GRAVITY INVESTMENTS

PORTFOLIO RE-OPTIMIZATION

GSPHERE PRODUCT TOUR

www.gsphere.net

Contents

VIEW PAGE

Welcome to the Gsphere Product Tour

Gsphere is a Portfolio Re-Optimization system featuring visualizations and patented diversification measurements

In this guide we will show many of the system features. Note that not all user types have access to all the features described in this guide

DIVERSIFICATION DASHBOARD

Internal Diversification (59.65 (Good))

The Internal Diversification is the Gini Co-Efficient of the KL expansion (AKA energy spectrum or Eigenvalues) of a weighted correlation matrix

It gives a percentage values from 0 to 100 which may be interpreted such as: this 8-asset portfolio is 70% diversified. A score of 100% means that there is no observable systemic commonalities inside the portfolio.

Fiduciary Diversification (7.75 (Caution))

Fiduciary Diversification is measured by the portfolios intrinsic dimension multiplied by the Gini-Co-efficient

Because the Fiduciary diversification fully accounts for both the quantity and commonality of investments it is the best singular measure for diversification and thus the best evaluator for the fiduciary obligations to diversify for U.S investors.

Systemic Diversification is measured as the Intra Portfolio Correlation or IPC. This is a weighted average intra portfolio correlation which then scales the range of the correlation spectrum to a percentage scale. Note that good values start around 40%. Seldom do any portfolio achieve a value greater than 70% since all values greater than 50% provide that the average correlation is negative.

Systematic Diversification (49.02 (Good))

Idiosyncratic Diversification (11.94 (Adequate))

The Idiosyncratic diversification is the portfolio's intrinsic dimensionality. This value is like the portfolios Concentration Co-efficient (CC), but further subtracts any perfect redundancy. More Simply it is the number of asset in the portfolio adapted for the weighting scheme. This value is generally equivalent to the holding quantity for equally weighted portfolios.

DETAILED P&L

P&L history chart is created anytime a strategy includes multiperiod Re-Optimizations in the backtest.

Can display when rebalancing actions and stop loss protection

Export the P&L chart data to Excel for other projects

Always based on a $1000 invested, dividends are reinvested

Portfolio metrics for your designated period appear here in the three tabs

Profit and Loss details shows historical events, each color segment is a different Re-Optimization segment

ROLLING ALLOCATION CHART

The Rolling allocation chart (stack chart) shows how allocations vary over time

This is especially interesting to see how the optimization and rules engine combine to produce different portfolio allocations across market conditions

This chart is produced automatically for optimized backtests

| Profit & Loss | Position Performance Chart | Stack Chart |

Stack 100%

Legend: $CASH$ · DBJP · FJP · EWN · EWS · THD · EWU · RSX · VNM · PXH · DEM · DFJ · CHIX · EPOL · EWP · SCIF · IDXJ · DFE · FXI · TLTE · BKF · EWH · EWD · TUR · FEZ · BIK

Dates: Aug 1 2013 · Oct 29 2013 · Jan 25 2014 · Apr 24 2014 · Jul 22 2014 · Oct 18 2014 · Jan 15 2015 · Apr 13 2015 · Jul 11 2015 · Oct 8 2015 · Jan 4 2016 · Apr 2 2016 · Jun 29 2016 · Sep 26 2016 · Dec 23 2016 · Mar 22 2017 · Jun 19 2017 · Sep 15 2017 · Dec 13 2017 · Mar 11 2018 · Jun 8 2018

Performance Metrics

Export to Excel

| Performance Ratios | Returns | Risk |

#	Symbol	Company Name	Sharpe	Sortino	Calmar	Ulcer
1	GCP G$101785. 07-28	GCP Global Quant	0.4291	0.5939	0.2316	0.6445

A nice way to illustrate added value to investors

Often you can see how in Diversification Optimization disfavored investments grow in allocation

HISTORICAL ALLOCATIONS

Control to activate display options
for portfolio history when available

Navigate the date tabs to see the
corresponding allocation and risk
return chart

Historical Details

☑ Show Detailed P&L
☑ See Historical Allocations

| 07/18 | 07/17 | 07/16 | 07/15 | 07/14 | 07/13 |

Allocation Chart

27.13 %
25.95 %
6.40 %
14.75 %
25.77 %

— Cash and Equivalents   — AAPL   — AMZN   — GOOGL   — NFLX

Risk Return

70%
60%
50%
40%
30%
20%
10%
0%

Return

10%   20%   30%

Risk

— AAPL   — AMZN   — FAANG   — GOOGL   — NFLX

Light, interactive HTML5 charts
render great on any screen or device

GRAVITY | www.gravityinvestments.com

PORTFOLIO MONITOR

This page lives here on the portfolio page

Measures for Return, Diversification, Income, Risk, Capital, Preservation and Consistency

Color coded for issue spotting

Organize portfolios into folder

See portfolio performance

Update to any desired period

BENCHMARKS

Add any benchmarks you would like to see with the portfolio

Set as many as would like

Benchmark

Select Benchmarks to apply to the Portfolio:

Dow Jones 5000 Total Market ▼

Add Benchmark:

Apply Benchmark

Applied Benchmarks:

▼

Delete Benchmark

#	Benchmark Name	Up Capture	Down Cap...	Alpha	Beta	R2			
1	NASDAQ 100 for FAANG	119.65%	100.67%	11.16%	1.06	0.64	33.42 %	19.96 %	☑
2	S&P 500 for FAANG	134.15%	99.79%	19.63%	1.08	0.43	33.42 %	12.69 %	☐
3		126.13%	93.60%		1.08	0.43	33.42 %	10.57 %	☐

Profit & Loss   Position Performance Chart   Stack Chart

Export to Excel

Profit and Loss

FAANG   NASDAQ 100   S&P 500   Dow Jones Industrials   Dow Jones 5000 Total Market

Graph the portfolio vs benchmark

Mark a benchmark as default for it to always show with the portfolio

Analyze MPT and relative performance stats

DIVERSIFICATION SOURCE CHART

This chart shows how much diversification may be in any portfolio.

The extent to which the portfolio fills the space under the diagonal line provides for how much diversification the portfolio has for a given number of investments.

The peak value shows how many dimensions it takes to span the portfolio with 100% of the information included. More dimension = more diversification. If the top value is less than the diagonal, then there is some amount of complete redundancy in the portfolio. This is often greater in larger portfolio especially index strategies

Diversification Sources See our YouTube tutorial

Ideal Diversification — FAANG
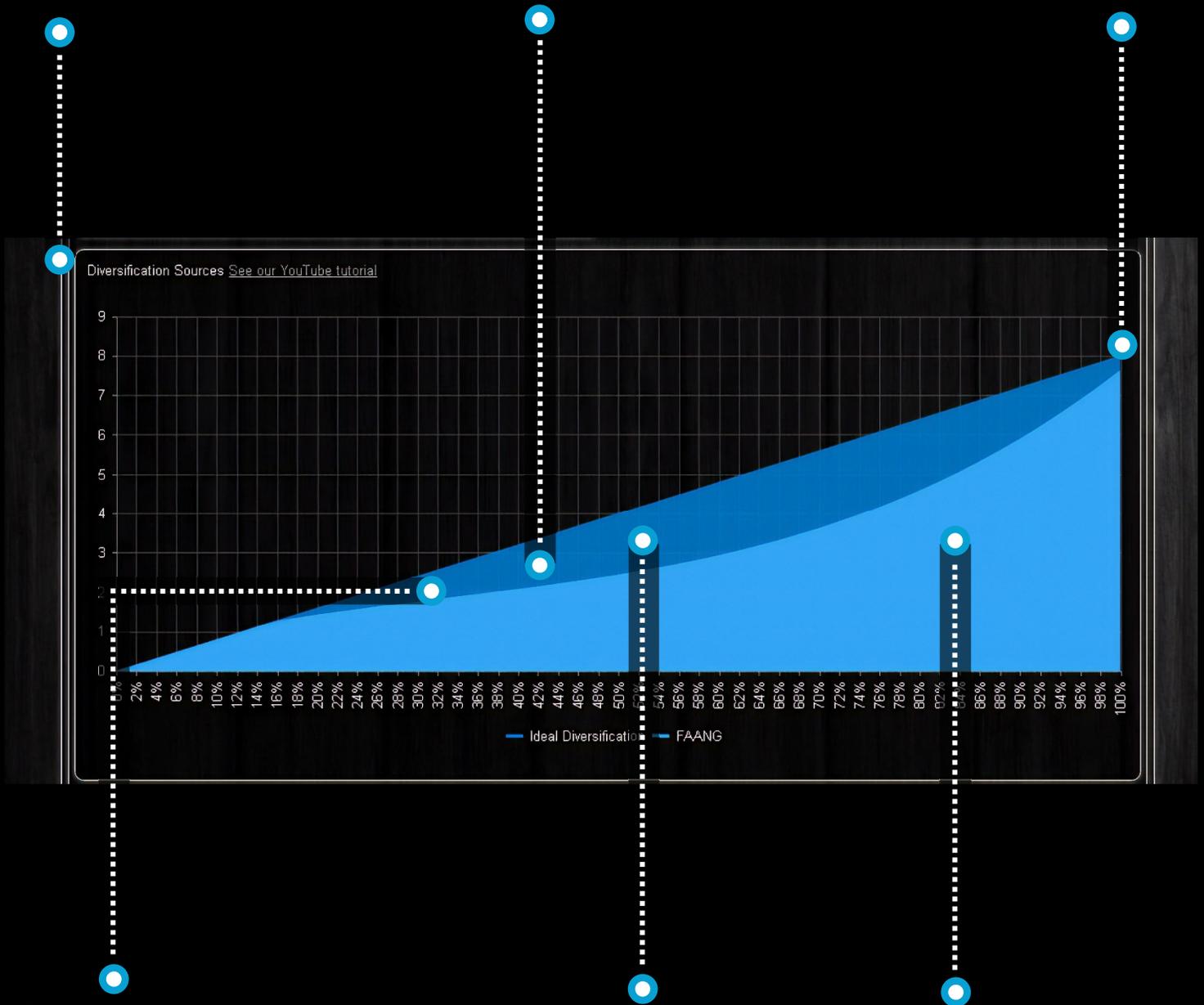
The graph would fill the diagonal exactly if all of the assets were uncorrelated and equally weighted. As systemic and weighting concentrations pervade the strategy the graph will dip

The extent which the graphs fills the diagonal is called the Gini Co-efficient. This is the % used in the internal diversification gauge.

The chart integrates idiosyncratic (asset specific) diversification (AKA holding quantity) with the systemic commonality of the positions (the Gini Co-efficient)

POSITION PERFORMANCE

See the individual performance of each asset
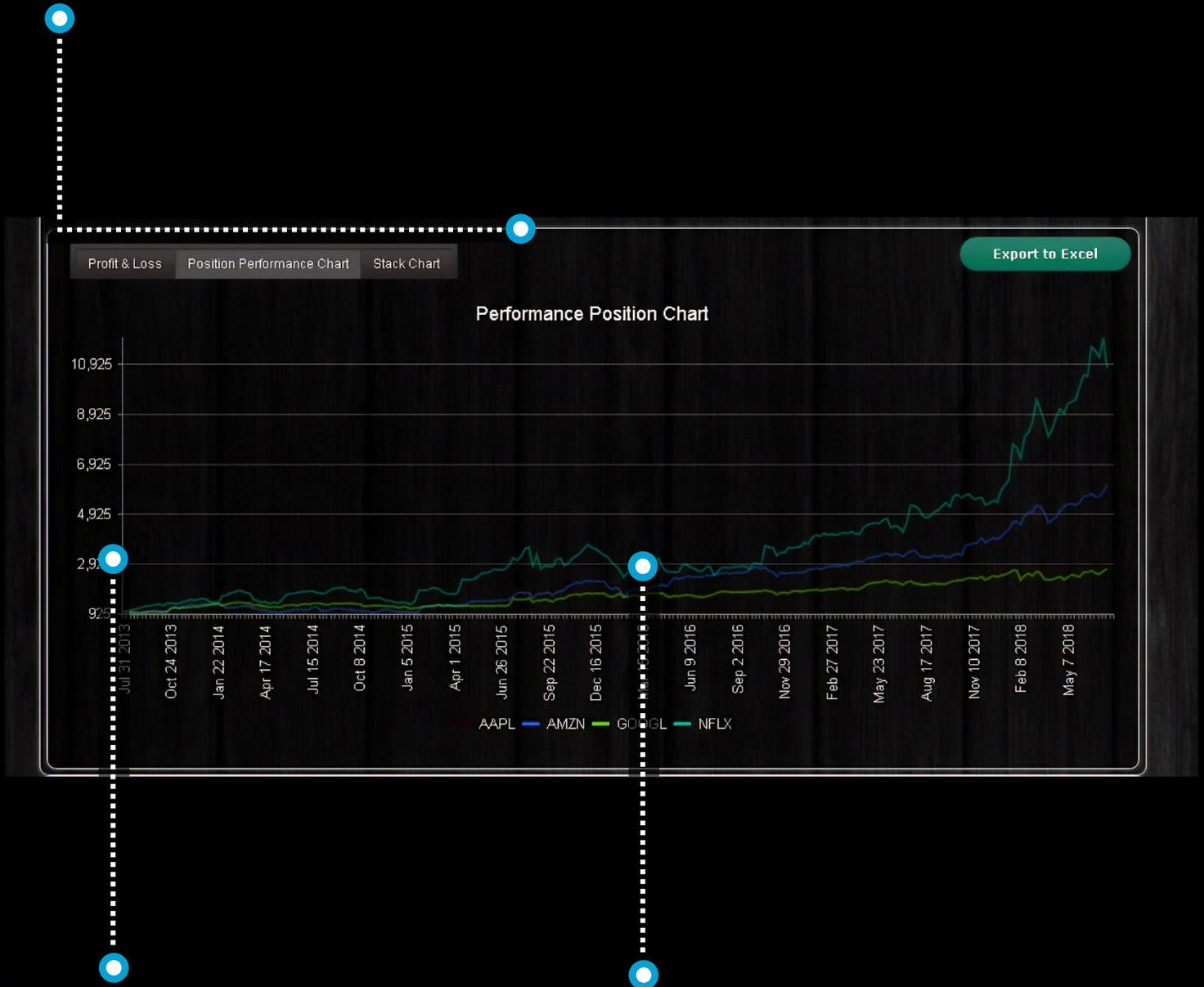
All assets are normalized for an initial 1000$ invested

Mouseover the graph to see dates and prices

GRAVITY | www.gravityinvestments.com

RETURNS AND CMATRIX

The return report gives portfolio and position returns including in cell charts

Calendar returns available here on this tab

Trailing returns available here on this tab

Return Report

Export to Excel

	Portfolio Observation Period	Calendar	Trailing				Year		
							Year		
							Quarter		
#	Symbol	Company Name	2018	2017	2016		Month		
1	FAANG$10... 07-28	FAANG	37.22 %	36.97 %	10.08 %		Week		
2	AAPL	Apple Inc.	11.74 %	48.04 %	12.36 %				
3	AMZN	Amazon.com Inc.	52.84 %	55.17 %	17.72 %			119.07 %	
4	FB	Facebook Inc.	-3.60 %	51.00 %	12.55 %			33.41 %	
5	GOOGL	Alphabet Inc.	16.74 %	30.37 %	4.35 %			46.92 %	
6	NFLX	Netflix Inc.	76.66 %	50.57 %	12.59 %			129.45 %	

* all returns reported as annualized unless under one year

Correlation Matrix Report

Show whole Matrix

Name	AAPL	AMZN	FB	GOOGL	NFLX
AAPL	1.0000	0.3352	0.3537	0.2914	0.2646
AMZN	0.3352	1.0000	0.4931	0.4347	0.3814
FB	0.3537	0.4931	1.0000	0.4438	0.3586
GOOGL	0.2914	0.4347	0.4438	1.0000	0.2996
NFLX	0.2646	0.3814	0.3586	0.2996	1.0000

See the correlation matrix color coded to spot opportunities and risks

Sort any of the rows to spot issues

Set your own timescale

POLICY TREE

The policy tree is the rule set that govern how any strategy is optimized, backtested and automated

Polices can be saved and shared

Govern not just the rebalancings, but the Re-Optimization so that the portfolio adapts with the market.

📑 POLICY TREE

Save Policy Tree	Open Existing Policy Tree	Apply Tree Settings

ReOptimization
  # of months
  Choose mode of Reoptimization: BackTest
  Choose Reoptimization Period: 12.00
  Choose Backtest Period Length: 60.00

Weighting Policy
  Optimization Policy
    Diversification Optimization
      Computation Dimension
        Select Type of Computational Domain:
        Default
    Simulation
    Capital Market Assumptions
      Sample Periods
        Sample Period 1
      Return
        Shrinkage
        Hurdle Rate
        Ceiling
        Floor
      Risk
        Risk Definition
          Risk Definition:
          Semi-Deviation
        Shrinkage

Set the method for how to optimize the portfolio

Set the rules to govern how to set the capital market assumptions and sample data. Add and weight multiples samples following our best practice guidelines for best performance

Control the risk, return and diversification. Throttle up or back the importance of each variable to the strategy.

POLICY TREE 2

Policies to define and control risk estimation

Maximum diversification policy not only works well, but ensures investor or advisor stays on the tracks

Stop Loss polices to govern in position risk management. Never let a loss become a bad story

Risk
  Risk Definition
    Risk Definition:
    Semi-Deviation
  Shrinkage
    Shrink Range of:
    Medium   □ 0.00
  Ceiling
  Floor
Threshold Constraints
  Threshold: 0.00 %
Allocation Constraints
  Minimum:
  Maximum: □ Apply only to assets with unspecified constrains
Maximize Diversification
Rounding Policy
  Rounding: 0.00 %
Equal Weight Policy
Stop Loss
  □ Global Stand Deviation From Stop 0.00
  □ Moving Average
  Number of days: 180
  □ Global Stop Price 0.00
  □ Global Loss From Position Price 0.00 %
  □ Allow Sold Positions in Next Re-Optimization
  □ Allow Sold Positions in next Re-Balance
Model Fees

Constraint policies applied to entire portfolio

Add any fee to display performance net fees

POLICY GUIDELINES

DIVERSIFICATION MANAGEMENT

Threshold Constraint

The Threshold Policy is applied to both a portfolio an any recommendation report built including that portfolio. The purpose of the threshold is to remove very small allocation weights that are so small as to be a nuisance due to the transaction costs outweighing the portfolio benefit given the value of a portfolio.   The value is expressed as a percentage and any allocation given to any assets less than the designated percentage will be reset to zero and the capital reallocated to the remaining assets.

Constraint Policy

This policy when activated incorporates the global minimum and maximum constraints as part of the policy tree

Rounding Policy

rounds any optimized positions to desired integer or decimal

Computation Dimension

The computational Dimension relates to the number of assets being optimized.   Generally the more assets being optimized the higher to computations dimension.   A rule of thumb is the square root of the number of assets.   Three is the minimum value, while there is no formal maximum, the computational demands grow exponentially with every added dimension, so we generally cap the values at 10. The computational dimension is also used as a concentration control function,   the smaller the computations dimension the more gsphere will "cherry pick" a smaller subset of the most efficient and optimal assets.

SIMULATION

Simulation

The Simulation is used to generate a "Superposition"   this represents the average allocation produced by each simulated iteration.   The simulation works effectively as a blender and generally normalizes the allocations in the direction of equal weight while maintaining the principal tenants of Diversification Optimization. The simulation policy is preferred to using constraints to ensure a pragmatic, diversification portfolio that balances both systematic and non-systematic risks. The simulation is a Monte Carlo method which means simulated values are drawn from a probability distribution. This helps the simulation maintain a realistic posture.

Simulation Count

The greater the simulation count the greater the blending. Values should generally be set in the range 0-100. Simulations counts greater than 100 will have only a marginal effect and will take more time to compute.

| **Simulation ND** | ND simulations combines the monte Carlo simulation method with Gsphere own genetic algorithm. The resulting combination produces the same superposition allocation but one that is a little less randomly fluctuated and more in tune with the optimization inputs. It is the preferred simulation option. |

| **Allow Existing Assets to Vary** | An existing position refers to an allocation, share of value that has been defined to the system. This position will not vary in its portfolio weight unless checked |

WEIGHTING

| **Equal Weight** | An equal weight policy distributed the portfolio evenly |

| **Equal Vector** | An equal vector policy overrides any risk or return assumption because it assumes equal utility among all the assets. The resulting portfolio is a diversification maximizing portfolio. This policy will result in all assets receiving some allocation weight with the possible exception of cash. This is a very simple, yet effective policy, especially for those seeking greater diversification and not having any preferences for one security versus another. |

| **ReOptimization** | The Reoptimization unit and interval is set and applies to a backtested portfolio or automated portfolio through the robo advisory service. |

| **Rebalancing** | The Rebalancing unit and interval is set and applies to a backtested portfolio or automated portfolio through the robo advisory service. |

SAMPLING

| **Sample Period** | Gsphere supports any number of sample periods. The portfolio manager is free to set any sample period(s) of their choice. The decision to |

| **Sample Period is Trailing** | IF the sample period is marked as trailing then the sample will roll forward in any future reoptimization, both in a backtest or with automation. |

| **Correlation Type** | The correlation type is a property unique to any sample period. |

| **Sample Weight** | The weight assigned to any sample puts the risk, return and correlation forecasts produced by that sample in the designated proportion to the values produced by other samples. It is the relative weights that matter, and it is irrelevant if there is only one sample period created. Weights to sample periods should generally be in proportion to the portfolio managers belief in the predictive efficacy of that sample. |

OBSERVATION

Observation Period

The observation period is the period that the results of the optimization will be reviewed. If running a backtest, we strongly recommend that the observation period be fully distinct from the sample period as not to introduce any biases. For portfolios built to be put traded on now the observation period shows how that strategy would have done in the past.

Walk Forward

By selecting the walk forward option the portfolio manager is build a backtest. The observation period will walk forward from the latest data in any of the sample periods and follow the rules set by the reoptimization and rebalancing policies.

Auto-Update

When active this policy gives that the portfolio will always open with latest performance data

Observation Period is Relative

If the observation period is relative, then as time passes the observed period will advance with time.

CAPTIAL MARKET ASSUMPTIONS

Return Shrinkage

Return shrinkage is a normalization technique that helps to clean up outliers in the data. Shrinkage preserves the rank of the data (so that your lowest return position will remain you lowest return position etc.) but it decreased the dispersion of return values among your portfolio positions. In the end, we want to produce estimated return values that are a fair yardstick of how much we value that assets, typically the actual range of financial data is much greater than the range of preference that investors would ascribe. Shrinkage is based on an algorithm called James Stein Estimation. It is demonstrated that using any level of shrinkage will produce more accurate estimates. the relative Shrinkage used between the risk and return variables is also used to make the portfolio more aggressive or conservative. For example, shrinking risk values to the average would effectively eliminate the risk statistic from impacting the asset allocation, accordingly the portfolio tips in the direction of returns and favors greater returning assets without regard to the risk involved, becoming more aggressive. Generally, some minimum level of shrinkage is recommended as more shrinkage allows diversification to take a more prominent role in portfolio construction.

Return Floor

The return floor will elevate any return value to the set floor. The floor is applied before shrinkage. It is used to correct historical anomalies.

Return Ceiling

The return ceiling will lower any return value to the set ceiling. The ceiling is applied before shrinkage. It is used to correct historical anomalies. Generally we apply return ceilings in the range of 20-35 %

Return Shrinkage

Rather than shrinking the dispersion of positions returns estimations to the population mean you can override that value. Generally, a return shrinkage target would be set to a long-term portfolio level return and the use of the target is more appropriate if the sample period provides useful return rank data but may be of an inappropriate magnitude.

Hurdle Rate

The hurdle rate is the minimum rate at which any risky investment must be expected to make. Hurdle rates can be higher in more aggressive portfolios and lower in conservative portfolios. Gsphere will exclude from the optimization any asset failing to outperform the hurdle rate. Hurdle rates can also be negative which is often used to enable assets with negative historical performance to be included to the optimization. The hurdle rate can be a return on a money market fund, or treasury bill or it can be the margin rate for a leveraged portfolio or it can be the rate of expected inflation.

Risk Definition

Changes to the risk definition change the risk metric that is associated to each asset. Gravity has developed significant best practices with the risk definition. Recall that any risk metric is a surrogate for the probability and magnitude of futures losses. The standard deviation from "modern Portfolio theory" is easily improved on with metrics that better correspond to what risk actually is and that have a more predictive quality.

Risk Shrinkage

Risk shrinkage is a normalization technique that helps to clean up outliers in the data. Shrinkage preserves the rank of the data (so that your lowest risk position will remain you lowest risk position etc.) but it decreased the dispersion of risk values in your portfolio positions. In the end we want to produce estimated risk values that are a fair yardstick of how much we value that assets, typically the actual range of financial data is much greater than the range of preference that investors would ascribe. Shrinkage is based on an algorithm called James Stein Estimation. It is demonstrated that using any level of shrinkage will produce more accurate estimates. the relative Shrinkage used between the risk and return variables is also used to make the portfolio more aggressive or conservative. For example, shrinking risk values to the average would effectively eliminate the risk statistic from impacting the asset allocation, accordingly the portfolio tips in the direction of returns and favors greater returning assets without regard to the risk involved. Generally, some minimum level of shrinkage is recommended as more shrinkage allows diversification to take a more prominent role in portfolio construction.

Risk Floor

The risk floor will elevate any risk value to the set floor. The floor is applied Before shrinkage. It is used to correct historical anomalies.

Risk Ceiling

The risk ceiling will lower any risk value to the set ceiling. The ceiling is applied before shrinkage. It is used to correct historical anomalies.

Risk Shrinkage Target

Rather than shrinking the dispersion of positions risk estimations to the population mean you can override that value. Generally, a risk shrinkage target would be set to a long-term portfolio level risk metric and the use of the target is more appropriate if the sample period provides useful return rank data but may be of an inappropriate magnitude.

RISK MANAGEMENT

Global Stop from Positions Price

This stop loss policy sells off any position at an absolute price threshold.

Global Stop %

The Stop loss policy will sell off any position in a given optimization interval that has a daily closing value sufficient to attain a loss in the position greater than the threshold specified. Stop loss policy can be used for tax loss harvesting.   Stop loss is a trader's technique in accordance with the philosophy "let your winners run and cut your profits short." Additionally, it can prevent psychologically damaging losses to impact the portfolio manager or investor psyche.

Global Stop # of Standard Deviations

The Stop loss policy will sell off any position in a given optimization interval that has a daily closing value sufficient to attain a loss in the position greater than the threshold specified by calculating the assets standard deviation and entering the desired multiplier of that standard deviation.   For example, if a position has an annualized standard deviation of 20% and the portfolio manager enters a value of 1.5 then 1.5 * 20 = 30% and when that position losses 30% a stop loss order is triggered. This applies to backtests and portfolio automation.

Allow Stopped Positions to Reinvest in next Re-Optimization

After a position has been sold because a stop loss sale rule, this contingent policy governs if that position will be allowed in a subsequent reoptimization.

Allow Stopped Positions to Reinvest in Next Rebalance

After a position has been sold because a stop loss sale rule, this contingent policy governs if that position will be allowed in a subsequent rebalancing

UPCOMING POLICIES

Volume Weighting

It is often regarded that price movements associated with greater volume have greater predictive merit.   Volume weighting any sample captures this belief.

Profit Taking

rules to govern how positions can lock in gains.

Sample Inversion

Inverting a sample is a technique that a portfolio manager applies when she believes that the sample period offers material negative predictive efficacy.

Stambaugh Extrapolation

Stambaugh Extrapolation uses the relationship information for assets with shorter histories to interpolate a longer history than better enables an apples to apples estimation with other assets

Rip Cord Policy

The Rip Cord Policy when triggers sells the entirety of the portfolio and goes to cash.

FEE POLICY

Fee Policy

Sets a fee that will be subtracted from all illustrated performance metrics and charts

PORTFOLIO EDIT

This page lives here on the modeling link

Use this page to optimize a portfolio with unallocated capital or just calculate an existing portfolio

Tags support portfolio display, sharing, automation and performance options

GRAVITY INVESTMENTS
PORTFOLIO RE-OPTIMIZATION

Powered by
G sphere

Logged in as: James Damschroder
Logout

Investor · Portfolios · Modeling · Research · Compare · Settings · Help

Portfolio Info

Portfolio Name:
New Portfolio

Amount to Invest:
$1,000,000

Calculate | Optimize

Policy Tree

The Policy Tree enables you to set the variables for how your portfolio is backtested and re-optimized.

Open Policy Tree

Portfolio Tags

You can add tags related to your portfolio in the text box below

Please enter related tags

Positions

Import Candidate Set | Add Model | Import Time Series

Enter Your Stock or Fund Ticker Symbols:
Add Symbol/s

Or Search by Company name:

Or Upload an Excel file (.XLS or .XLSX) containing the symbols:
Select

(use comma separator to enter many at once)

Positions	Risk	Return	Utility	Constraints	Version History

#	Symbol	Company Name	Price	Allocation	Shares	Value	Short Sell
1	$CASH$	Cash and Equivalent	1				

This row of tabs supports the methods to enter assets or lists into the system

The model tab allows for already created portfolios to be included to a strategy. This supports a model-of-models approach

Enter tickers, or enters names of companies or funds, or import from outside sources

POSITION GRID

This is the position grid which the user can declare any known or fixed weighting to any position

If the user declares no positions then the optimization runs 'naked', if the gird is filled in, gsphere is just a calculator. But partial optimizations support complex client scenarios, core – satellite strategies and overlays.

Take a short position in any desired asset by checking the box, forecasted inputs will invert

Positions

Assets | Import Candidate Set | Add Model | Import Time Series

Enter your Stock or Fund Ticker Symbols: Or Search by Company name: Or Upload an Excel file (.XLS or .XLSX) containing the symbols:

Add Symbol/s   Select

(use comma separator to enter many at once)

Positions | Risk | Return | Utility | Constraints | Version History

#	Symbol	Company Name	Price	Allocation	Shares	Value	Short Sell	
1	$CASH$	Cash and Equivalents	1					
2	AAPL	Apple Inc.	194.21	10.00 %	2534.98	378980.00	☐	✖
3	AMZN	Amazon.com Inc.	1808				☐	✖
4	FB	Facebook Inc.	214.67	18.20 %	4000.00	689800.00	☐	✖
5	GOOGL	Alphabet Inc.	1285.5				☐	✖
6	NFLX	Netflix Inc.	363.09				☐	✖
7	BND	Vanguard Total Bond Market ETF	78.97	2.64 %	1219.51	100000.00	☐	✖
8	ZROZ	PIMCO 25+ Year Zero Coupon U.S. Treasury Index Exchange-Traded Fund	111.7				☑	✖
9	GLD	SPDR Gold Trust ETF	115.77				☐	✖
				30.84 % of 3,789,800.0		$1,168,780		

Retain: ○ Allocations ○ Shares ● Values

Kick Out Zeros | Clear All Weights

Please Note: When you enter in quantity of Shares or Values, asset Allocations will get recalculated based on Value's Running Total. On the other hand, when you enter in Allocations or change the "Amount to Invest", Allocations will get recalculated based on the "Amount to Invest".

Retaining previously optimized results, then adding additional capital to the model supports a contextual optimization of the investors existing, optimized or held away accounts.

Enter an allocation, share or value and the value entered will persist through optimizations, edits and future events

Removing unallocated positions and clearing all assigned or derived weights support various workflows

CONSTRAINT TAB

Constraints can be set globally from the policy tree or individually in this tab

Create any combination of position and group min and max constraint

You can apply a group schema here to use as a category constraint

Positions	Risk	Return	Utility	Constraints	Version History

Select Group Constraint Classification Schema Industry   Apply

#	Symbol	Company Name	Minimum	Maximum	Group Name
	Group Name: CONSUMER GOODS		Group Allocation Constraint Min:	Max:	
2	AAPL	Apple Inc.			CONSUMER GOODS
	Group Name: FINANCIAL		Group Allocation Constraint Min:	Max:	
7	BND	Vanguard Total Bond Market ETF	7.00 %	15.00 %	FINANCIAL
8	ZROZ	PIMCO 25+ Year Zero Coupon U.S. Treasury Index Exchange-Traded Fund		15.00 %	FINANCIAL
9	GLD	SPDR Gold Trust ETF	5.00 %	10.00 %	FINANCIAL
	Group Name: N/A		Group Allocation Constraint Min:	Max:	
1	$CASH$	Cash and Equivalents		2.00 %	N/A
	Group Name: SERVICES		Group Allocation Constraint Min: 10.00 %	Max: 15.00 %	
3	AMZN	Amazon.com Inc.			SERVICES
6	NFLX	Netflix Inc.			SERVICES
	Group Name: TECHNOLOGY		Group Allocation Constraint Min: 10.00 %	Max: 35.00 %	
4	FB	Facebook Inc.		20.00 %	TECHNOLOGY
5	GOOGL	Alphabet Inc.		20.00 %	TECHNOLOGY

Set Global Max/Min Allocation

Set individual asset minimum and maximum constraints

Use the groupings here or click-in to make up your own groups

Set group min and max constraints

RETURN ESTIMATION GRID

Inspect and manage your risk and return estimations

Track the return estimations as they go from historical to projected

Applied returns are what is fed to the optimizer

Positions

Assets | Import Candidate Set | Add Model | Import Time Series

Enter Your Stock or Fund Ticker Symbols:

Or Search by Company name

Or Upload an Excel file (.XLS or .XLSX) containing the symbols:

[Add Symbol/s]

[Select]

(use comma separator to enter many at once)

Positions | Risk | Return | Utility | Constraints | Version History

#	Symbol	Company Name	Historical Return	Expected Return	Applied Return	Forward Return
1	$CASH$	Cash and Equivalents	0.00 %	0.00 %	0.00 %	0.00 %
2	AAPL	Apple Inc.	29.73 %	28.37 %	17.40%	12.00 %
3	AMZN	Amazon.com Inc.	78.16 %	52.58 %	30.75%	20.00 %
4	FB	Facebook Inc.	1.41 %	14.21 %	14.21 %	14.21 %
5	GOOGL	Alphabet Inc.	30.74 %	28.87 %	26.28%	25.00 %
6	NFLX	Netflix Inc.	93.01 %	60.01 %	33.20%	20.00 %
7	BND	Vanguard Total Bond Market ETF	-1.05 %	14.21 %	9.38%	7.00 %
8	ZROZ	PIMCO 25+ Year Zero Coupon U.S. Treasury Index Exchange-Traded Fund	0.35 %	14.91 %	10.28%	8.00 %
9	GLD	SPDR Gold Trust ETF	-4.03 %	14.21 %	12.06%	11.00 %

The Utility tab gives the final utility function (numerator and denominator)

Blend Gravity's quantitative forecasts with a manual or outside source

Forward returns can be manually entered or imported

ADVISOR PAGE

The portfolio edit page for the advisor user type offers a streamline interface

user's workflow is to enter portfolio into the system to get portfolio analysis and create the basis for a recommendation

GUEST EDIT

The guest user edit is designed to be custom branded and embedded, usually as part of a free portfolio analysis

Prompt web visitors with a strong call to action that sends them here

Most investors are less diversified than they think they are so this will expose the investors true diversification and can inspire corrective action

GRAVITY INVESTMENTS
PORTFOLIO RE-OPTIMIZATION

G sphere

Logged in as: Guest www.gravityinvestments.com

Logout

Positions

Please enter your portfolio

Enter Your Stock or Fund Ticker Symbols:

Add Symbol/s

(use comma separator to enter many at once)

Or Search by Company name:

Or Upload an Excel file (.XLS or .XLSX) containing the symbols:

Select

#	Symbol	Company Name	Price	Allocation	Shares	Value
1	$CASH$	Cash and Equivalents	1			
				% of 1,000,000.00		$0

Get My Portfolio Analytics

Get help with my portfolio

the investor enters their portfolio

the users are taken to the portfolio view page

VIEW CONTROLS

When the portfolio manager is ready to execute and automate the strategy the portfolio is sent to the trading system with our API

The portfolio is tagged with Automated tag which turns on the portfolio monitor, and triggers activated investment policies as they become executable

Updates to the portfolio are pushed to the trading system

(41.26 (Good))   **(5.80 (Caution))**

Execute Strategy

Execute and Automate Strategy

Portfolio Observation

Select a new period for the analysis

☐ 1m ☐ 2m ☐ 3m ☐ 6m ☐ 1y ☐ 2y ☐ 3y ☐ 5y ☐ 10y ☐ YTD

Boundaries of observation period:

Update Observation Period   Backward from today ▾

Benchmark

Select Benchmarks to apply to the Portfolio   Add Benchmark: Applied Benchmarks:

Apply Benchmark   ▾   Delete Benchmark

#'s	Benchmark Name	Up Capture	Down Cap...	Alpha	Beta	R2	Portfolio R...	Benchmar...	D...
1	NASDAQ 100 for FAANG	63.25%	81.76%	-3.15%	0.76	0.34	12.60 %	19.96 %	☑

User can select any time period to view the portfolio for, and all charts, graphs and analytics update to the reset period.

User can set multiple benchmarks for stats and charting

VECTORS

Gsphere maps correlations of assets to angles of separation in the 3D polar chart

Assets with more attractive metrics (greater utility) have longer vectors

Highly correlation assets customer together

AMZN

NFLX

GOOGL AAPL

FB

EDV VMBS
ZROZ

$CASH$

XLE AMLP

BKLN

RALS
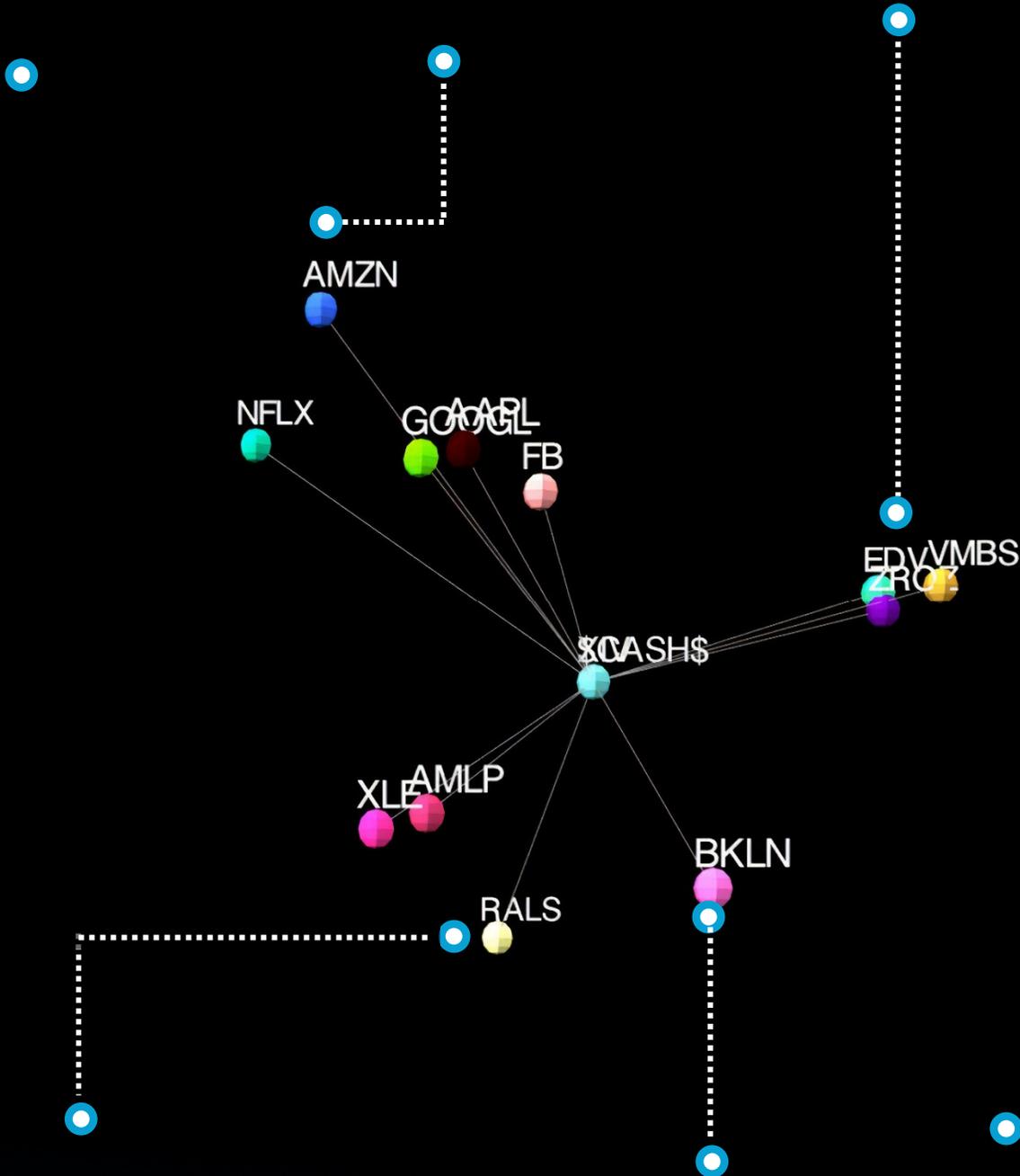
Uncorrelated assets are graphed 90 degrees apart

Opposite correlations are graphed opposite apart one another

In this way, we translate economic balance to physical balance

FRAME

The frame is the portfolios 3D, holistic efficient frontier

The best investments combine to create the frame

Inefficient assets are trapped inside

FB

ZROZ

$CASH$

AMLP
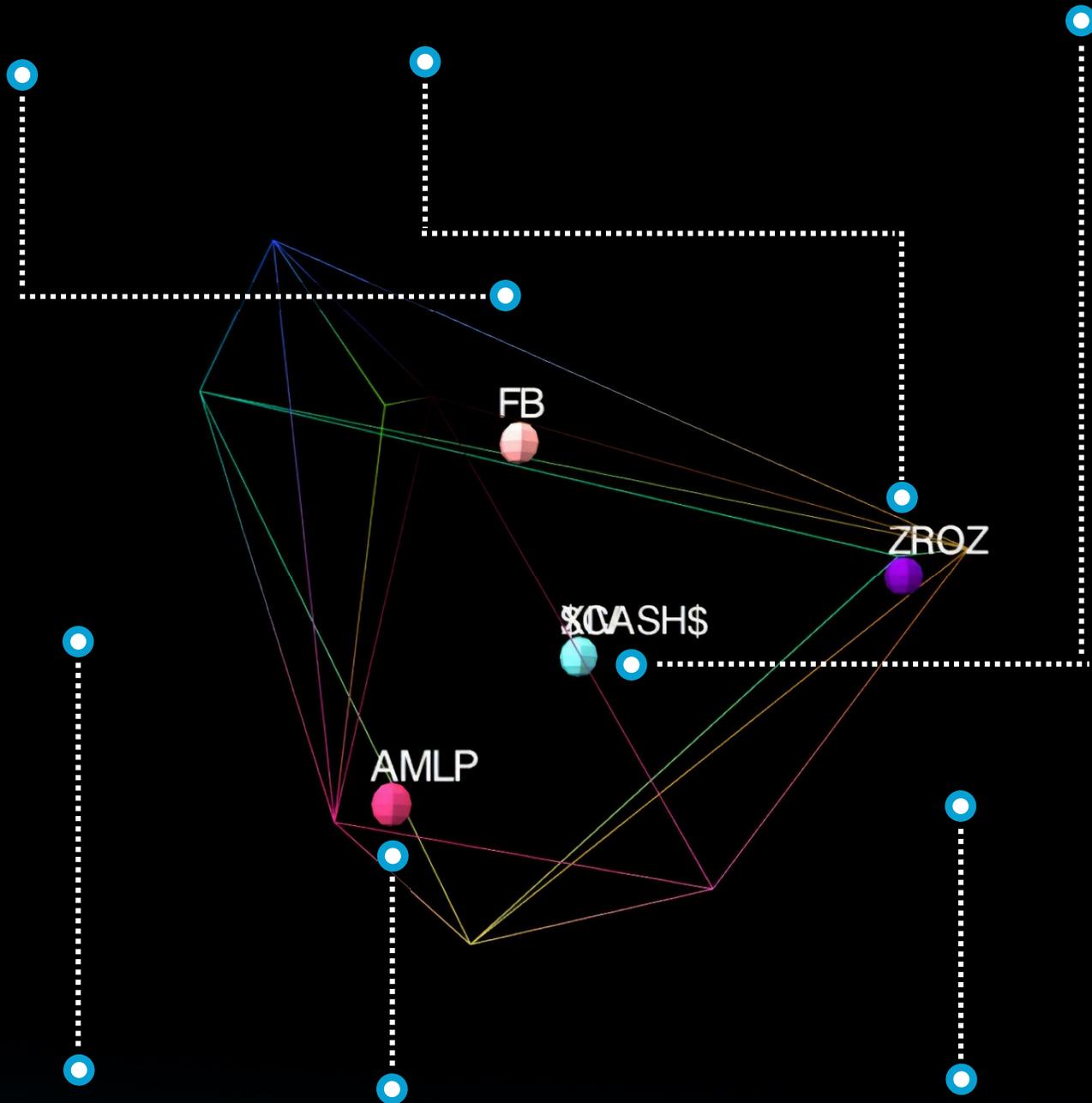
Inefficient assets will be outperformed by some combination of other assets for any market direction

We can visualize nearly efficient vs. deeply inefficient assets and be more forgiving for nearly efficient assets with a simulation induced superposition

The frame and graphics are always displayed in 3 dimensions, but the mathematics can be set in higher dimensions. The lower the calculation dimension the more discriminating the algorithm

SPHERE

The symmetry of the volume this process induces is the portfolios diversification visualization

○

this visualization is great to objectively educate clients about diversification

○

This is the source of many investors "aha moment"

○
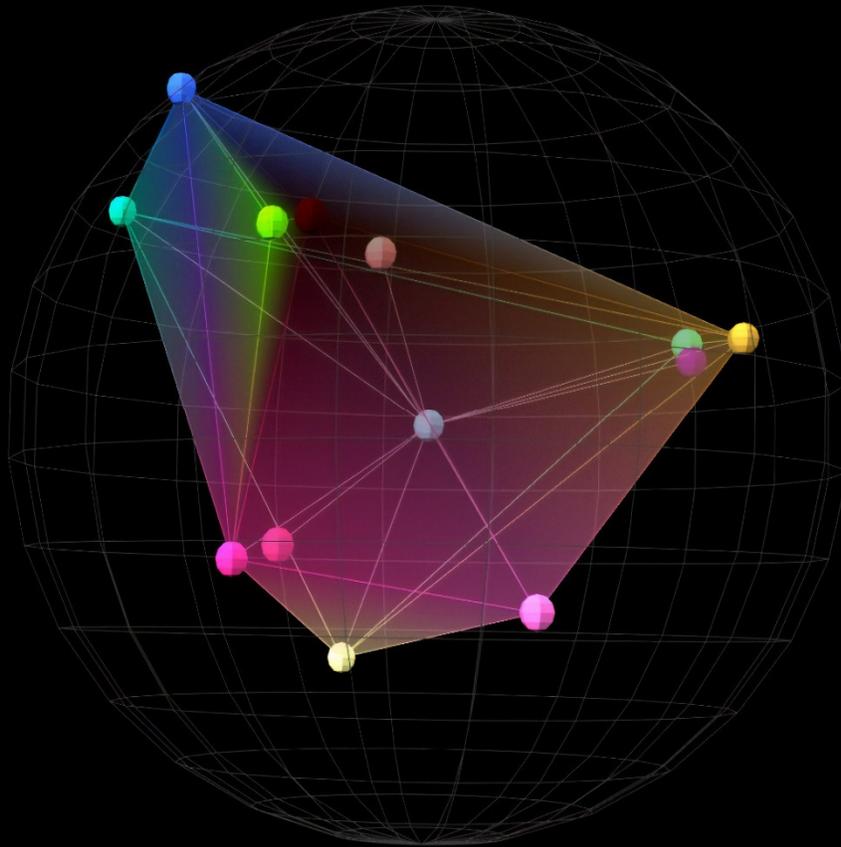
the 3d graphics are interactive: both on the webpage and inside the pdf reports

○

The sphere is just a visual reference model to depict what perfect symmetry looks like against the portfolio. Portfolios do not need perfect sphericity to have great diversification, but huge risk reduction align with major improvement to symmetry.

○

ALLOCATIONS

With the portfolio modeled geometrically, we can calculate the optimal allocations for each asset

The weights are equal to the assets' relative volume contribution

AMZN
6%

NFLX
17%

GOOGL
0%

AAPL
3%

FB
3%

EDV
0%

VMBS
0%

$CASH$
0%

AMLP
0%

XLE
8%

BKLN
17%

RALS
14%
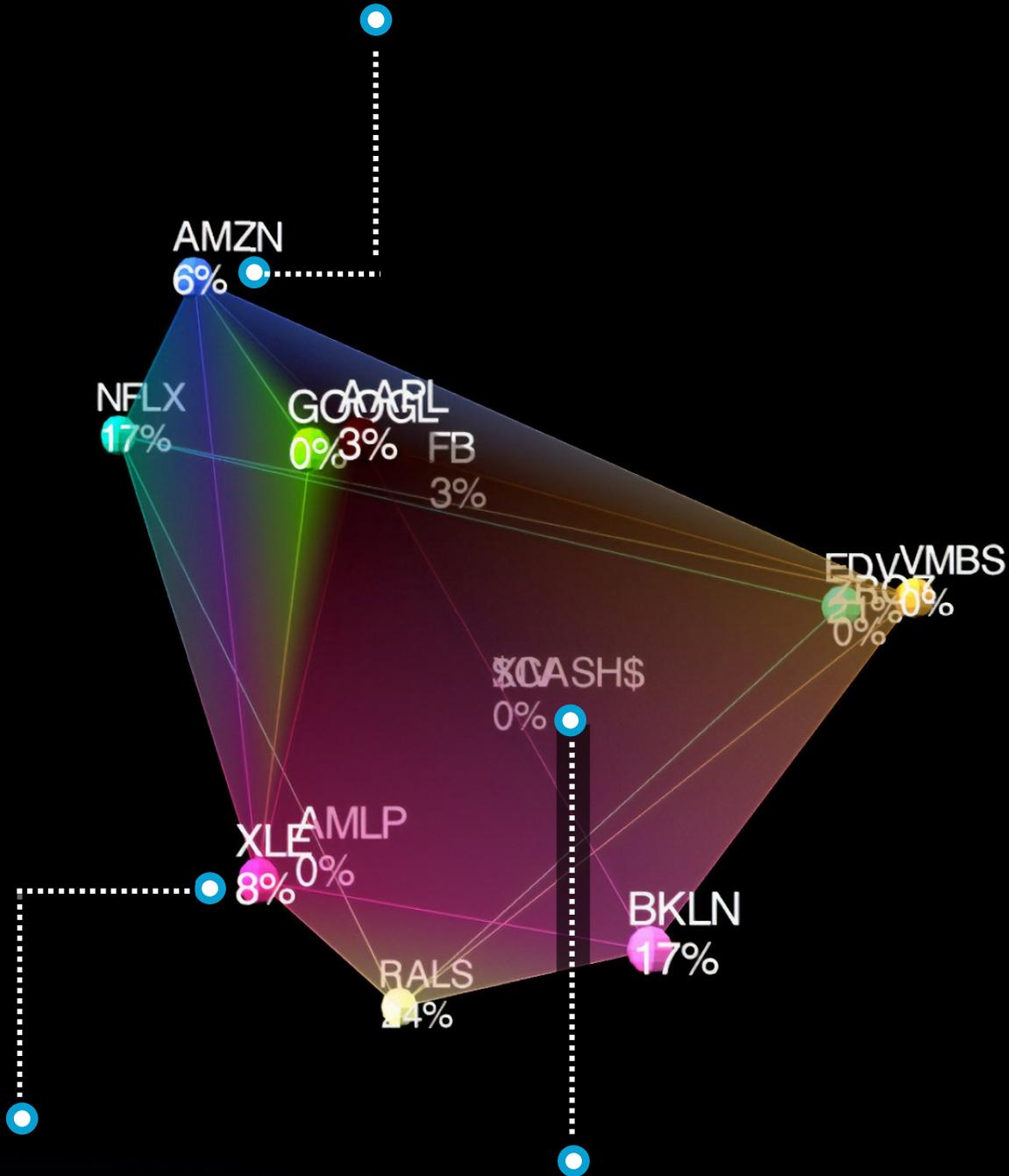
It is like a smart pie chart, containing the assets relativity information and the sum of the whole; the very definition of holistic

Inefficient assets have zero weight

BOXES

The diversification boxes cut the 3D space into 8 boxes

Each box represents diversification potential

Box exposure or lack of it is very tangible and easy to understand
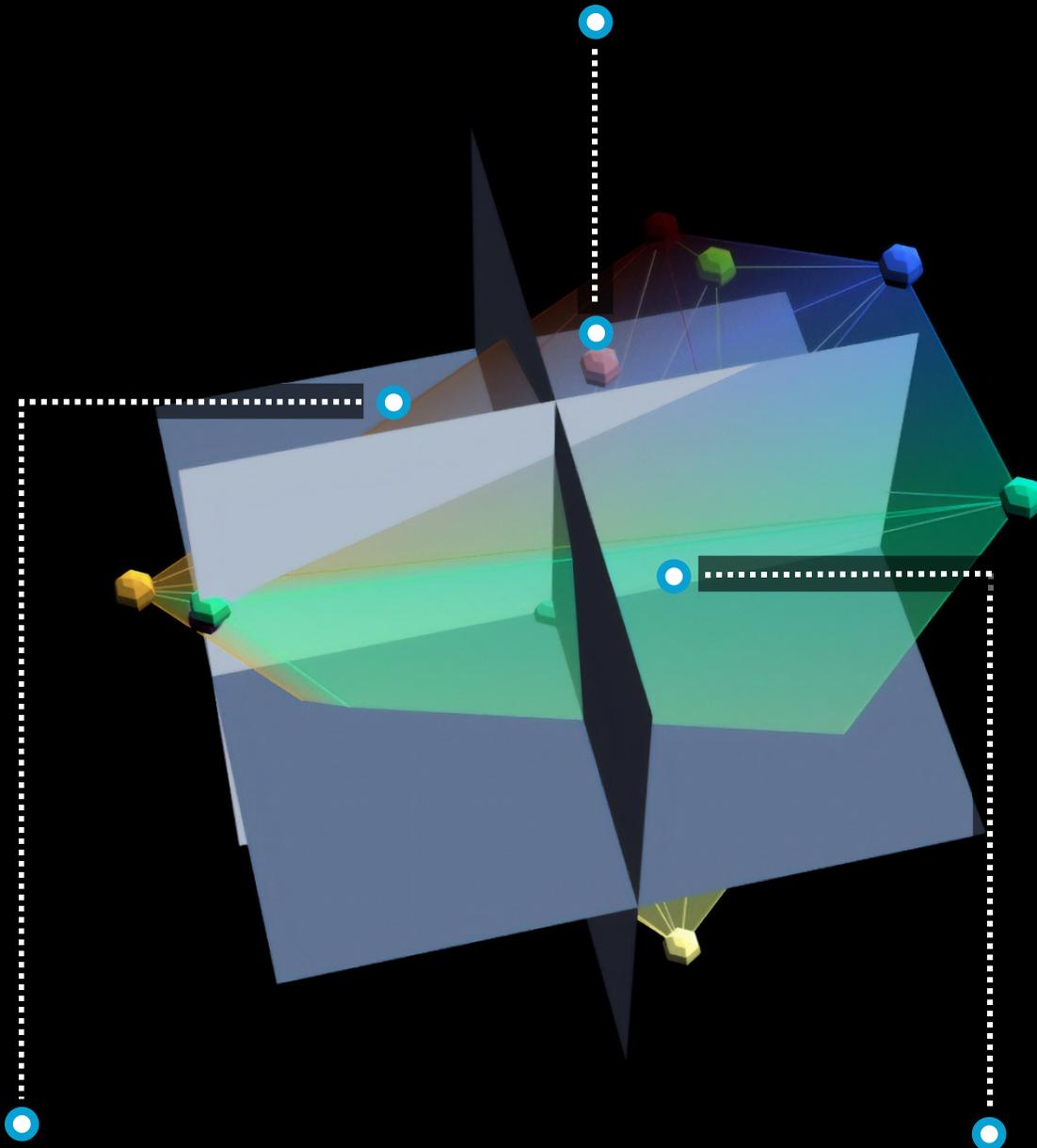
An empty box is an opportunity to obtain better diversification for the investor.

The boxes are another visual reference like the globe

COMPARE

Gsphere offers a full comparison of any two portfolio

The comparison is available in the compare link
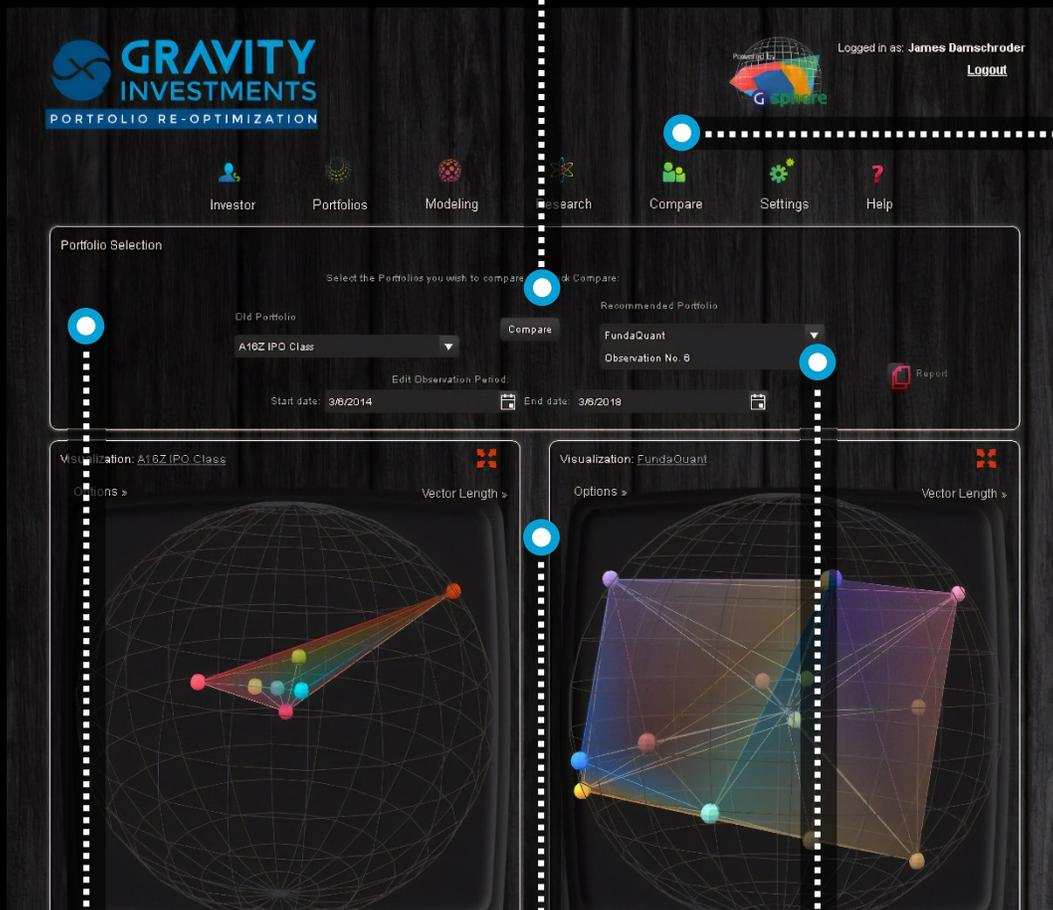
Select the portfolio to compare and adjust the data range if desired

The differences in the 3D views can be striking when investors have poor diversification

Advanced users can compare multiple versions of the same portfolio

COMPARISON PROFIT AND LOSS CHART

The relative profit and loss of the
two portfolios is often an important
influence in investor acceptance

Confidential material for designated recipients only. Limited to professional / accredited investor use

GRAVITY | www.gravityinvestments.com
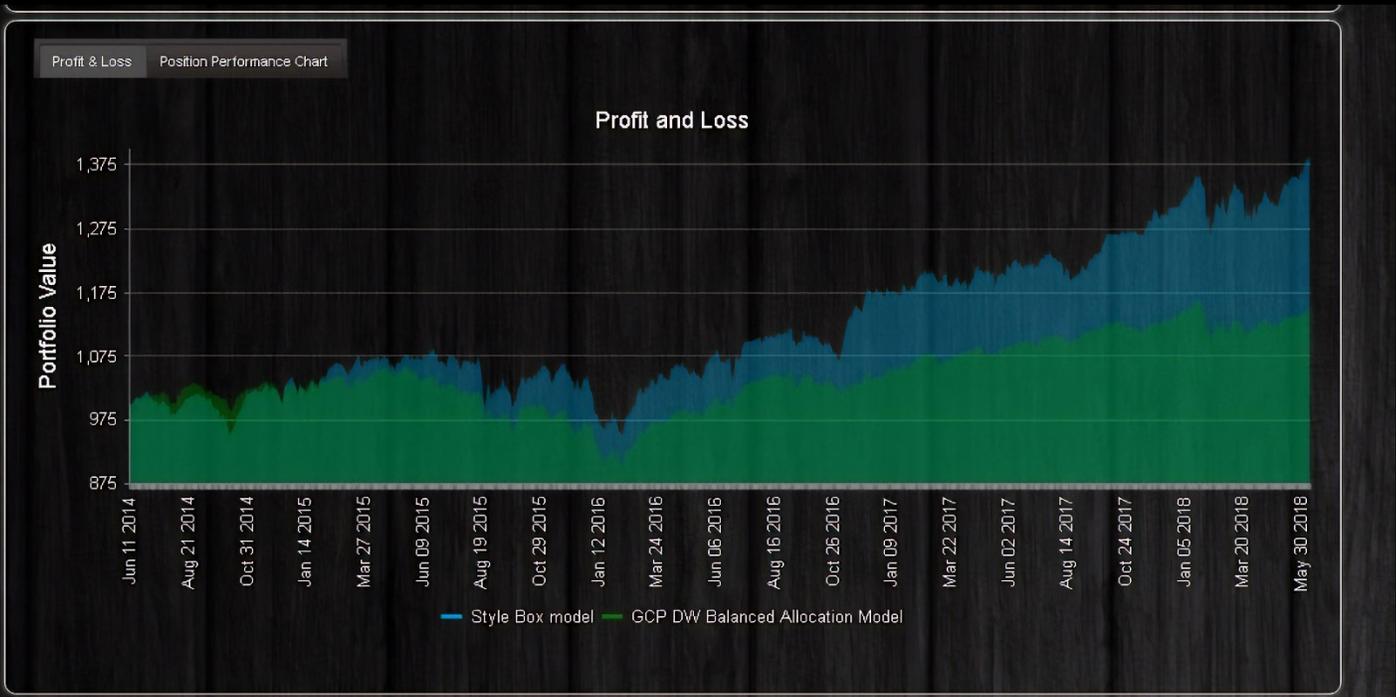
COMPARISON DIVERSIFICATION GAUGES

Comparative diversification gauges remove any shred of subjectivity in the comparison

Each color code and scale is unique to that measure; red is danger, orange is caution, yellow is adequate, green is good, dark green is excellent and blue is abundant

Fiduciary Diversification is the standard for evaluating fiduciary appropriateness of diversification

While there is no limit to some diversification values, further increases in values do little to help, but also do not hurt unless it causes other values to retract

Often, we see a trade off in idiosyncratic diversification and systematic diversification. To have strong total fiduciary diversification one needs both.

COMPARISON DIVERSIFICATION SOURCES

This chart illustrates the totals dimensionality for each portfolio

More important that the total dimensionality (the right most value for each graph) is the path it takes to get there. This is the diversification of your diversification

Diversification Sources See our YouTube tutorial

Dimensions

10
9
8
7
6
5
4
3
2
1
0

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

━━ Ideal Diversification ━━ stock model ━━ GA Repple 80:20
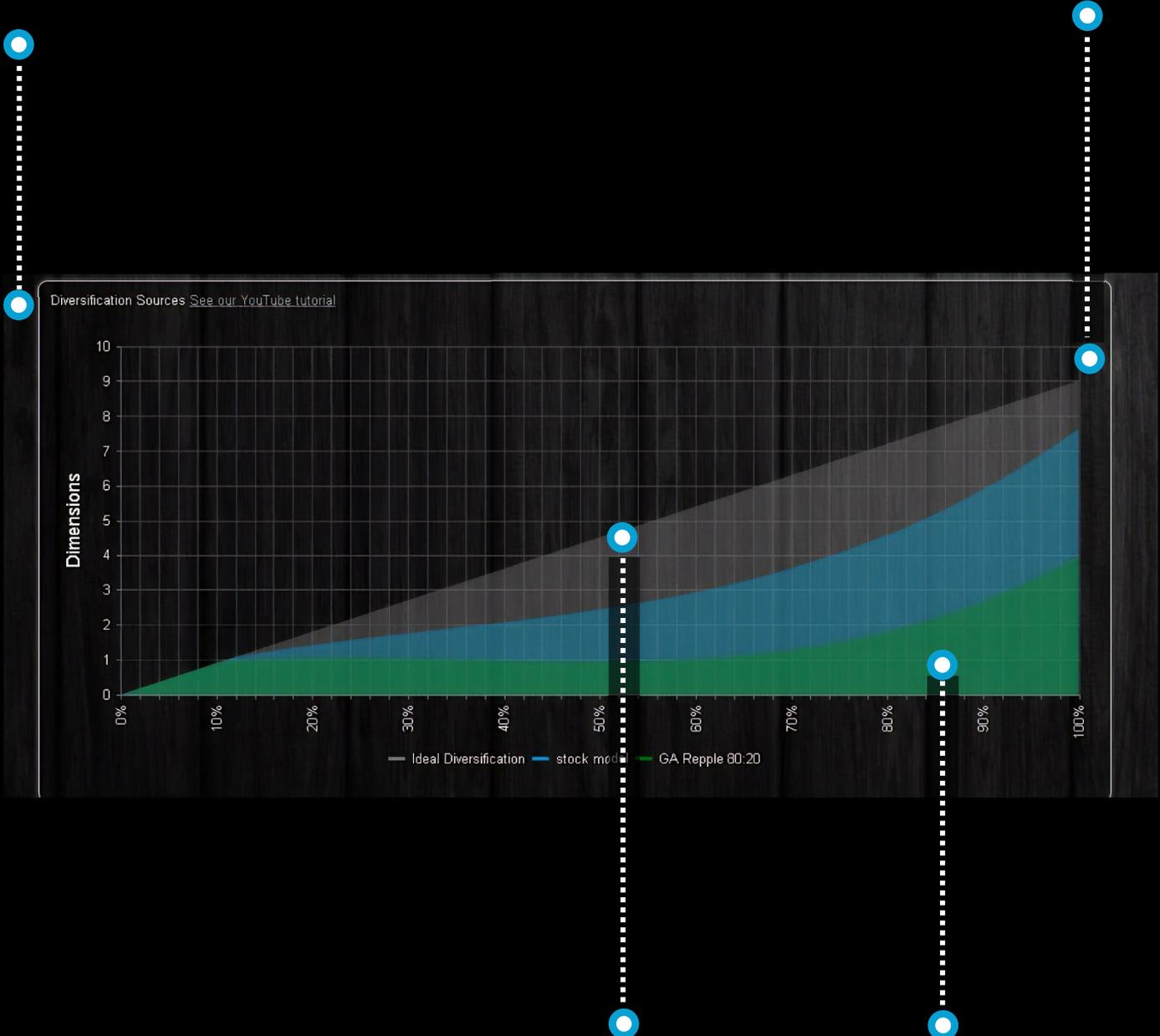
A linear increase is vastly superior to hyperbolic increase

This green graph shows that despite all of the holdings, statistically this portfolio has 70% of its variation governed by one single thing. This is the insidious systemic risk that many investors bare without awareness.

COMPARE RISK & RETURN

Comparative risk and returns
illustrates both the portfolios and
their components

Risk & Return Chart
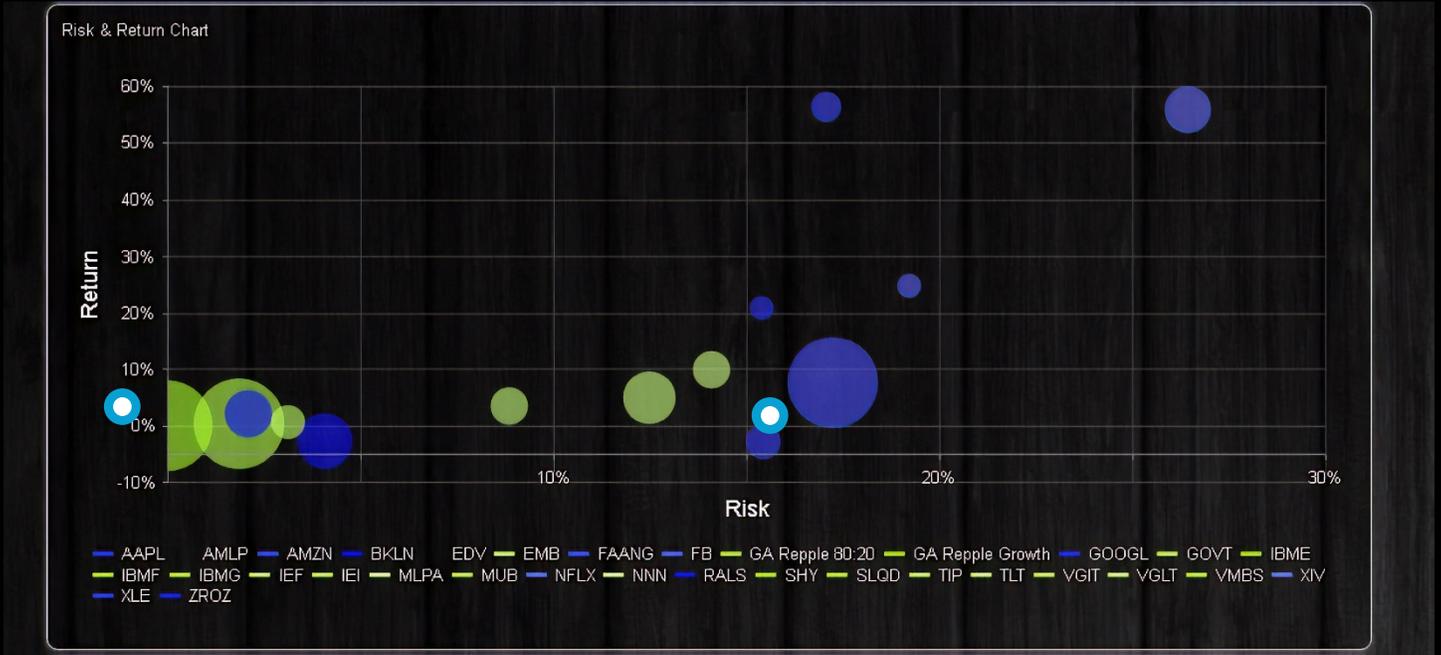
CONTACT

Enter investor details and KYC / profile data here
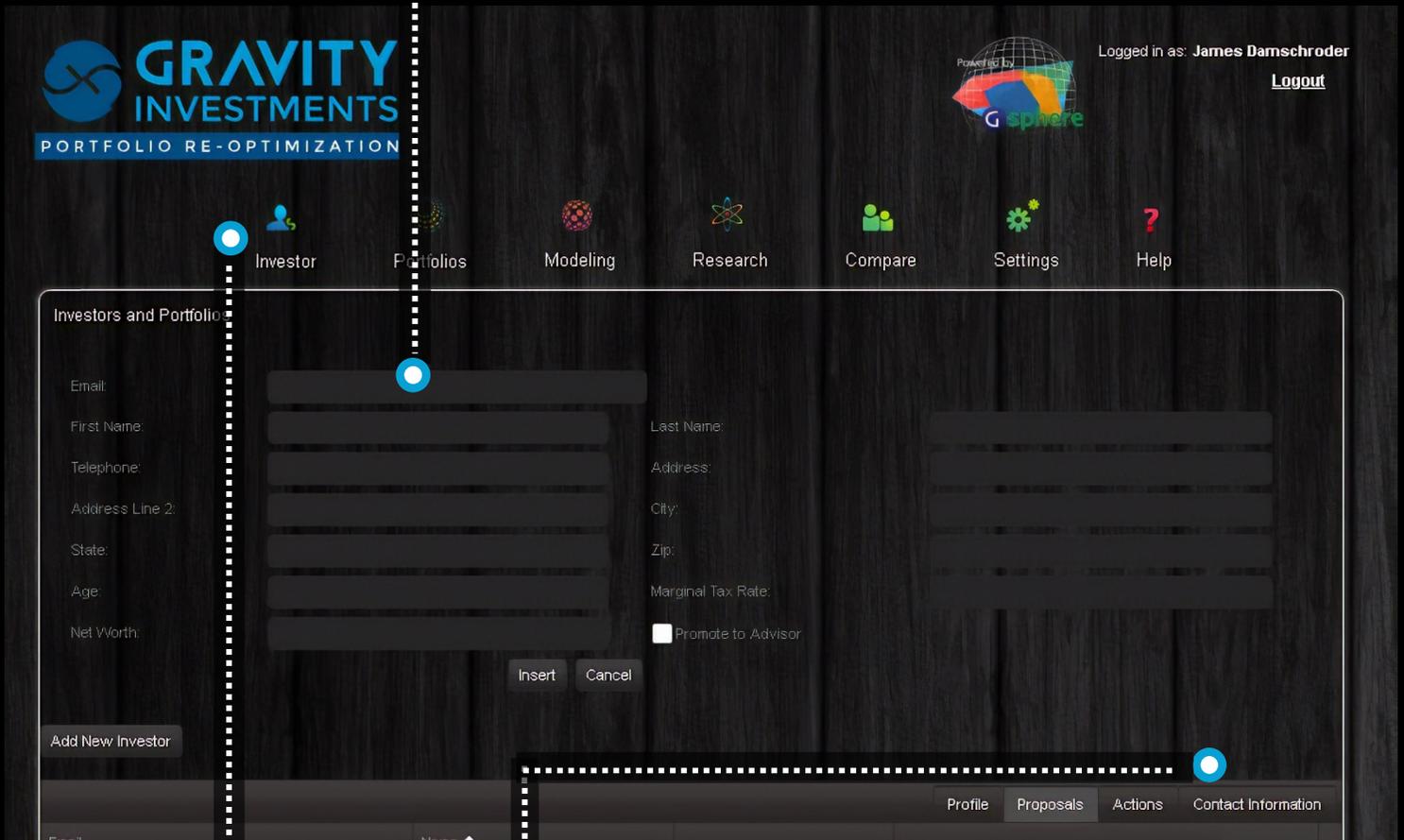
Investors and their portfolios are kept separate from your models for privacy

keep investor objective, proposals, contact data and analytics here

OBJECTIVES

These portfolio objectives may be set by the advisor or sent to the investors

The investor must prioritize what is important to her

Each objective is competing with the others for her preference

Investor Objectives ✕

Set the Objectives you want to apply

Please prioritize what portfolio attributes are important to you. These portfolio objectives compete with each other for your preference. Portfolios cant be great at everything. Tell Gsphere what you want your portfolio to be great at.

Total Return
Not Important — Essential
◀ ━━━━━━●━━━━━━ ▶

Capital Preservation
Not Important — Essential
◀ ━━━●━━━━━━ ▶

Current Income
Not Important — Essential
◀ ━━━━━━━━━● ▶

Stability
Not Important — Essential
◀ ━━━●━━━━━━ ▶

Minimizing Tax
Not Important — Essential
◀ ●━━━━━━━━ ▶

Minimizing Market Exposure
Not Important — Essential
◀ ━━━●━━━━━ ▶

Diversification
Not Important — Essential
◀ ●━━━━━━━━ ▶

Time Horizon
Short term — Long term
◀ ━━━●━━━━ ▶

Save

The objectives will be used to either select the model that is the best fit from the firms designated model lineup or are used to reparametrize the utility functions of the investment candidates used in the custom recommendation

Each position is evaluated against each objective and multiplied by the investors preference

RECOMMENDATION

The recommendation button is a major call to action that appears on the portfolio view page after getting her portfolio analytics back
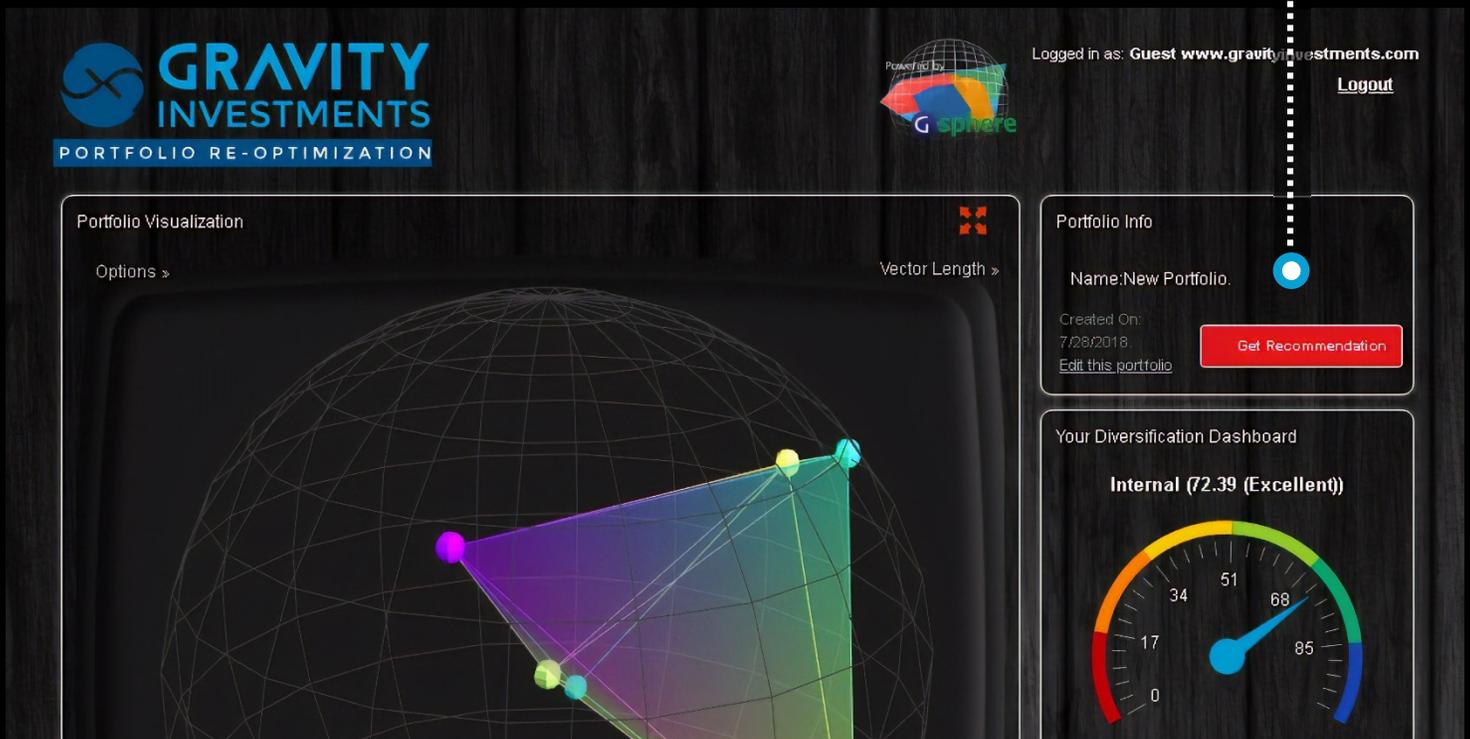
The logic behind the recommendation is set in the brand settings page

The recommendation may be a selection of a model portfolio, or an optimization of existing holdings, or a custom implementation of the firm's candidate sets and the investors objectives.

EXCEL IMPORT

Import positions for a quick analysis

Flexible formats to minimize excel manipulations

Import allocation, shares or values depending on your workflow and data availability, or just import the positions to optimize
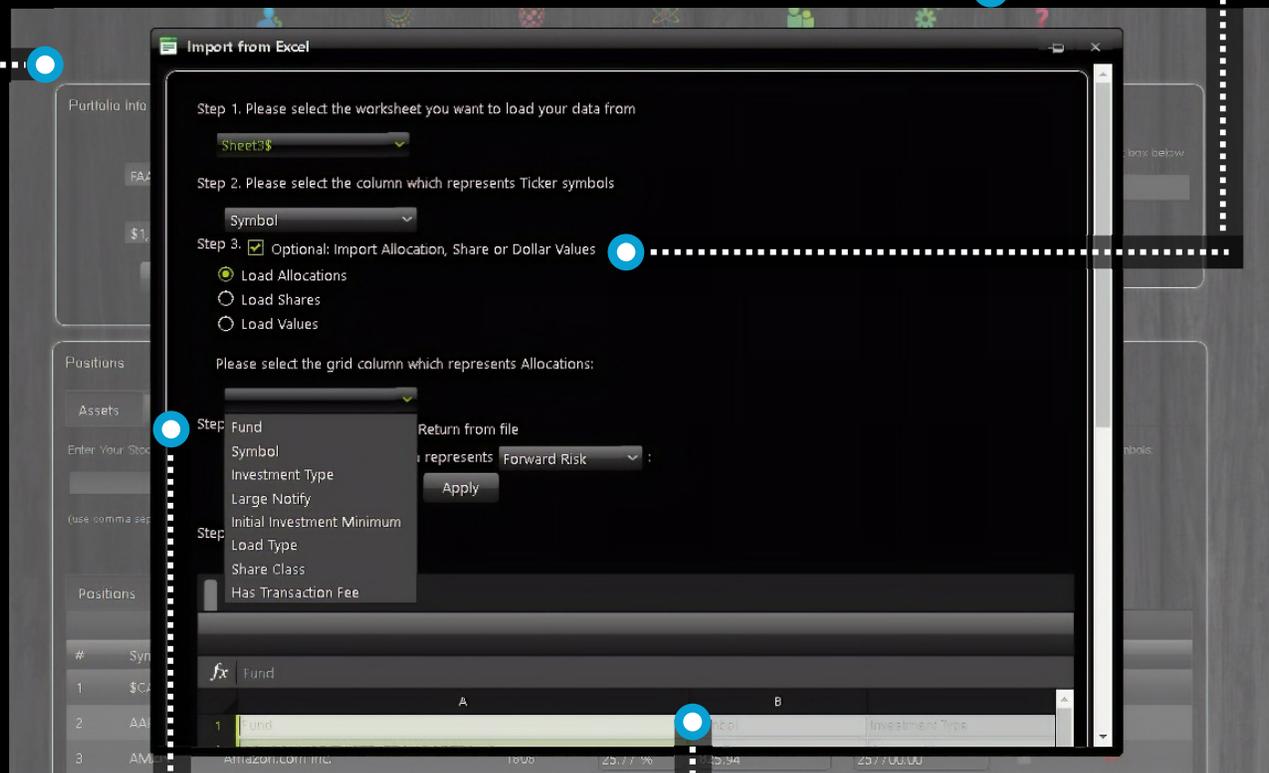
Import risk and / or return assumptions

Preview the import data

Support for importing outside time series allows inclusion of private assets, hedge funds etc. into model

VERSIONS

Use this to compare returns across various iterations of the strategy

For any strategy you can keep track of the version history

Track the history of the live strategy

Positions

| Assets | Import Candidate Set | Add Model | Import Time Series |

Enter Your Stock or Fund Ticker Symbols:

[   ] Add Symbol/s

Or Search by Company name:

[   ]

Or Upload an Excel file (.XLS or .XLSX) containing the symbols:

[   ] Select

(use comma separator to enter many at once)

| Positions | Risk | Return | Utility | Constraints | Version History |

Show Returns

Version Name	Created On	Start Date	End Date	Return			
First Instance	6/11/2015 6:12:37 PM	6/11/2014	6/11/2015	10.43 %	Set as Active Observation		✖
Instance No. 2	6/11/2015 6:17:00 PM	6/11/2014	6/11/2015	10.79 %	Set as Active Observation		✖
Instance No. 3	8/3/2017 9:53:33 AM	6/11/2014	6/11/2015	2.91 %	Set as Active Observation	Active	✖

Comply with DOL standards to document and manage uncompensated risk

Rollback to any previous version to set that version as the active instance

RESEARCH

Log, audit and track your researched positions

Manage individual positions here, we call investments that are sent to the optimization "candidates"

Candidate sets are groups like a watch list or a buy list that are sent to the optimizer, these are building blocks of your strategies

Research

Candidates   Candidate Sets

| | Industry | See On | Research Date | Note | Prices and Return | Researcher |

Add New Candidate

Ticker	Name	Candidate Sets	Price When Added	Target Price	Expected Return		
IVE	iShares S&P 500 Value Index Fund	ETF.com A Grade Ishare	86.14	0	0.00 %	Edit	✗
IVV	iShares S&P 500 Index Fund	ETF.com A Grade Ishare	185.41	0	0.00 %	Edit	✗
EOAIX	Eaton Vance Special Investment Trust	ETF.com A Grade Ishare	9.76	0	0.00 %	Edit	✗

Edit Candidate IVW

Enter the symbol: [   ] Search Symbol

Asset Symbol: IVW
Asset Name: iShares S&P 500 Growth Ind
Exchange: NYSEARCA
Industry: FINANCIAL
Price When Added: 97.85
Note:

Target Price: 111.50
Expected Return(%):   9.1 (%)

Available Candidate Sets

	Candidates Set Name	
☑	Equity Styles	Select an action
☐	Liquid Alt overlay	Select an action
☐	GIC Sectors	Select an action
☐	Strategic Alpha ETF	Select an action
☐	Aggressive Income	Select an action
☐		Select an action

Update   Cancel

| IJK | iShares S&P MidCap 400 Growth Index Fund | Gravity Dynamic Curati | 148.03 | 0 | 0.00 % | Edit | ✗ |
| IJH | iShares S&P MidCap 400 Index Fund | ETF.com A Grade Ishare | 133.97 | 0 | 0.00 % | Edit | ✗ |

See position details.

Researches may set the target price or expected return here which will inure as an optimization input

Manage what candidate sets any positions may be included to

The list candidate sets created by or shared to the user

Candidate sets can be centrally managed and shared with advisors or teams

Candidates   Candidate Sets

Add New Candidates Set

Candidates Set Name	Note	List of Candidates	Candidate Set Creator			
Equity Styles	uses Ishare ETF's	IVE - iShares S&P 500 Val	James Damschroder	See Respective Candidates	Edit	✖
Liquid Alt overlay	perfect complement to stock and bond portfolios	BGCIX - BlackRock Funds	James Damschroder	See Respective Candidates	Edit	✖
GIC Sectors		XLP - Consumer Staples S	James Damschroder	See Respective Candidates	Edit	✖
Strategic Alpha ETF	Alpha and Diversification emphasis	ZROZ - PIMCO 25+ Year ?	James Damschroder	See Respective Candidates	Edit	✖
Aggressive Income		ACRE - Ares Commercial	JP Pedinielli	See Respective Candidates	Edit	✖

Candidates Set Name:

Aggressive Income

Note:

Stretch Income Opportunities

Enter your symbols separated by commas:

Enter Symbol(s)

Or find the asset by typing in below:

Search Company or Fund Name

#	Symbol	Company Name		
1	ACRE	Ares Commercial Real Estate Corporation		✖
2	AINV	Apollo Investment Corporation		✖
3	BXMT	Blackstone Mortgage Trust Inc.		✖
4	CIO	City Office REIT Inc.		✖

Manage the list of included investments here

Edits to the candidate set on an existing strategy will be utilized in the following Re-Optimization

Candidate sets are static lists available to all Re-Optimization events if the security had existed in the prior period

Confidential material for designated recipients only. Limited to professional / accredited investor use

GRAVITY | www.gravityinvestments.com

RESEARCH

All sets are available in the Research link, available to portfolio managers and admins.

Link to outside research

Document whose ideas they are and why they are good investments

REPORT CONFIG

Select the report format: detailed report or factsheet. A comparison report is also offered from the comparison page and generally follows the format of the detailed report

Select the individual elements desired to include in the report. If benchmarks are set on your portfolio view page they will be included in the report.

All reports formants feature interactive 3D content inside the pdf (must be opened by Adobe Acrobat)

| Investor | Portfolios | Modeling | Research | Compare | Settings | Help |

Back   ○ Detailed Report   ○ Fact Sheet Report

Items in the Report

Please select the desired report elements:

☑ Portfolio Visualization ☑ Diversification Dashboard ☑ Profit and Loss chart ☑ Risk and Return Chart ☑ Allocation Chart ☑ Diversification Sources
☑ Position Performance ☑ Positions ☑ Return Report ☑ Risk Measures

Narrative

Please enter any text you want to appear on the first page of the report:

This portfolio is....

☐ Save Portfolio Descriptions   ☐ Default Disclosure   Generate Report

Disclosure Statements

Please drag and drop statements to the editor field.

- Risk disclosure
- Past Performance
- Portfolio data
- Data used to build model
- Solely for informational purposes
- GI shall not be responsible
- Supplemental sales literature
- The fund is not FDIC-insured
- Asset performance statistics
- This portfolio is hypothetical
- Results not guaranteed

B I U   </>
Format ▼   ✎ (inherited font) ▼   (inherited size) ▼
A ▼ ◌ ▼ 🖶

This portfolio is hypothetical.   Past performance is not indicative of future returns. The suitability of this portfolio recommendation must come from a Registered Investment Advisor.   Investing involves risk; including loss of principal and failure to attain expected results.

Checking these boxes will save the reports elements to the report in the future

Select standard disclosure items or create your own

Include a narrative or for the factsheets, include a strategy description and objective and a firm profile and manager profile.

SETTINGS

Admin control user access
conditions

Admins and Brand managers
configure brand options

Create benchmarks including
custom blended benchmarks

Share data features with your brand
or other users

Set the permission links for guest
user access to system features
including free portfolio analysis and
portfolio views

HELP

Contact information for direct support or support tickets

Look up worldwide exchange codes as ticker suffix for global exchange strategies

Glossary with definitions and formulas

G-Sphere Policy Guide

Constraints

Threshold Constraint
The Threshold Policy is applied to both a portfolio an any recommendation report built including that portfolio. The purpose of the threshold is to remove very small allocation weights that are so small as to be a nuisance due to the transaction costs in weighing the portfolio benefit given the value of a portfolio. The value is expressed as a percentage and any allocation given to any assets less than the designated percentage will be reset to zero and the capital reallocated to the remaining assets.

Constraint Policy
This policy when activated incorpoates the global minimum and maximun constraints as part of the policy tree.

Diversification Management

Computation Dimension
The Computational Dimension relates to the number of assets being optimized. Generally the more assets being optimized the higher to computations dimension. A rule of thumb is to set the Computational Dimension as the square root of the number of assets. Three is the minimum value, while there is no formal maximum, the computational demands grows exponentially with every added dimension so we generally cap the values at 10. The computational dimension is also used as a concentration control function, the smaller the computations dimension the more gsphere will "cherry pick" a smaller subset of the most efficient and optimal assets.

Simulation

Simulation
The Simulation is used to generate a "Superposition" which represents the average allocation produced by each simulated iteration. The simulation works effectively as a blender and generally normalizes the allocations in the direction of equal-weighting, while maintaining the principal tenants of Diversification Optimization. The simulation policy is preferred to using constraints to ensure a pragmatic, diversified portfolio that balances both systematic and non-systematic risks. The simulation is a Monte Carlo method which means simulated values are drawn from a probability distribution. This helps the simulation maintain a realistic posture.

Simulation Count
The greater the simulation count, the greater the blending. Values should generally be set in the range 0-100. Simulations counts greater than 100 will have only a marginal effect and will take more time to compute.

Simulation ND
ND simulations combine the Monte Carlo simulation method with Gsphere's own genetic algorithm. The resulting combination produces the same superposition allocation but one that is a little less randomly fluctuated and more in tune with the realistic, non-random structure of the optimization inputs. Generally speaking it is the preferred simulation option.

Allow existing assets to vary
An existing position refers to an allocation, share of value that has been defined to the system. This positions will not vary in its portfolio weight unless checked

Detailed descriptions of investment policies

Guide to walk forward out of sample multiperiod backtesting