GRAVITY INVESTMENTS
PORTFOLIO RE-OPTIMIZATION

GSPHERE PRODUCT TOUR

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
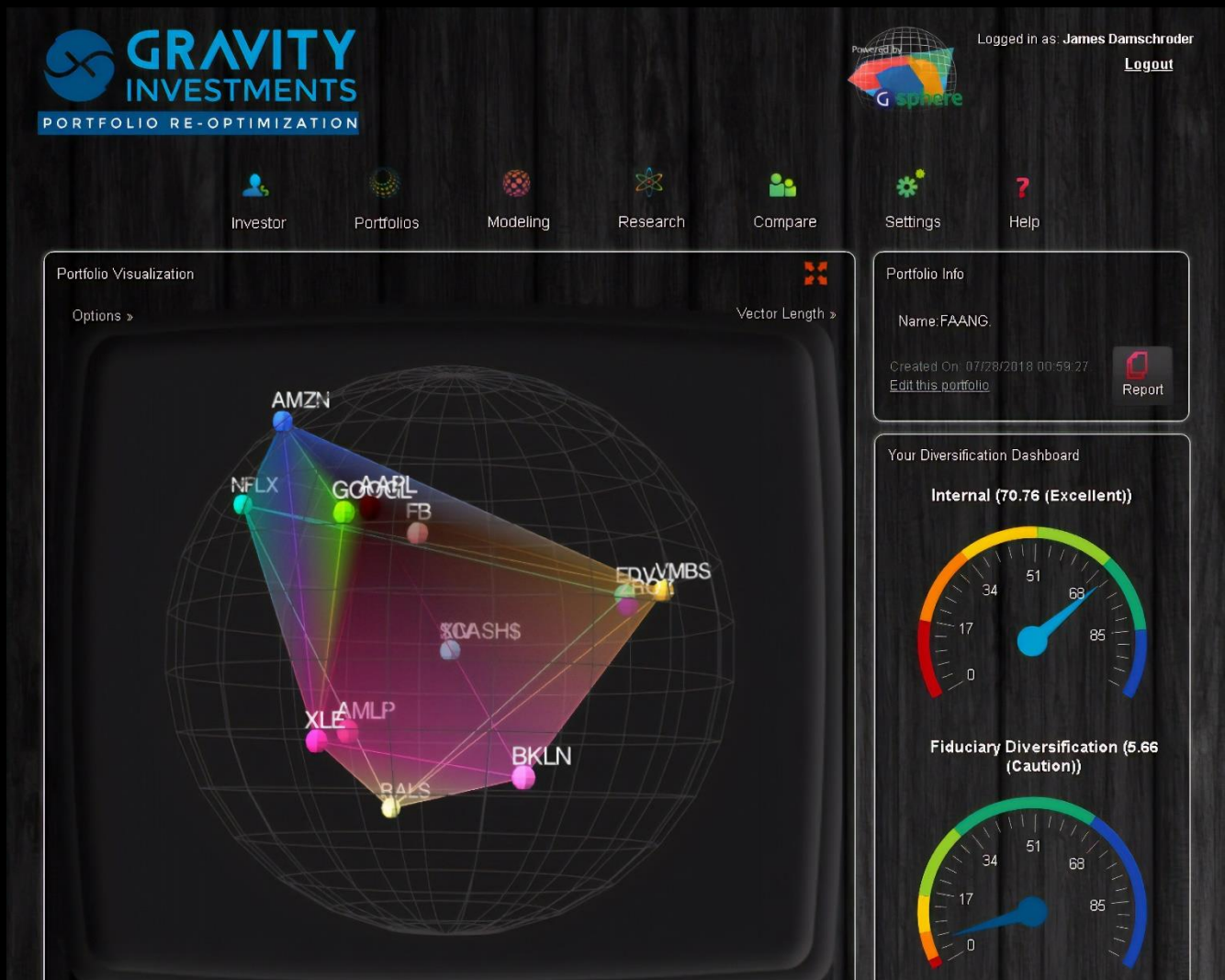
DIVERSIFICATION DASHBOARD

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.

Systematic Diversification (49.02 (Good))

Idiosyncratic Diversification (11.94 (Adequate))

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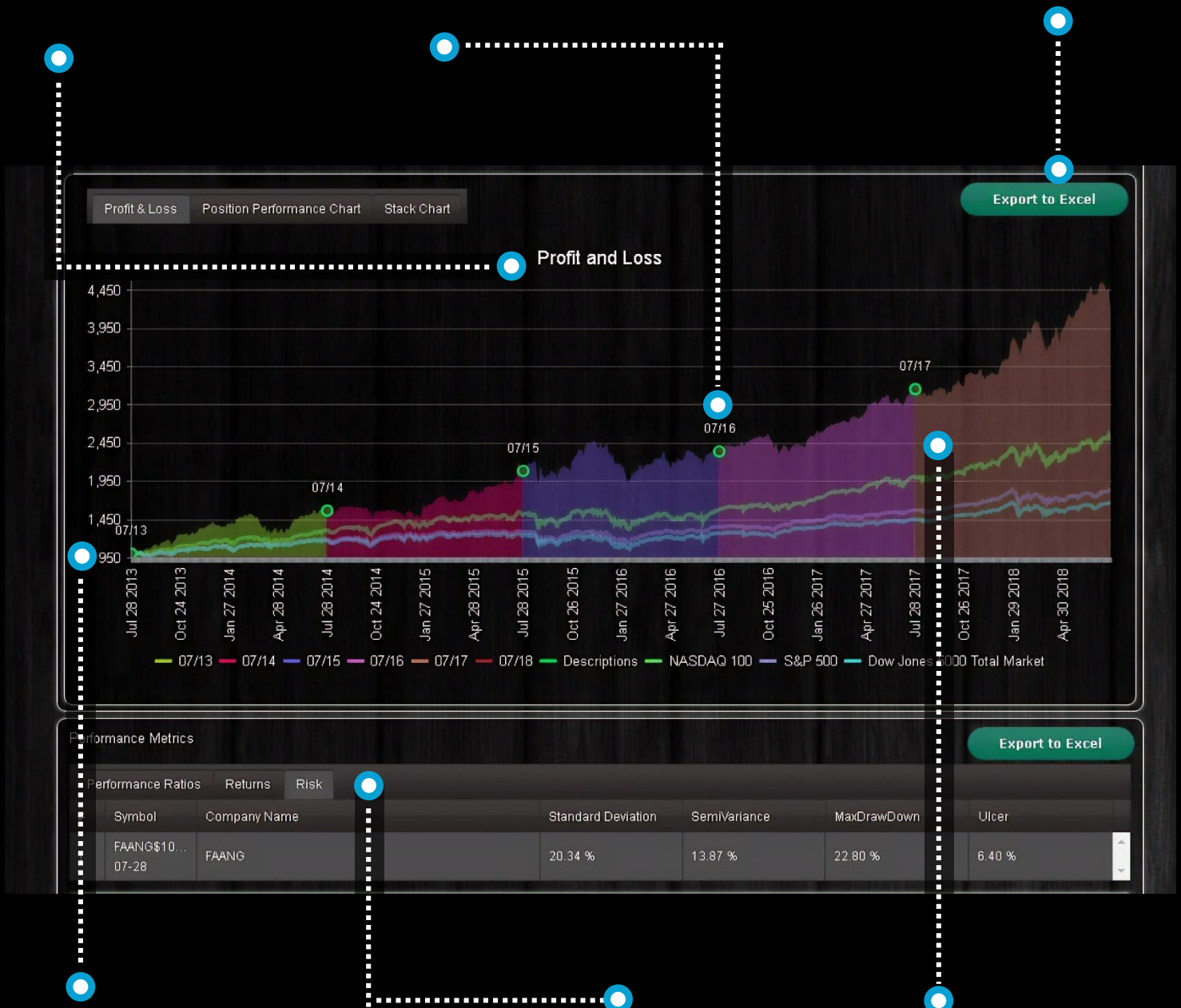
The Idiosyncratic diversification is the portfolio's intrinsic dimensionality. This value is like the portfolios Concentration Co-efficient (CC), but further subtracts any perfect redundancy. More Simply it is the number of asset in the portfolio adapted for the weighting scheme. This value is generally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

Profit & Loss | Position Performance Chart | Stack Chart

Export to Excel

Profit and Loss

4,450
3,950
3,450
2,950
2,450
1,950
1,450
950

07/17

07/16

07/15

07/14

07/13

Jul 28 2013 | Oct 24 2013 | Jan 27 2014 | Apr 28 2014 | Jul 28 2014 | Oct 24 2014 | Jan 27 2015 | Apr 28 2015 | Jul 28 2015 | Oct 26 2015 | Jan 27 2016 | Apr 27 2016 | Jul 27 2016 | Oct 25 2016 | Jan 26 2017 | Apr 27 2017 | Jul 28 2017 | Oct 26 2017 | Jan 29 2018 | Apr 30 2018

— 07/13 — 07/14 — 07/15 — 07/16 — 07/17 — 07/18 — Descriptions — NASDAQ 100 — S&P 500 — Dow Jones 5000 Total Market

Performance Metrics

Export to Excel

Performance Ratios | Returns | Risk

Symbol	Company Name			Standard Deviation	SemiVariance	MaxDrawDown	Ulcer
FAANG$10... 07-28	FAANG			20.34 %	13.87 %	22.80 %	6.40 %

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
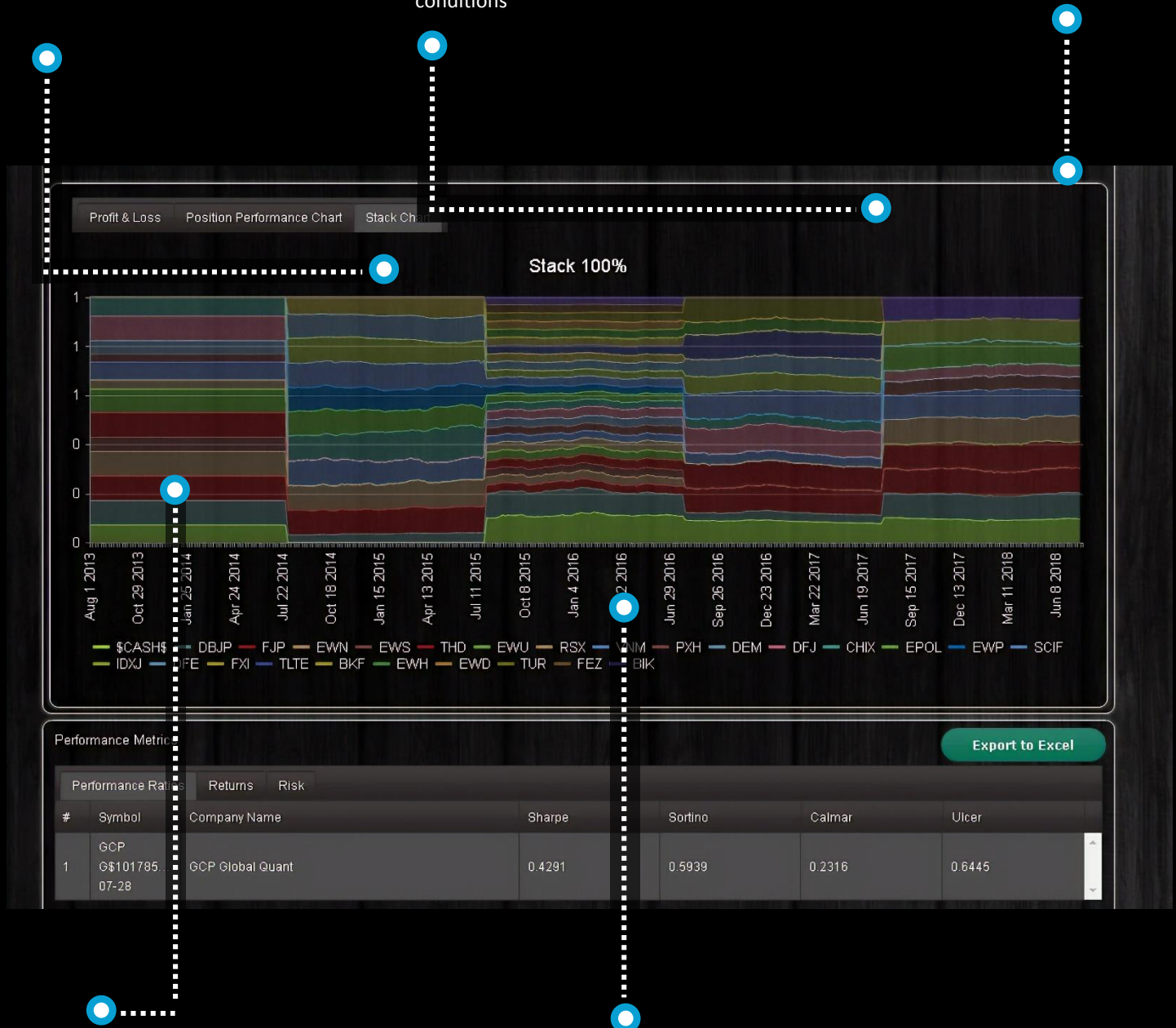
ROLLING ALLOCATION CHART

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%

$CASH$ — 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

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
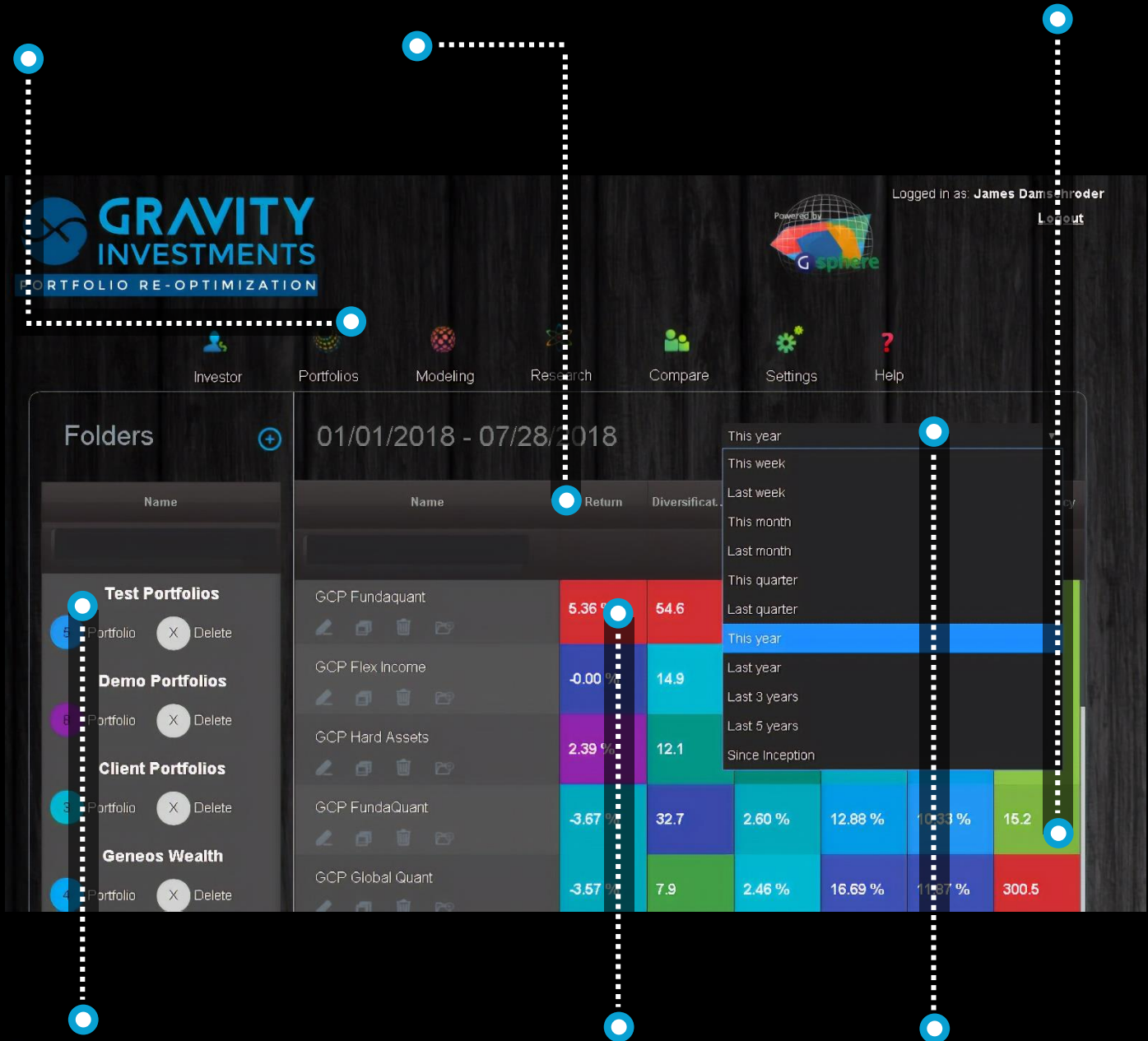corresponding allocation and risk
return chart

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

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

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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	Dow Jones 5000 Total Market for FAANG	126.13%	99.50%	22.10%	1.08	0.43	33.42 %	10.57 %	☐

Profit & Loss | Position Performance Chart | Stack Chart

Export to Excel

Profit and Loss

4,450
3,950
3,—
2,9—
2,4—
1,9—
1,4—
9—

Jul 28 2013 · Oct 24 2013 · Jan 27 2014 · Apr 28 2014 · Jul 28 2014 · Oct 24 2014 · Jan 27 2015 · Apr 28 2015 · Jul 28 2015 · Oct 26 2015 · Jan 27 2016 · Apr 27 2016 · Jul 27 2016 · Oct 25 2016 · Jan 26 2017 · Apr 27 2017 · Jul 28 2017 · Oct 26 2017 · Jan 29 2018 · Apr 30 2018

— 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

9
8
7
6
5
4
3
2
1
0

2% 4% 6% 8% 10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30% 32% 34% 36% 38% 40% 42% 44% 46% 48% 50% 54% 56% 58% 60% 62% 64% 66% 68% 70% 72% 74% 76% 78% 80% 82% 84% 86% 88% 90% 92% 94% 96% 98% 100%

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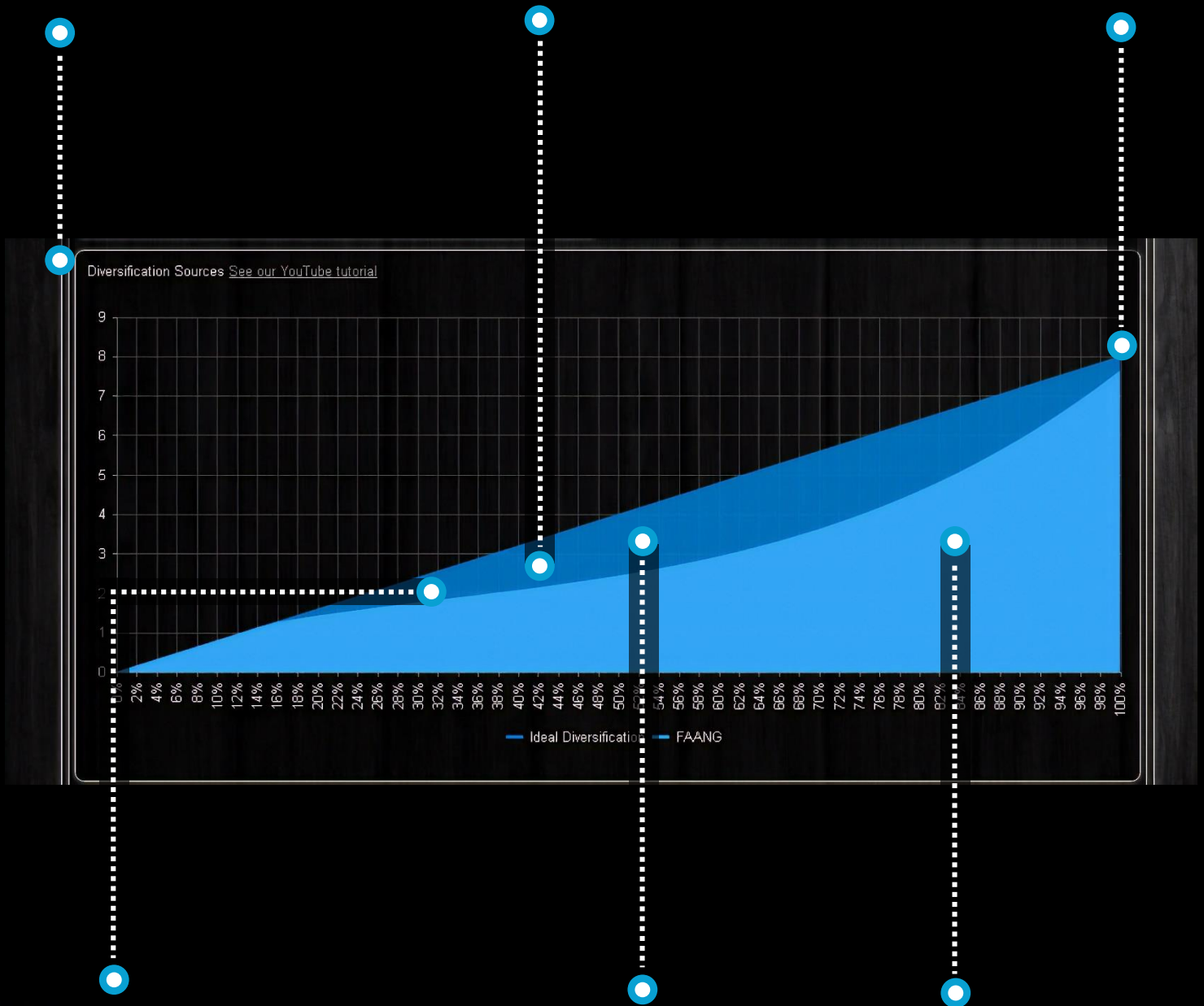
The graph would fill the diagonal exactly if all of the assets were uncorrelated and equally weighted. As systemic and weighting concentrations pervade the strategy the graph will dip

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

Profit & Loss | Position Performance Chart | Stack Chart

Export to Excel

Performance Position Chart

10,925
8,925
6,925
4,925
2,925
925

Jul 31 2013, Oct 24 2013, Jan 22 2014, Apr 17 2014, Jul 15 2014, Oct 8 2014, Jan 5 2015, Apr 1 2015, Jun 26 2015, Sep 22 2015, Dec 16 2015, Jun 9 2016, Sep 2 2016, Nov 29 2016, Feb 27 2017, May 23 2017, Aug 17 2017, Nov 10 2017, Feb 8 2018, May 7 2018

AAPL — AMZN — GOOGL — NFLX

All assets are normalized for an initial 1000$ invested

Mouseover the graph to see dates and prices

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
Month
Week

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

* 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

ADVISOR PAGE

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

users 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

Logged in as: Guest www.gravityinvestments.com
Logout

G sphere

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 is 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%	-0.15%	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
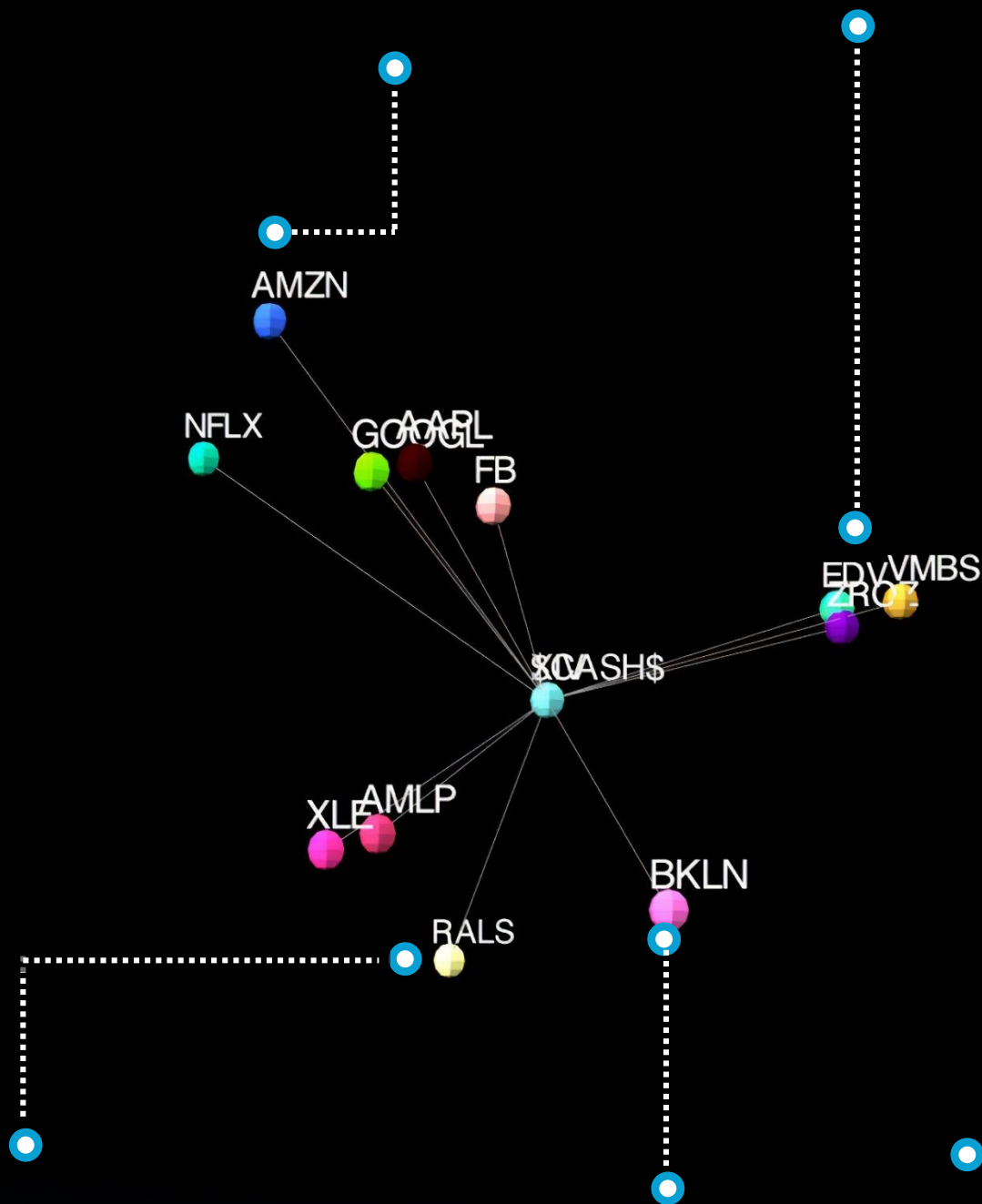
Uncorrelated assets are graphed 90 degrees apart

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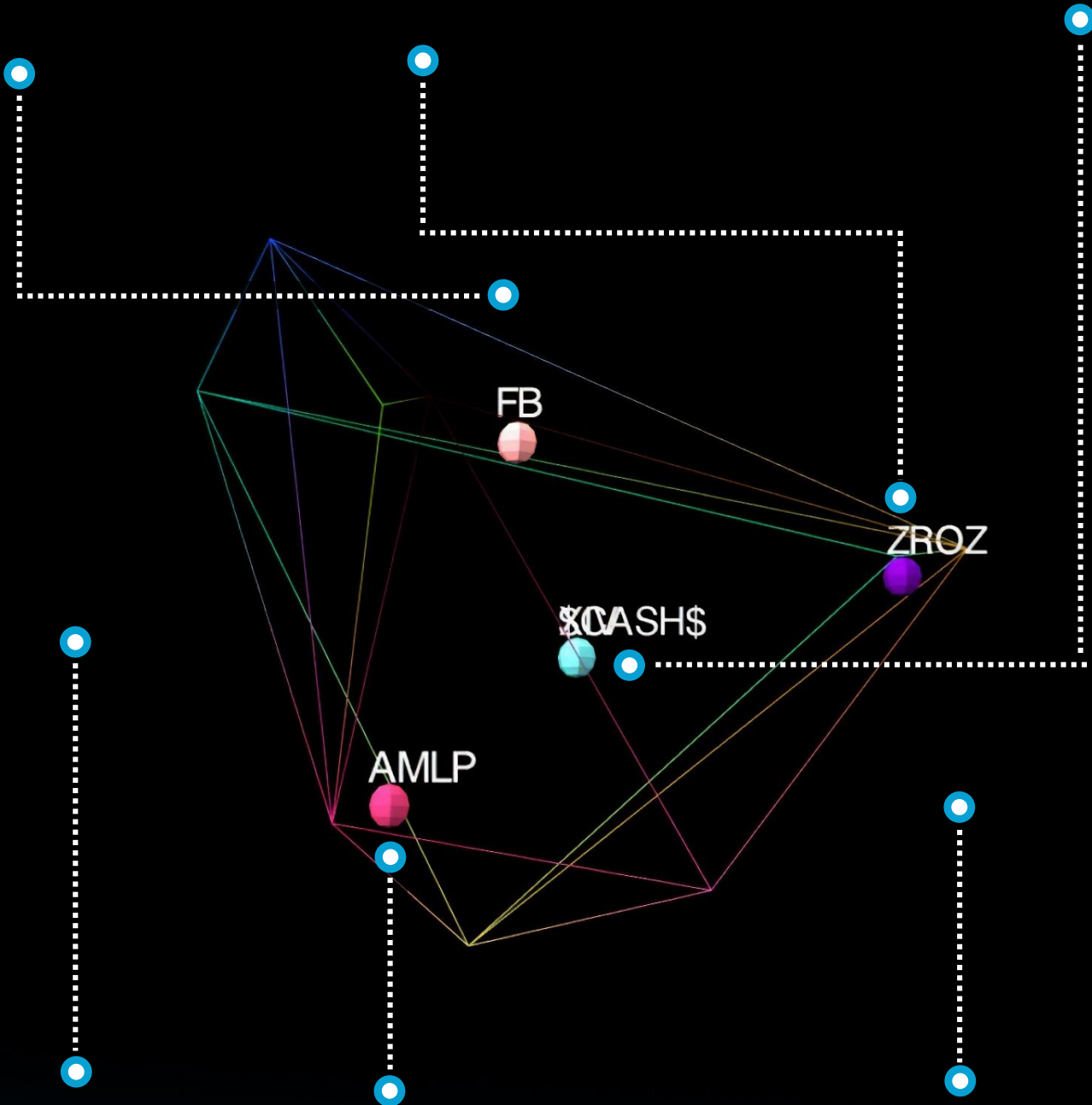
Inefficient assets will be outperformed by some combination of other assets for any market direction

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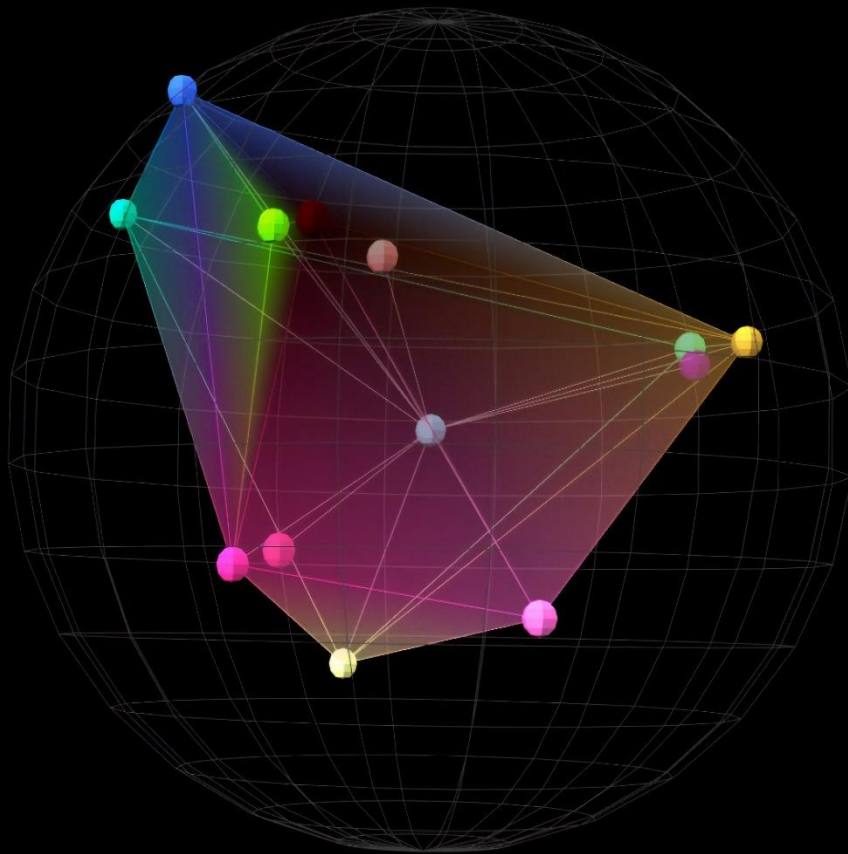
the 3d graphics are interactive: both on the webpage and inside the pdf reports

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
1%

VMBS
0%

$CASH$
0%

XLE
8%

AMLP
0%

BKLN
17%

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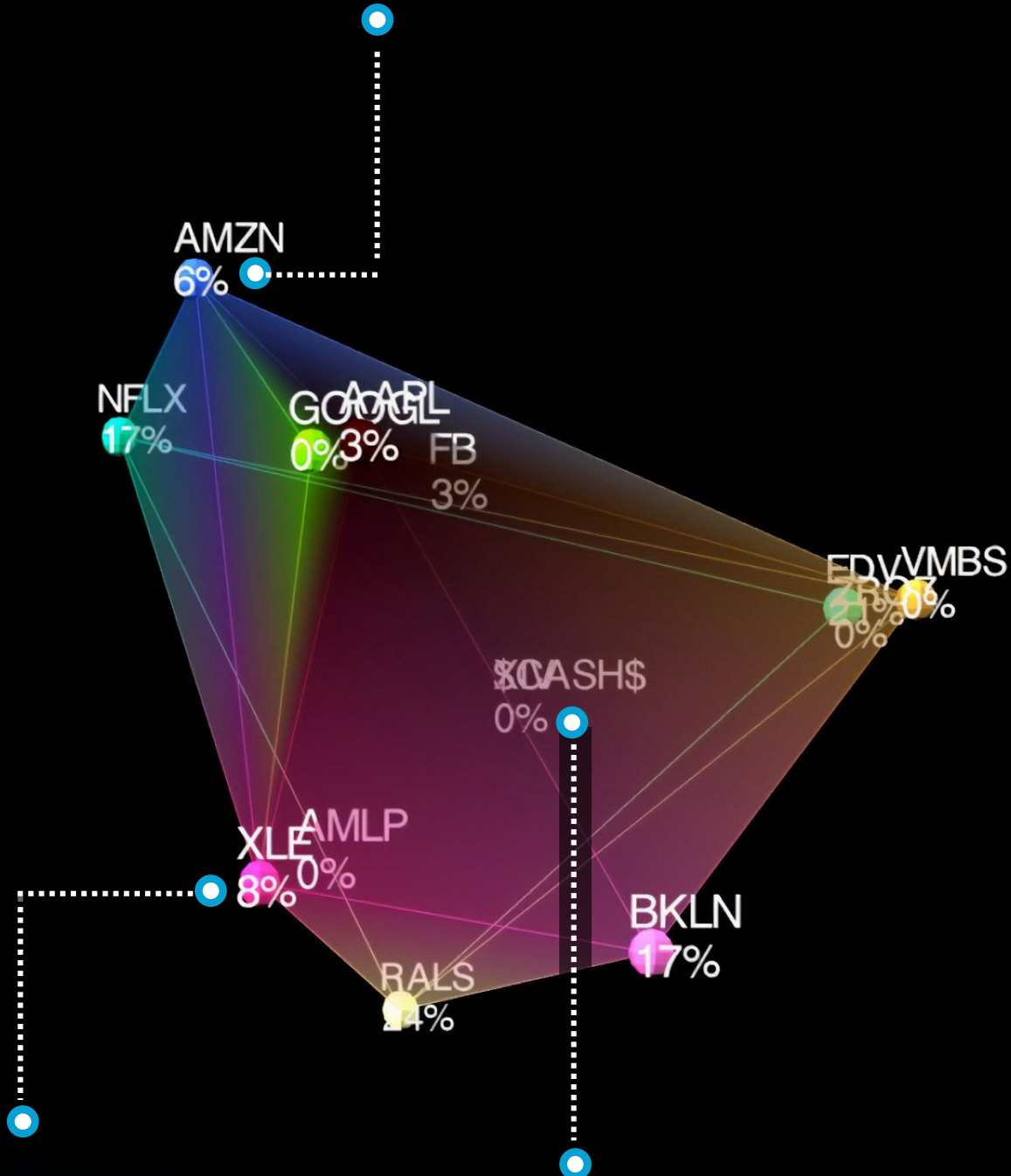
It is like a smart pie chart, containing the assets relativity information and the sum of the whole; the very definition of holistic

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
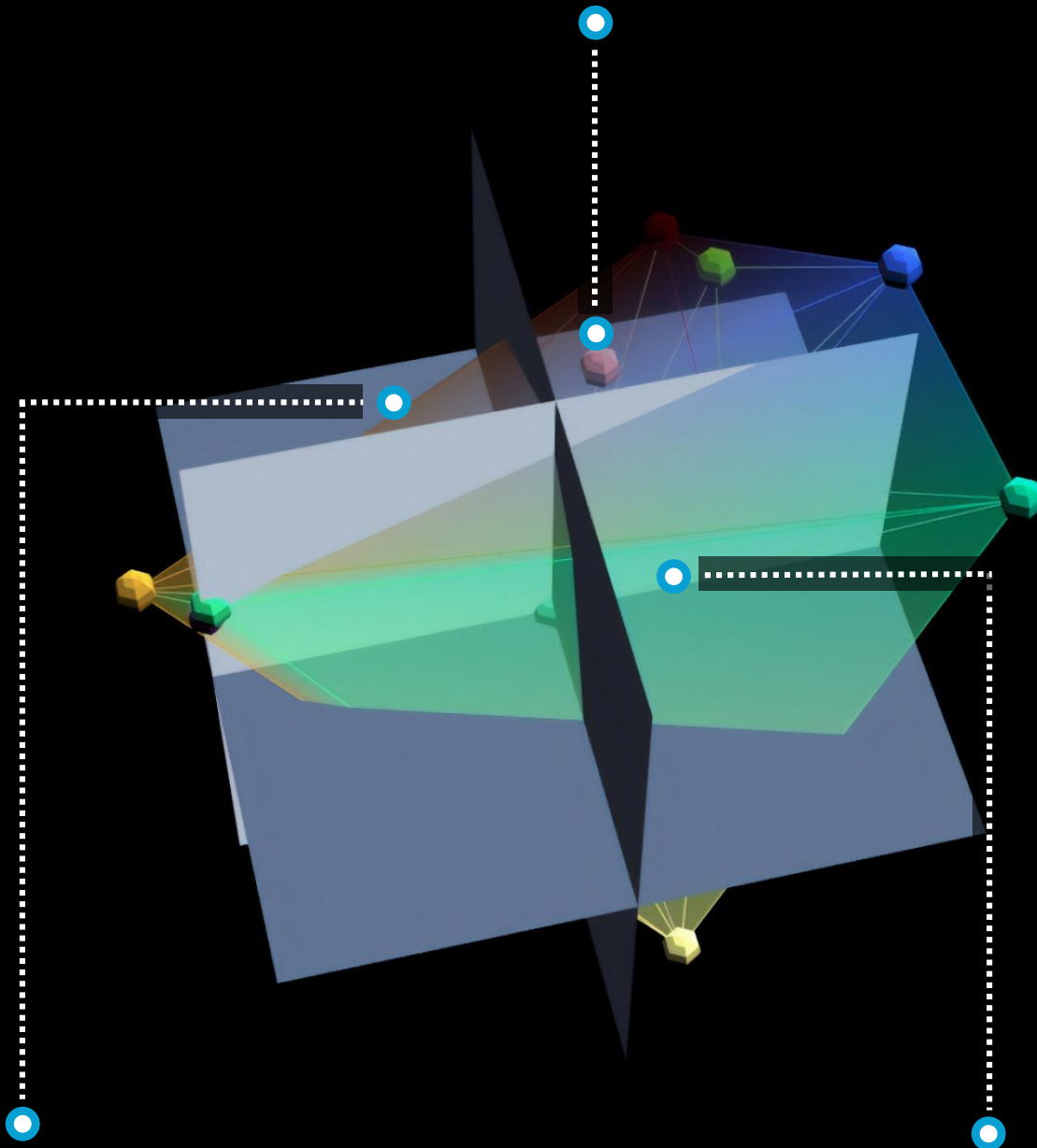
An empty box is an opportunity to obtain better diversification for the investor.

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
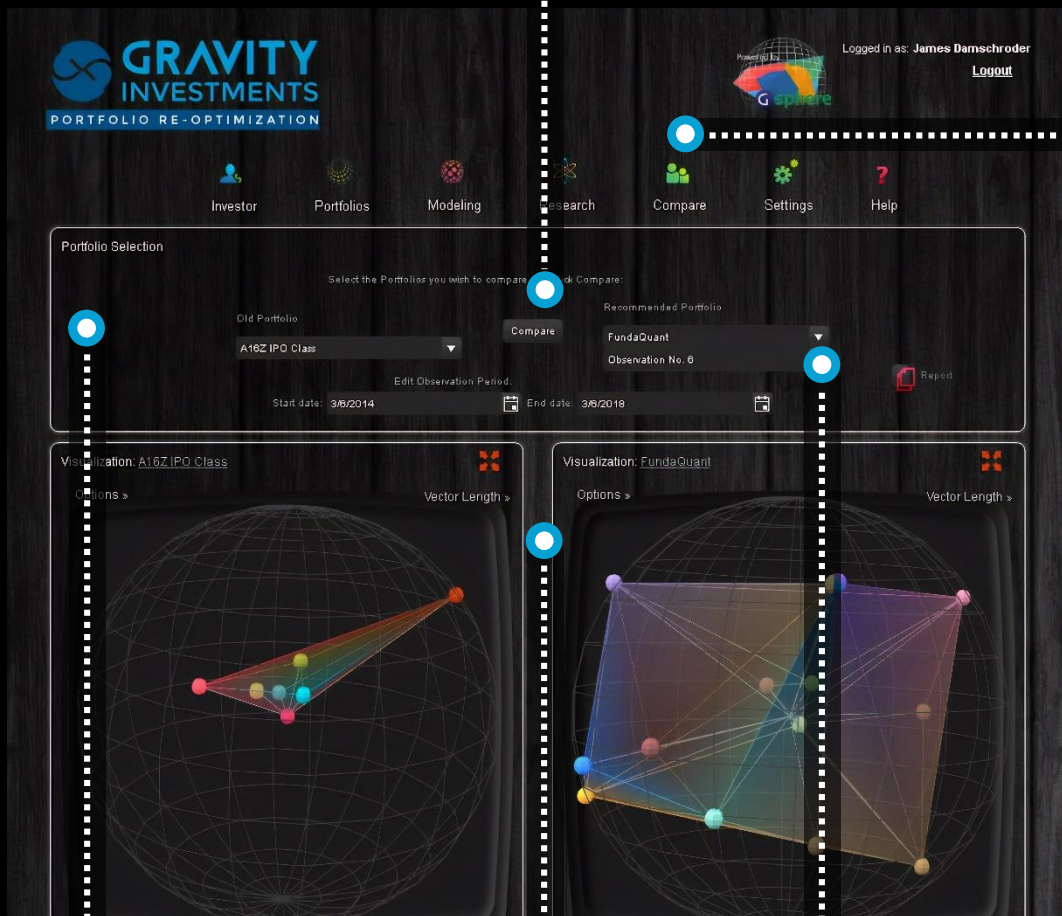
Select the portfolio to compare and adjust the data range if desired

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

Profit and Loss

Profit & Loss   Position Performance Chart

Legend: — Style Box model   — GCP DW Balanced Allocation Model
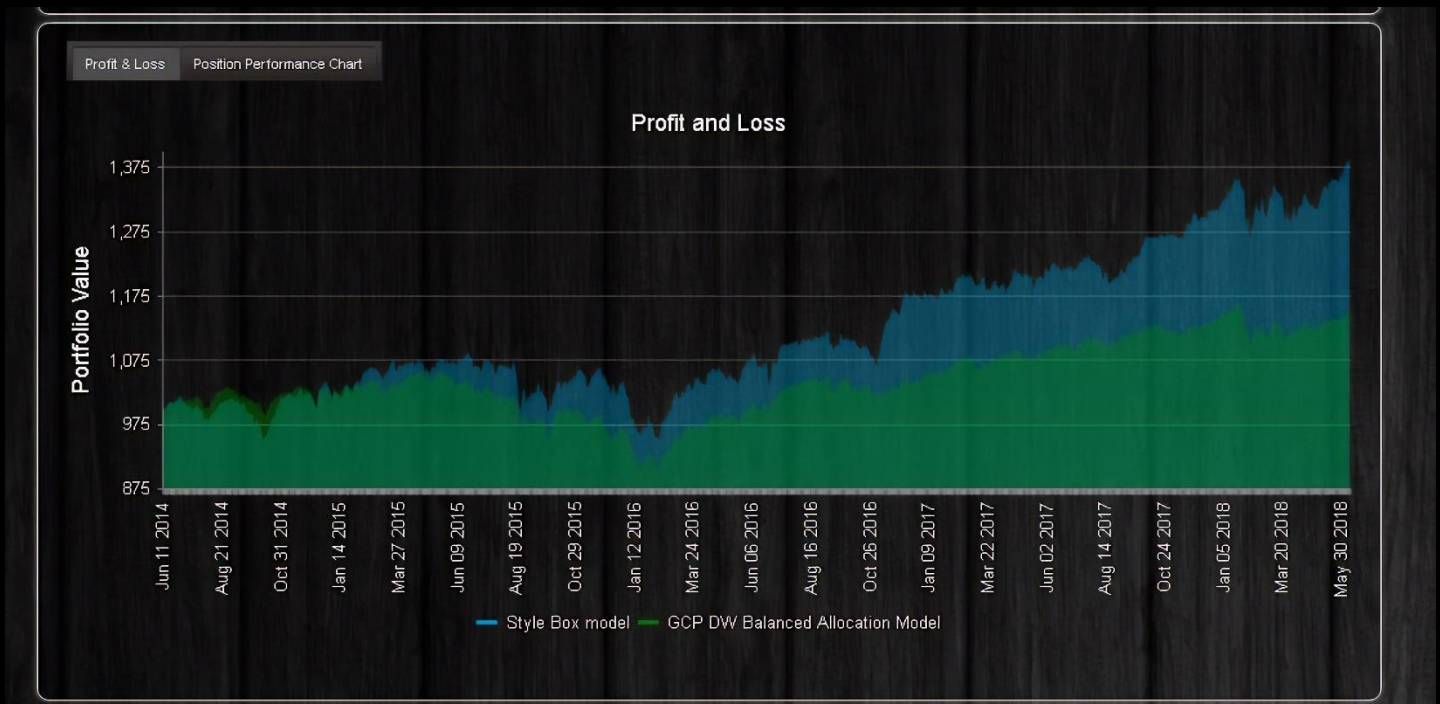
COMPARISON DIVERSIFICATION GAUGES

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

Diversification Dashboard:

Systematic Diversification   Internal   Idiosyncratic Diversification

Fiduciary Diversification

Diversification Dashboard:

Systematic Diversification   Internal   Idiosyncratic Diversification

Fiduciary Diversification

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
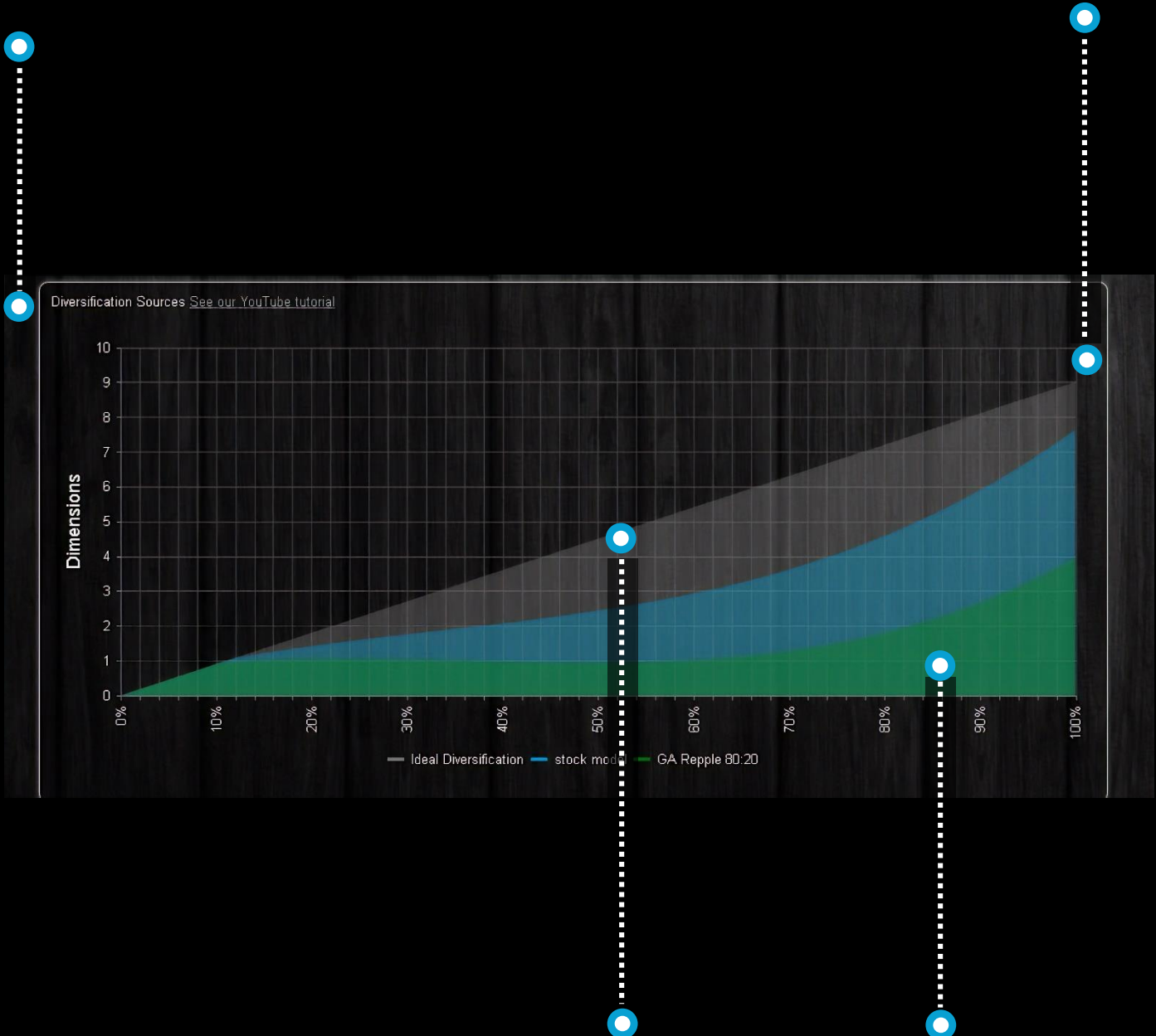
A linear increase is vastly superior to hyperbolic increase

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
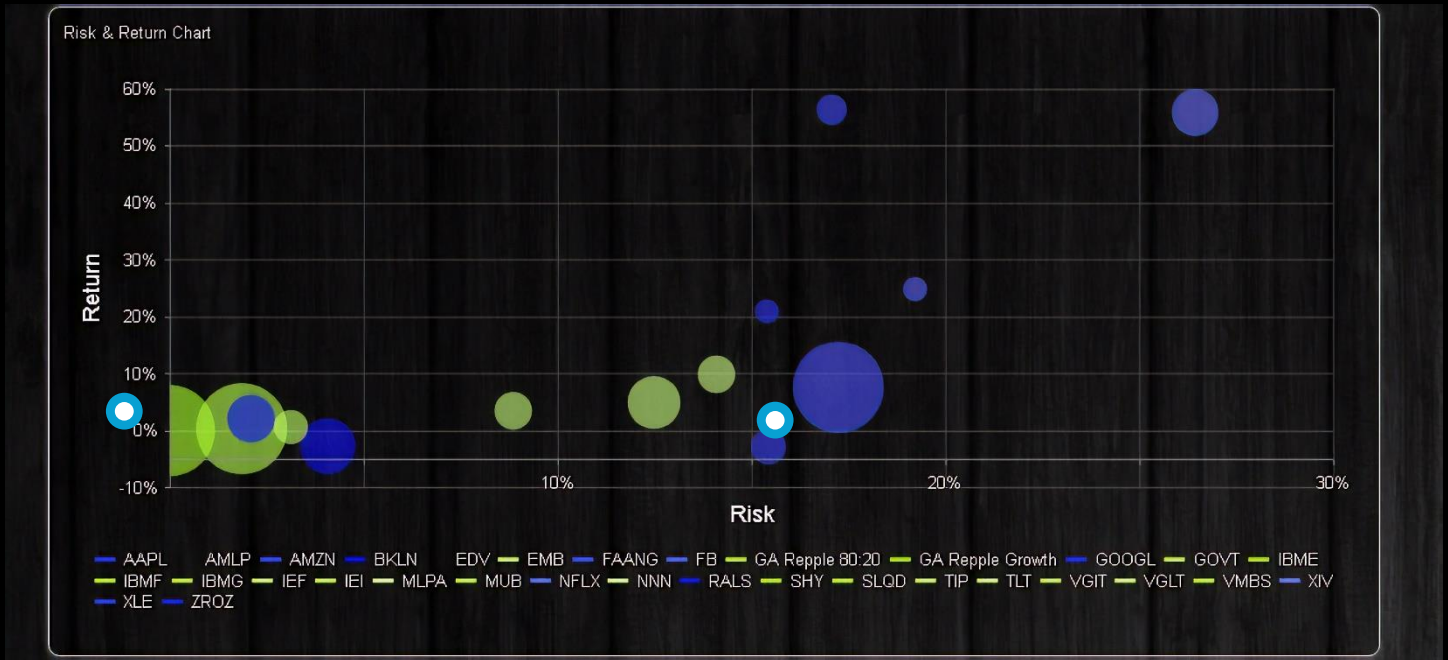
CONTACT

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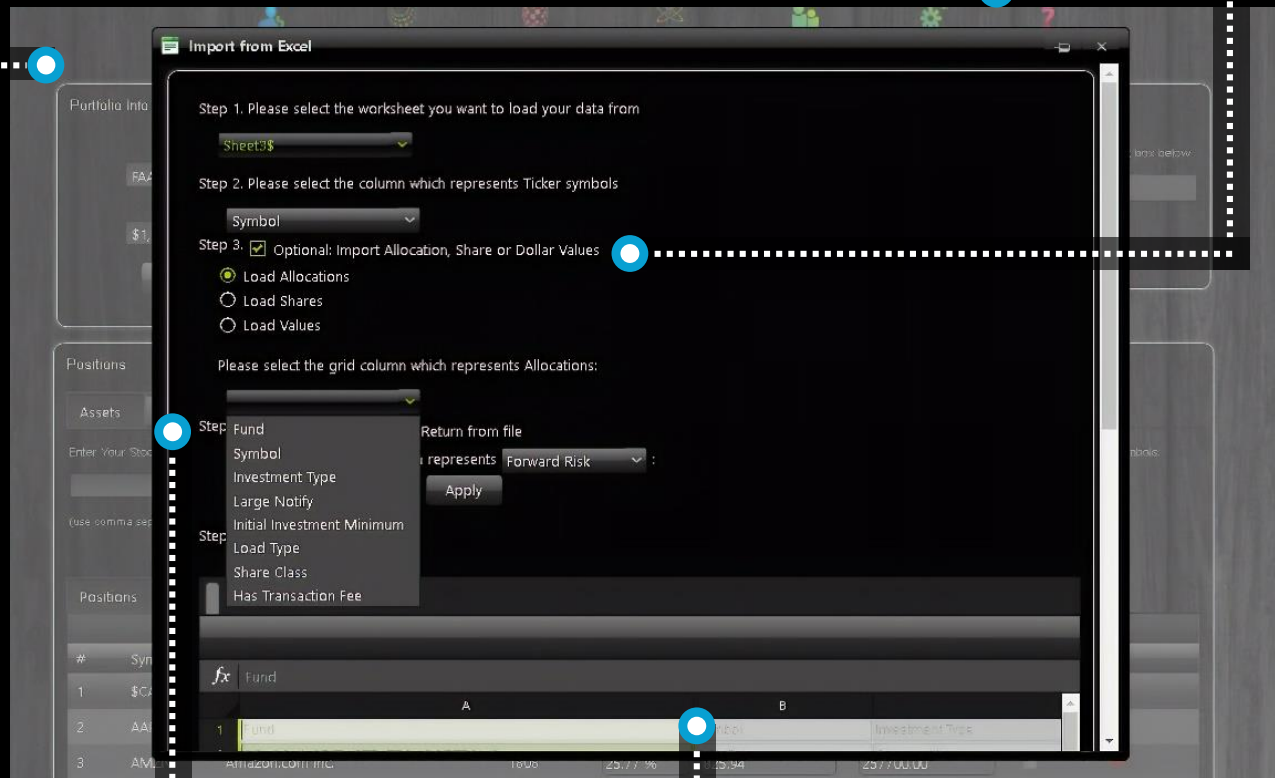
Each position is evaluated against each objective and multiplied by the investors preference

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

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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.

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

Logged in as: **James Damschroder**

Logout

GRAVITY INVESTMENTS
PORTFOLIO REOPTIMIZATION

Powered by

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

Support | Exchange Code Page | Glossary | Policies Description | Gravity Walk Forward Guide

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 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 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