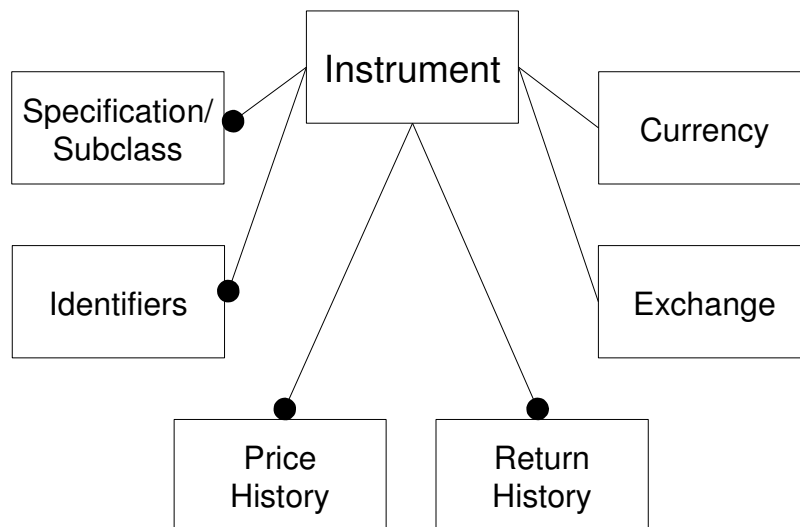
We have a physical and logical data model covering historical data, instrument definitions, transactions and accounts



Opportunities for Collaboration

That logical model could be the basis for an object-oriented framework that is extensible by design and asset-class neutral.

Instrument Model



Portfolio Model

