

## Exceptional & Rich ® India 40 Style Simulations

### Sandbox

AlphaBlock's "open indexing" is a systematic, scientific, and replicable method, which is based on a mathematical innovation that allows for the construction of smart beta portfolios that are less concentrated, recover faster after a market fall and improve on the limitations of the current indexing methods. The Exceptional & Rich [E&R] Indices Sandbox is a codebase that executes the following three steps. First; downloads yahoo EOD [end of day] closing price data. Second; generates relative performance rankings [detailed in the codebase]. Third; creates portfolios using these rankings. The portfolios are not rebalanced and are held for 3 holding periods [1, 2, and 3 years].

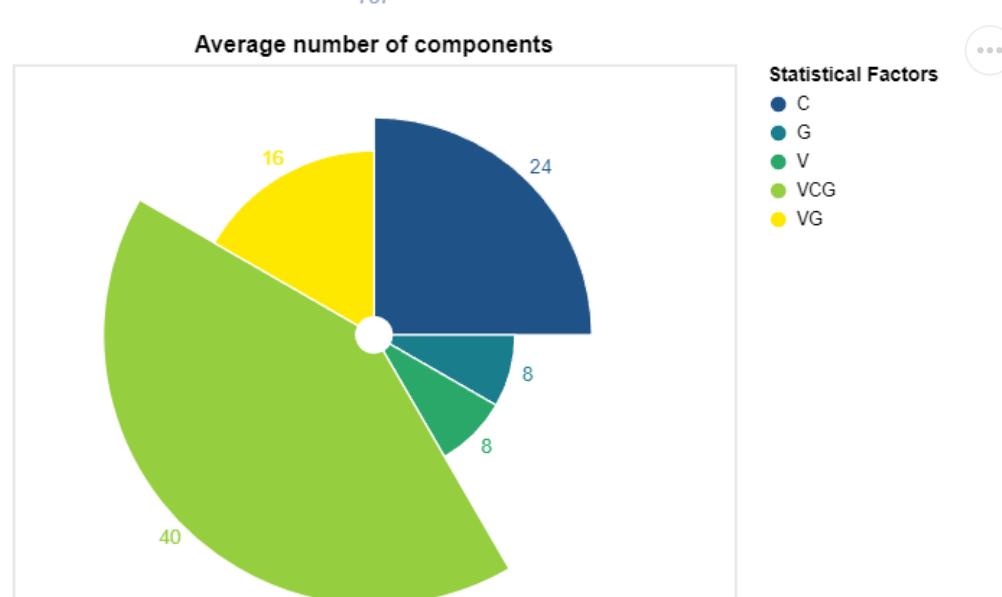
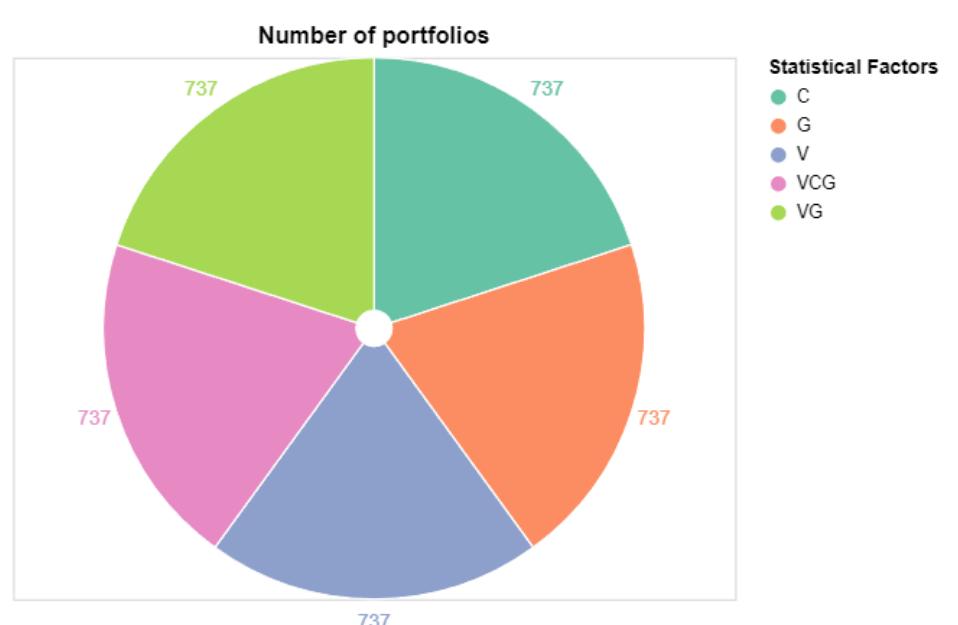
The method tests the following statistical factors. Value - if ranking is equal or below 20 i.e. bottom quintile [V]. Core - if ranking is between 20 and 80 i.e. rest quintiles ignoring top and bottom quintile [C]. Growth - if ranking is equal or above 80 i.e. top quintile [G]. The following types of portfolios are generated: Value [V], Core [C], Growth[G], Value Growth i.e. top and bottom quintile [VG], All quintiles [VCG]. Based on this data the following files are created: Summary Table, Index Drawdown, Index Draw DownCurve plot, and Daily Return. If the input type is All (VCG) the code will generate an unequal weighted portfolio with value and growth having 40% each and core only 20%.

Though the idealized expression of the 3N methodology is stable across different regions, assets and domains, on occasions, the behaviour of respective styles may diverge from their idealized behaviour. These divergences are function of region, basket size, starting point of the simulation, macro economic conditions, fundamental factors and other extraneous influences. We use A.I. to monitor and anticipate these divergences to enhance our Index funds.

### 1: Input Data

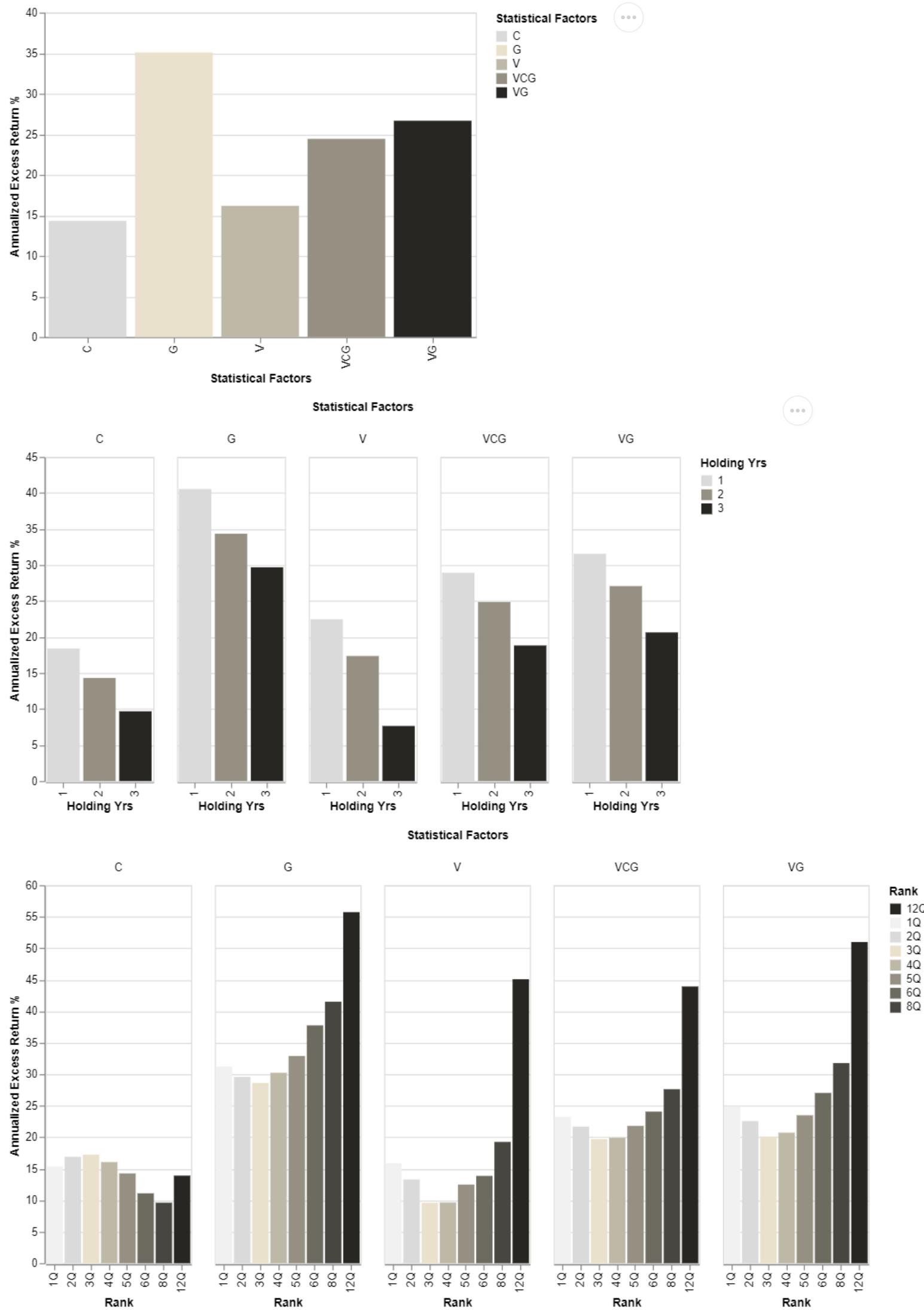
Input data defines the Exceptional & Rich Model, benchmark, inception point, number of components and the number of simulations run.

Group name	Benchmark	Total number of portfolios	Number of components	Portfolios starting year
Exceptional & Rich India 40	BSE 100	3685	40	2016



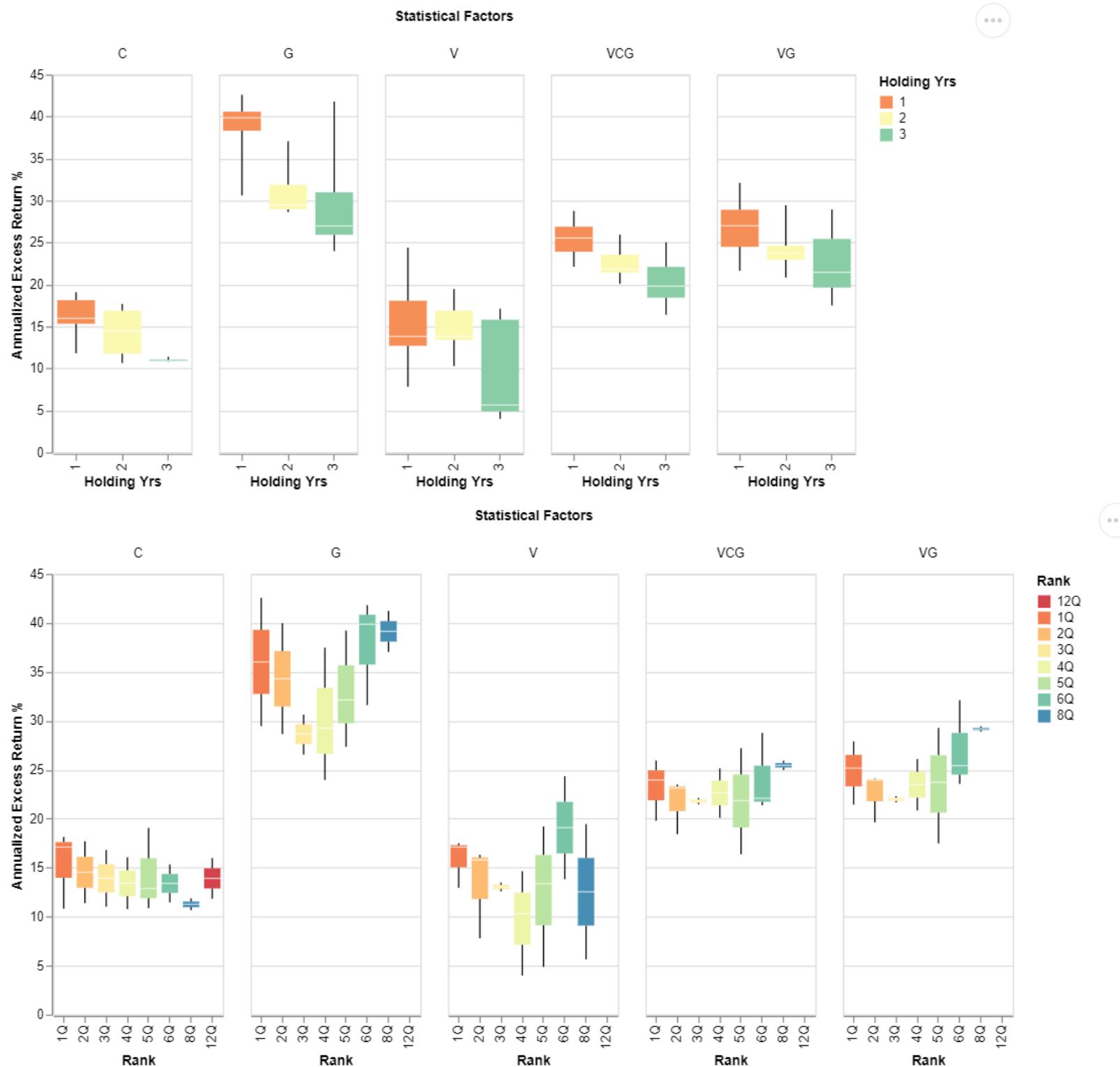
## 2: Average Annualized Excess Return Histograms for Various Factors

The histogram illustrates the average Annualized Excess Returns for the various statistical factors, across the three different holding periods and for the respective quarterly proxy ranking periods.



### 3: Quartile BoxPlots for Annualized Excess Returns

The Boxplots show minimum, first quartile, median, third quartile, and maximum annualized Excess Return for various statistical factors, for different holding periods, and for the respective quarterly proxy rankings. The outliers were removed from the data.

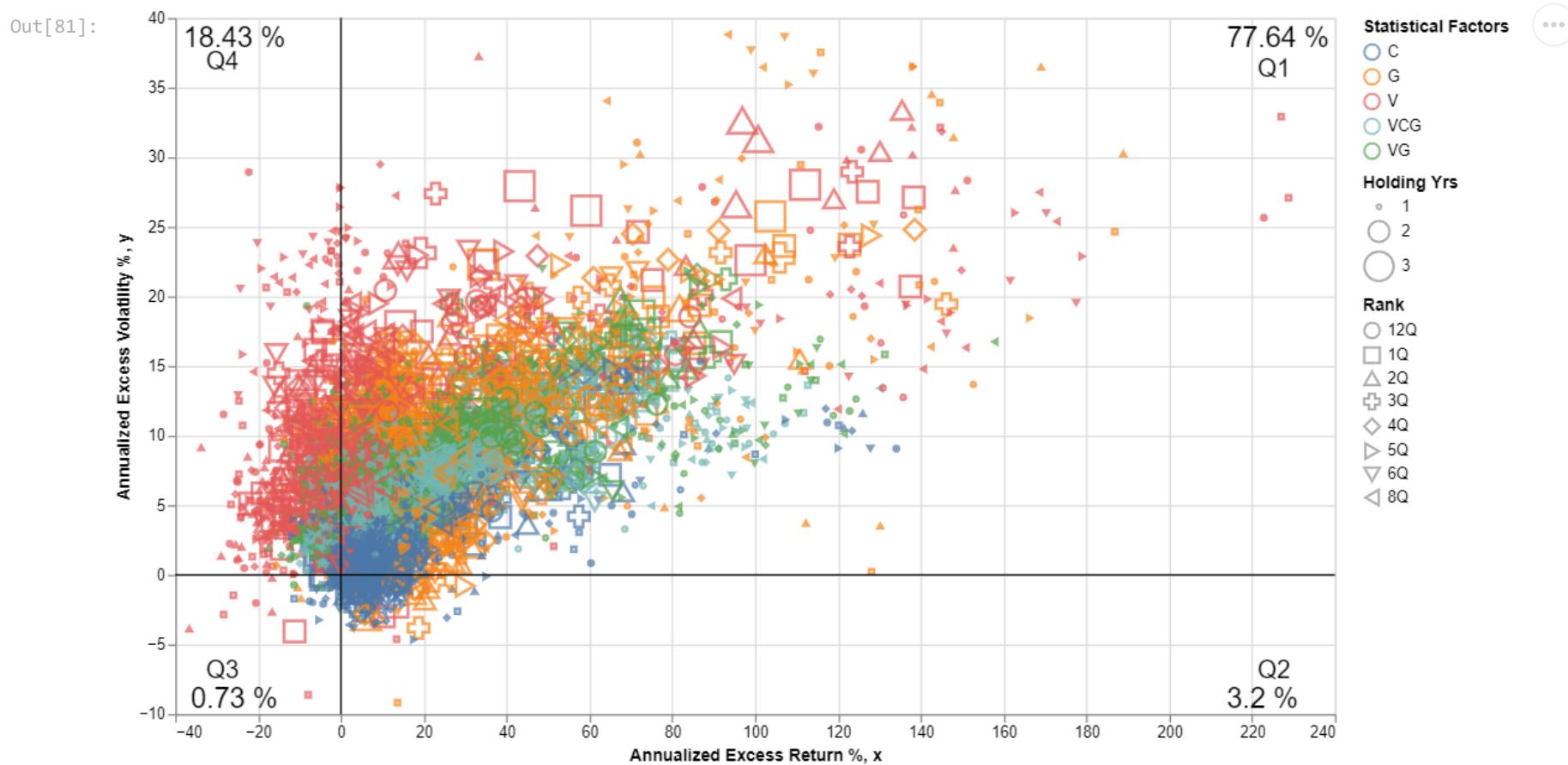


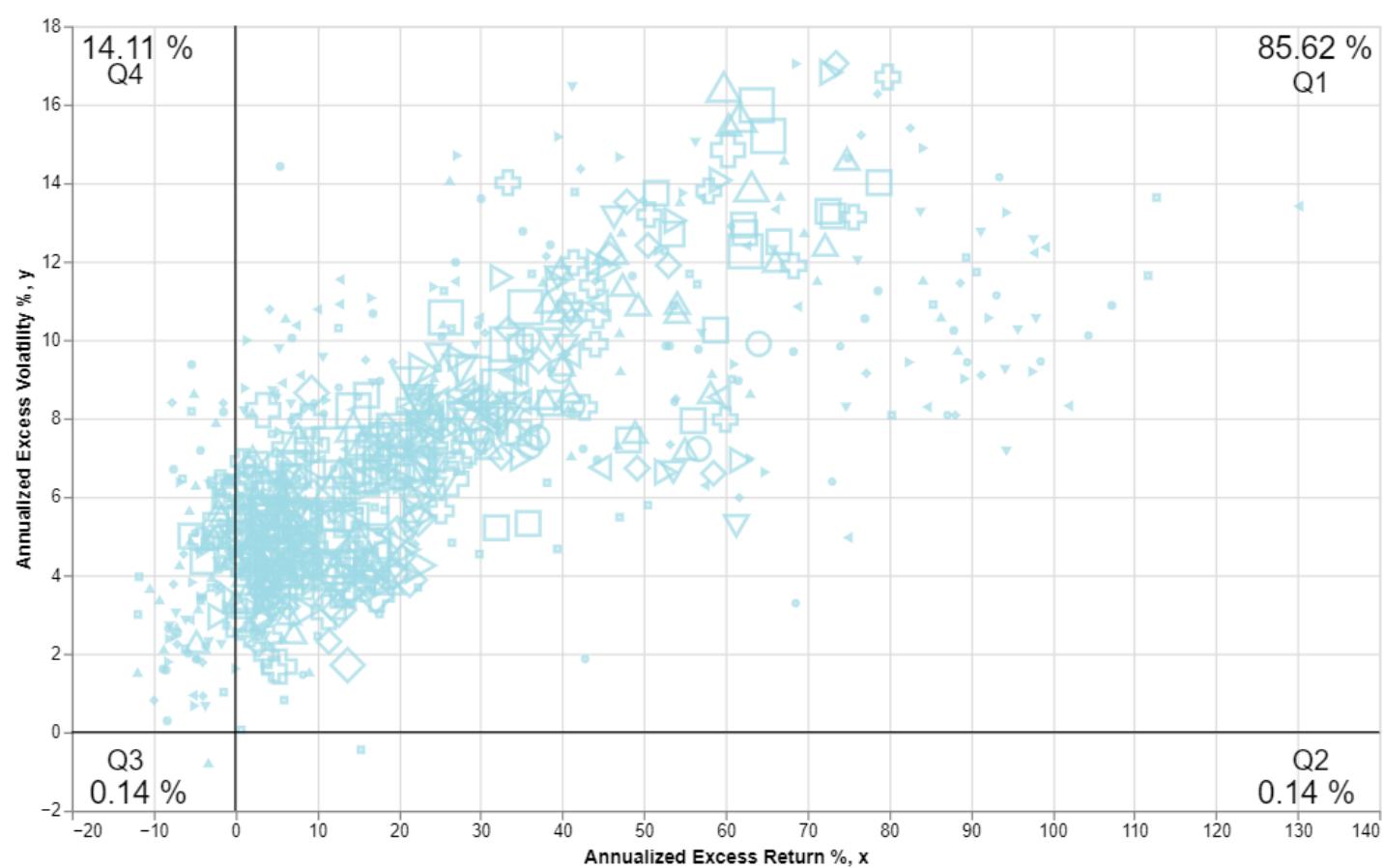
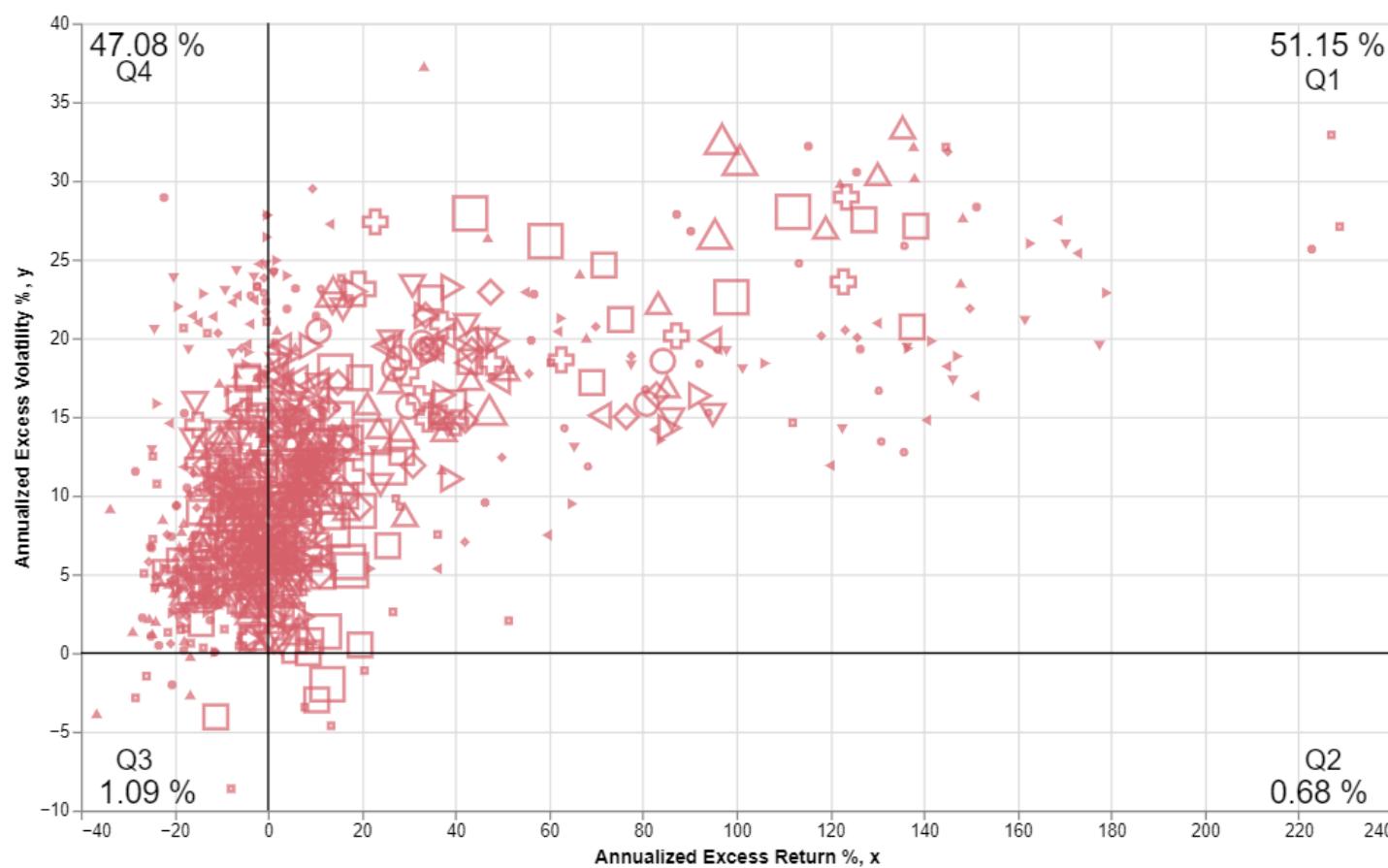
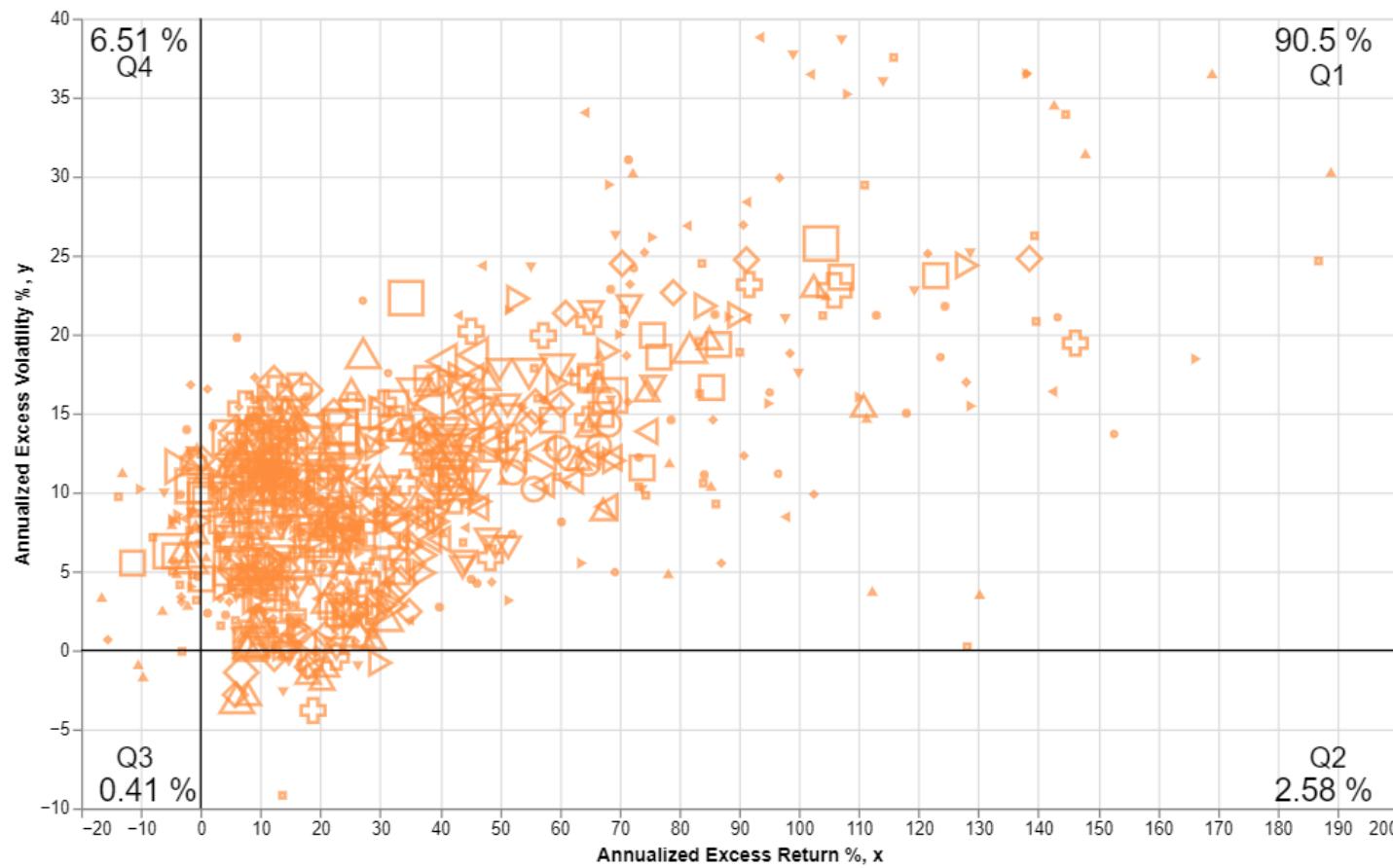
## 4: Cartesian Plots for various Statistical Measures

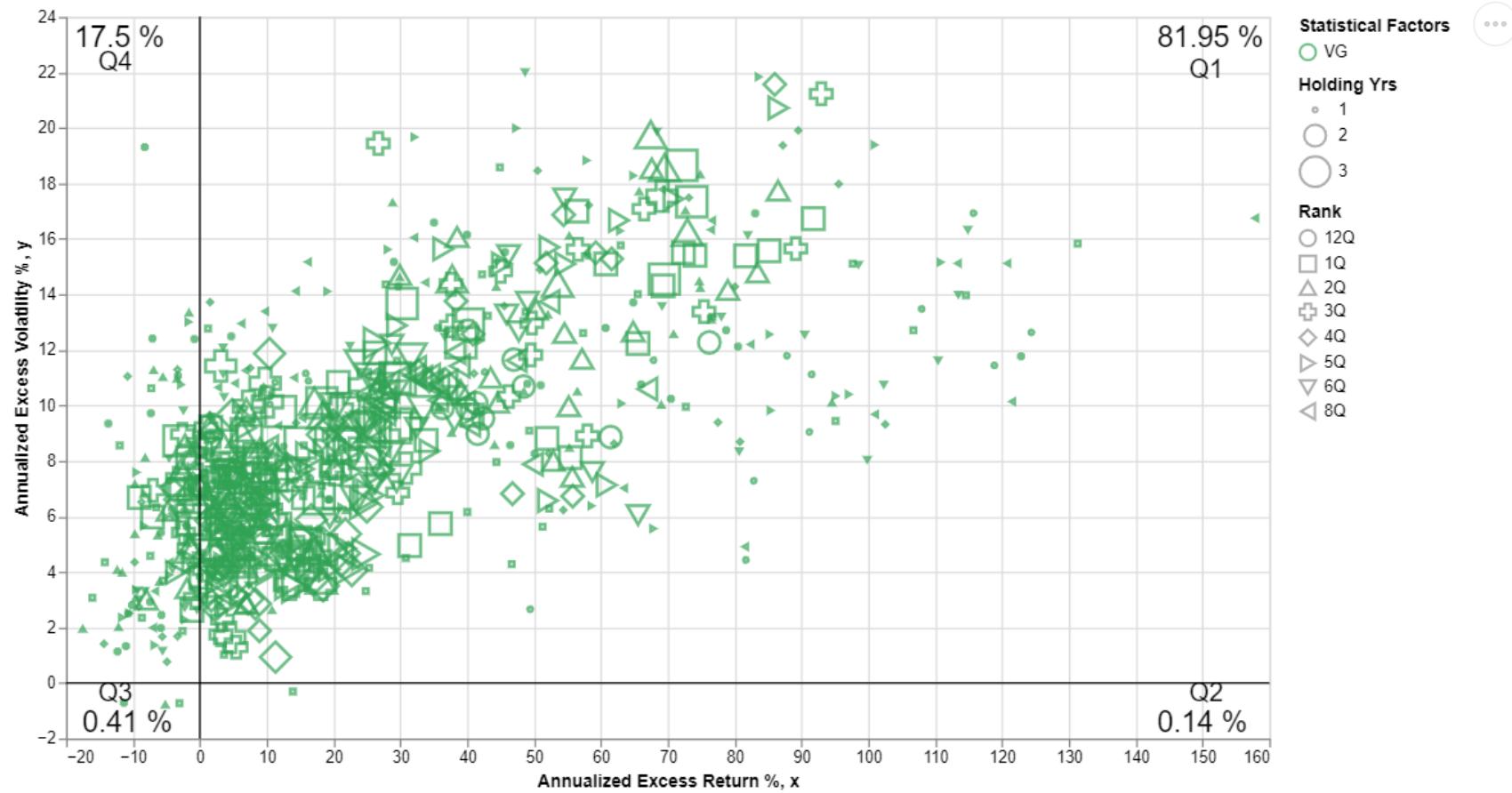
The Cartesian plots below illustrate Annualized Excess Returns vs. Annualized Excess Volatility, Information Ratio vs. Annualized Excess Returns, Annualized Excess Volatility vs. Information Ratio, Alpha vs. Beta and Tracking Error vs Information Ratio plotted for different statistical factors, for different holding periods and for respective quarterly proxy rankings.

### 4.1: Annualized Excess Return vs. Annualized Excess Volatility

The Cartesian chart of Annualized Excess Return vs. Annualized Excess Volatility plotted for different statistical factors, for different holding periods and for respective quarterly proxy rankings.

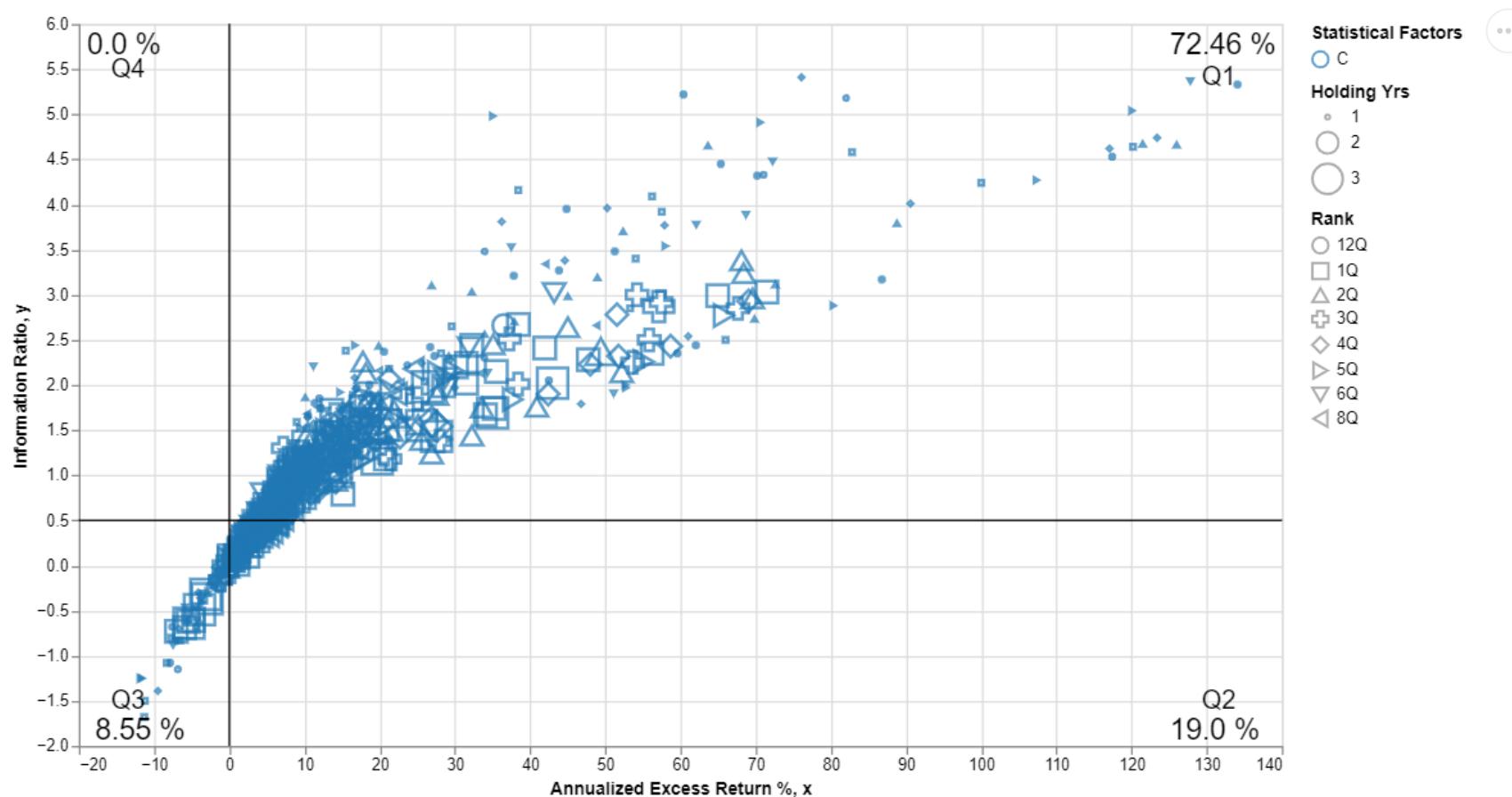
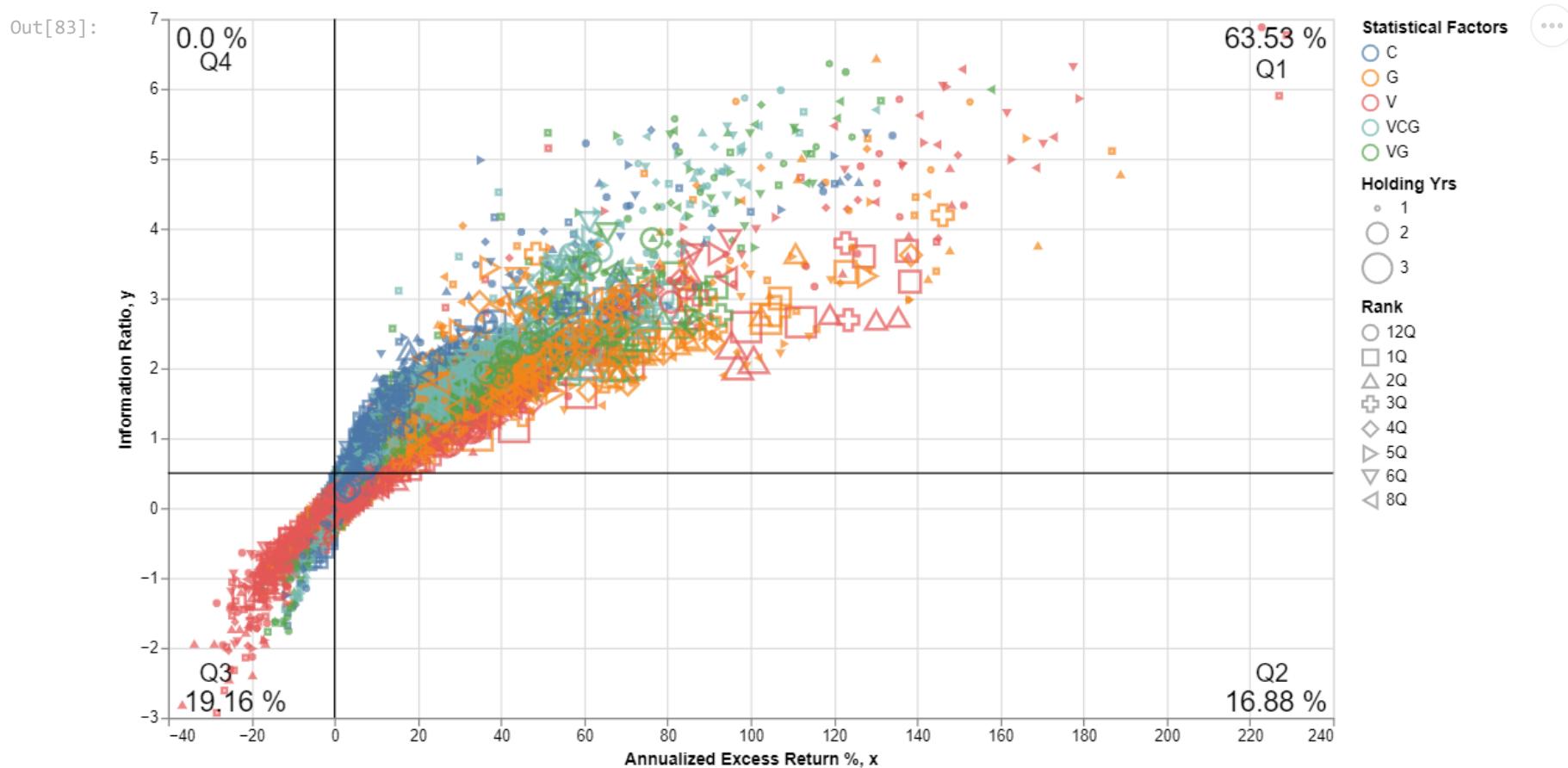


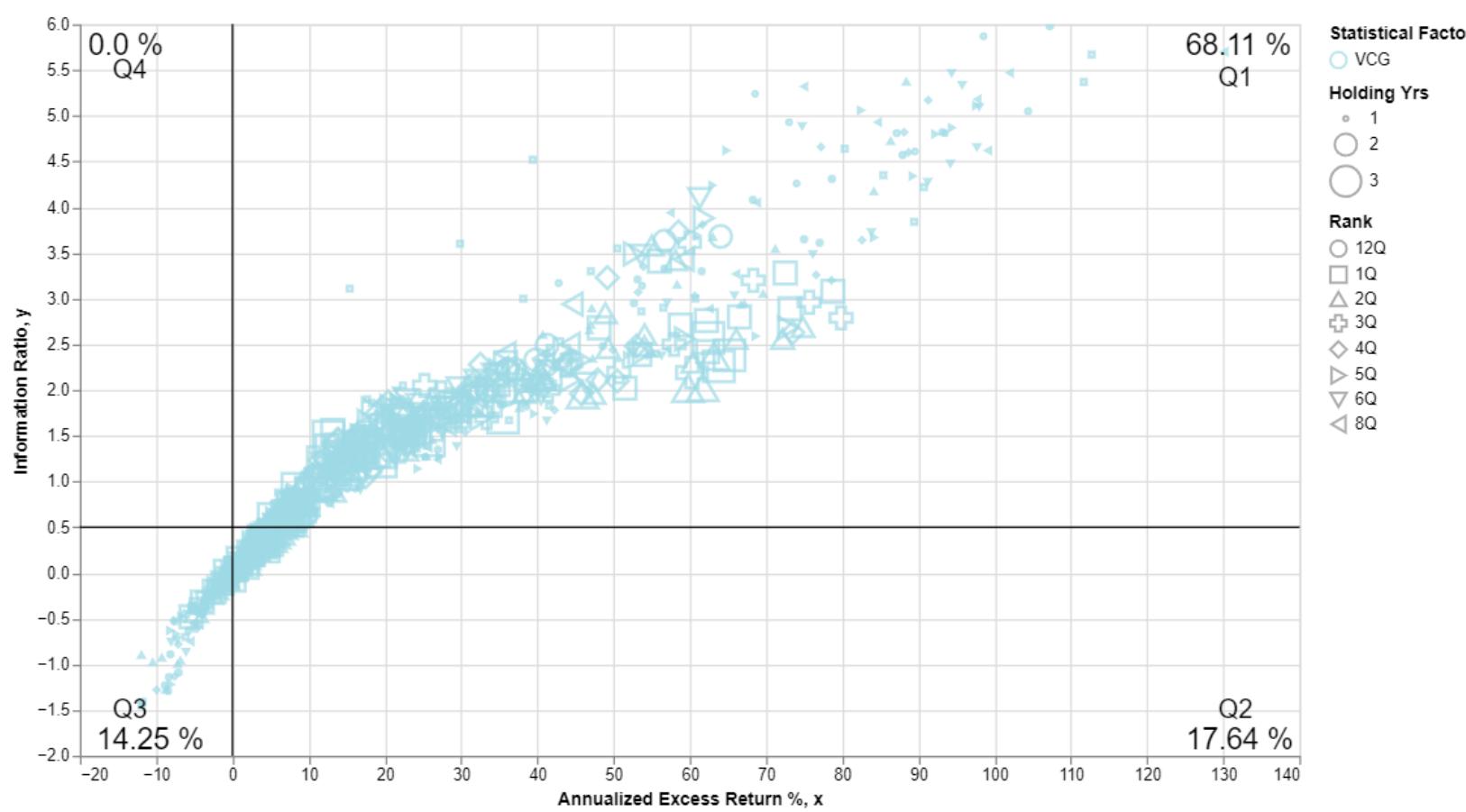
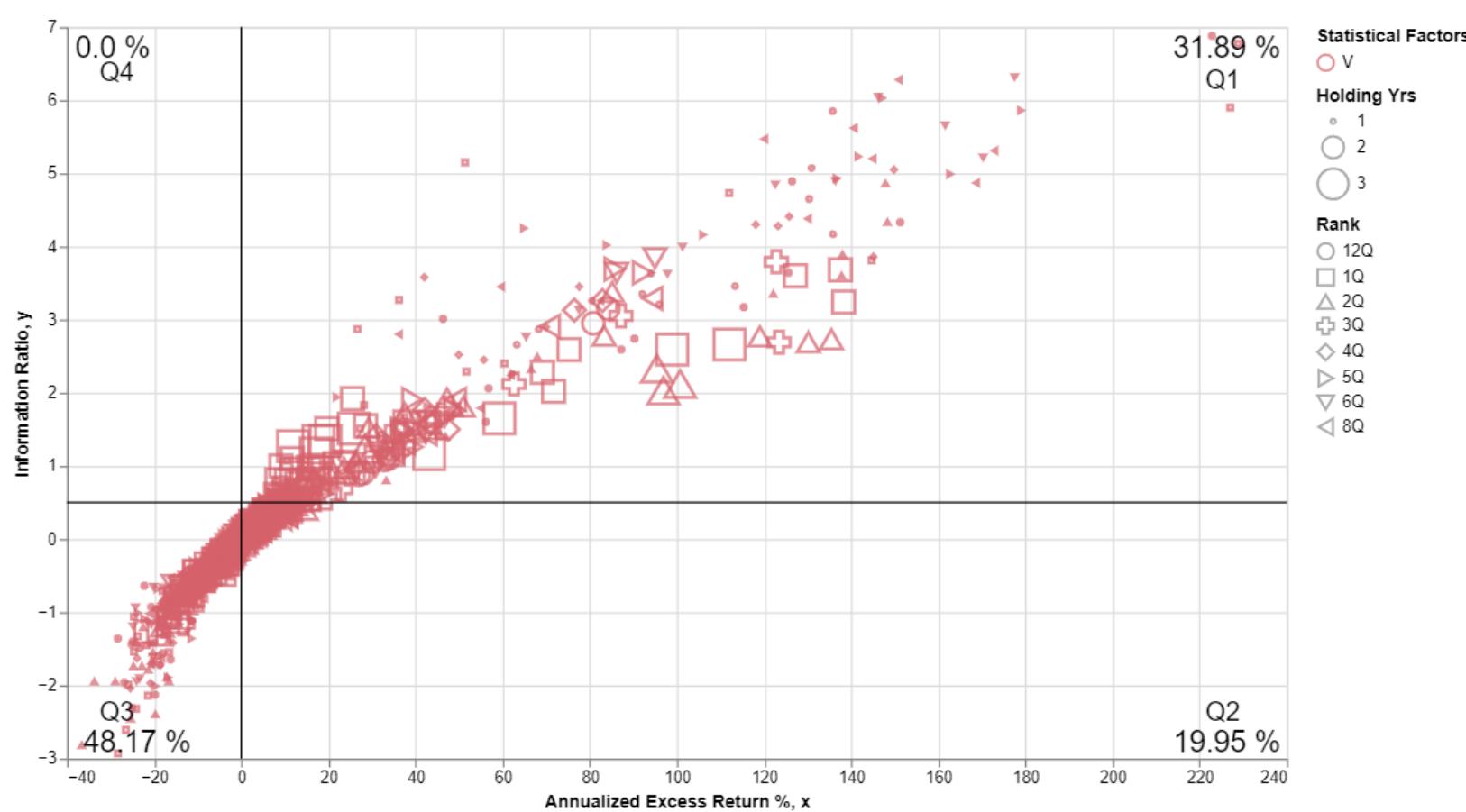
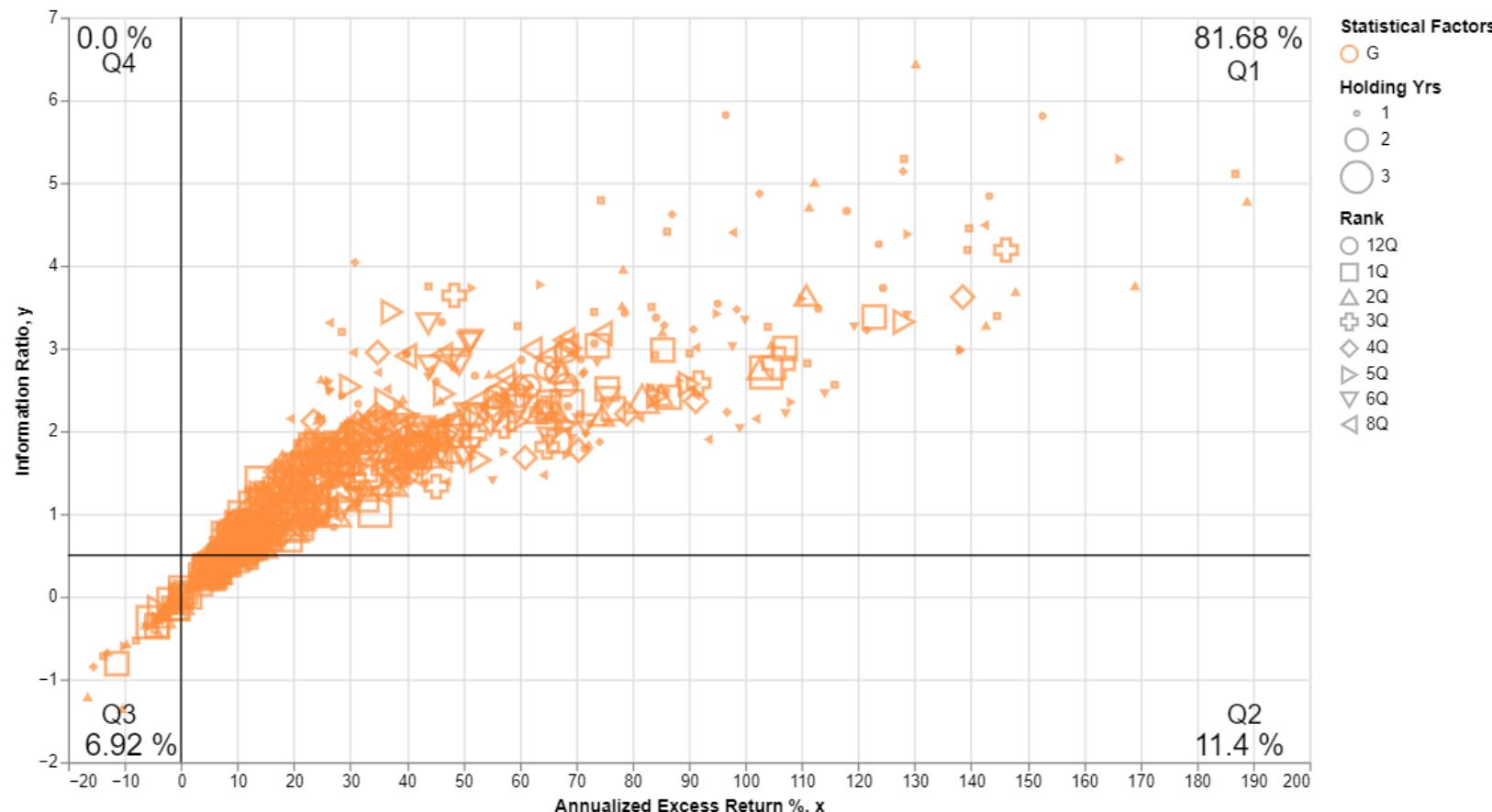


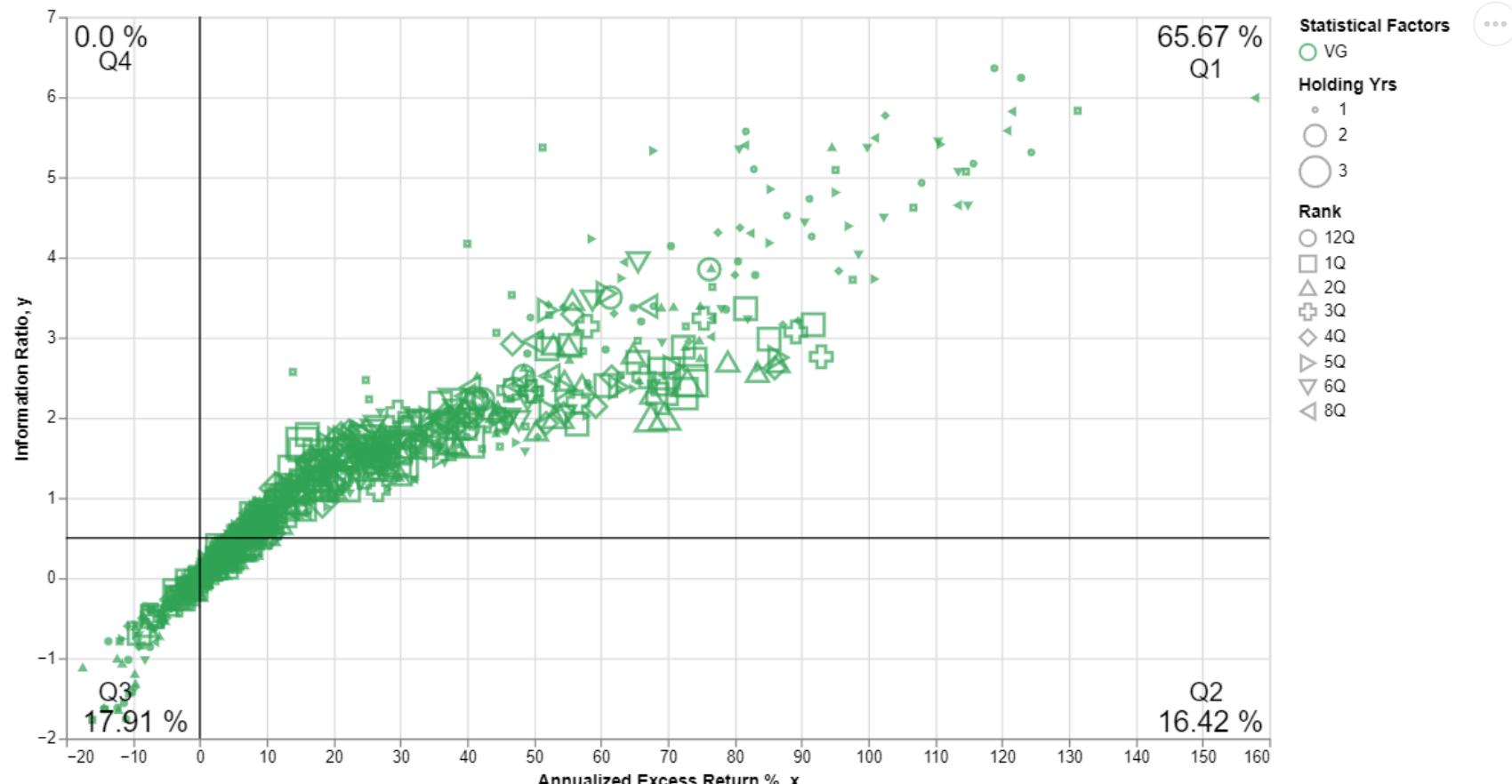


#### 4.2: Annualized Excess Return vs. Information Ratio

The Cartesian chart of Annualized Excess Return vs. Information Ratio plotted for different statistical factors, for different holding periods and for respective quarterly proxy rankings.

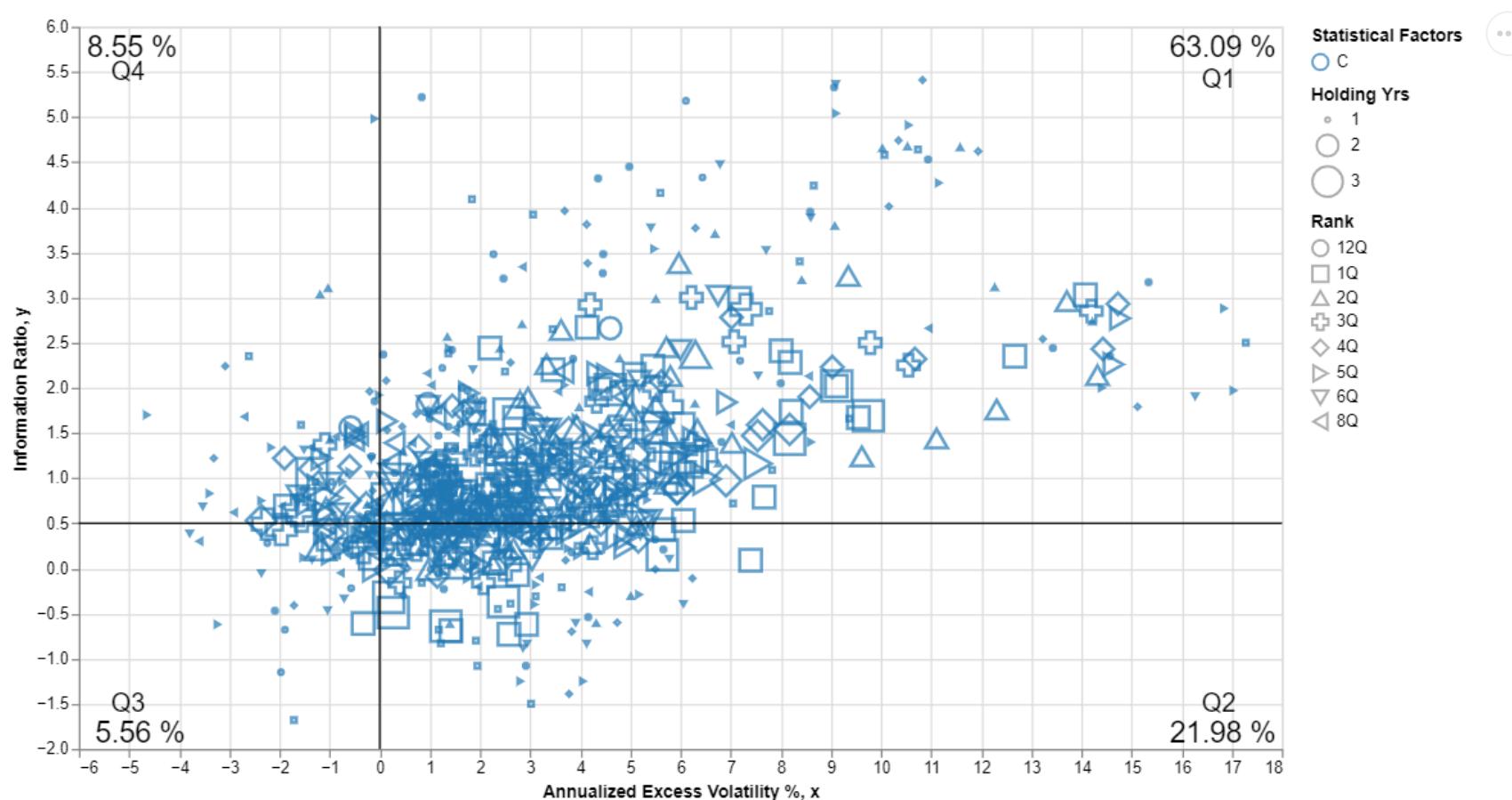
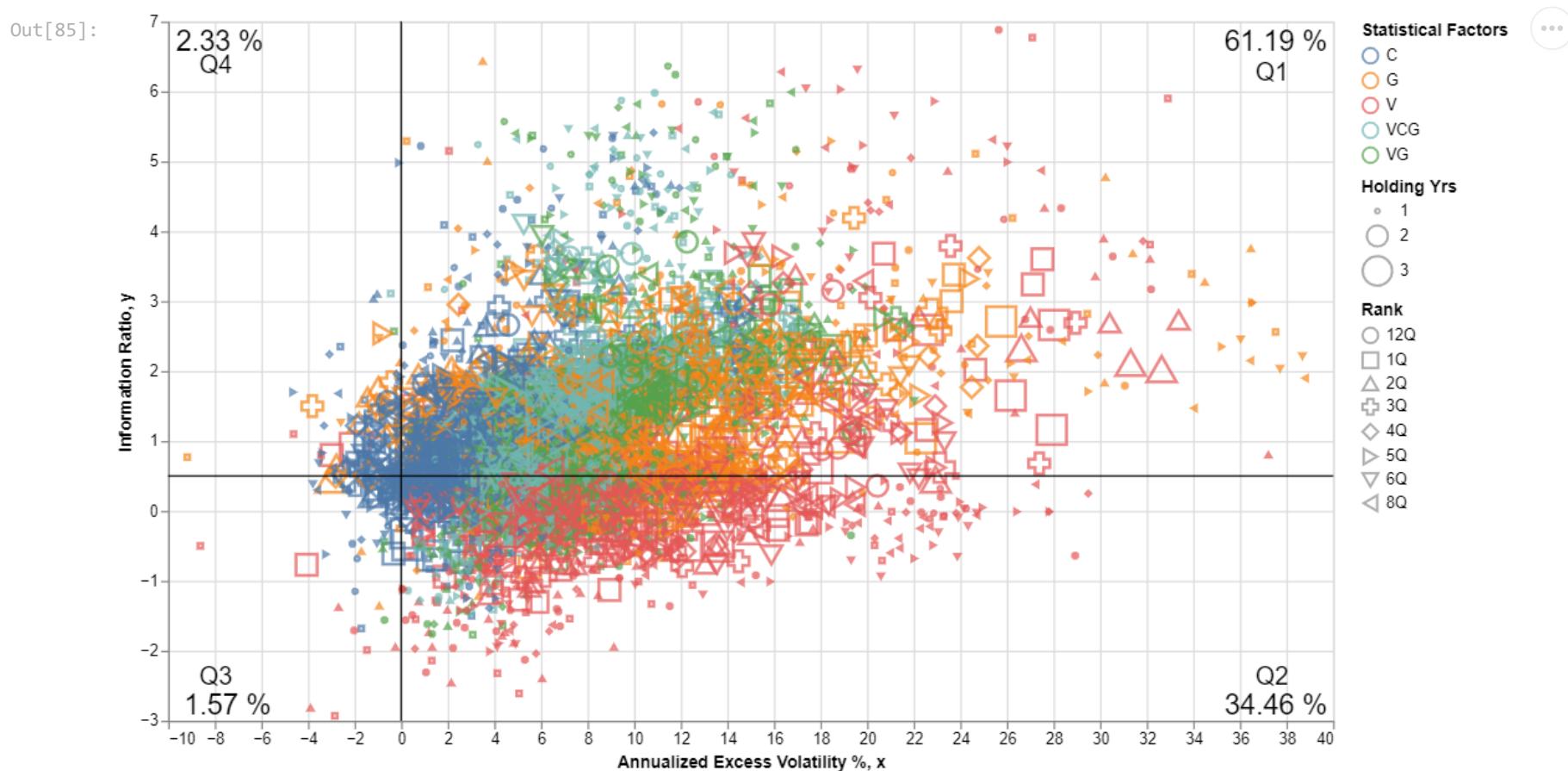


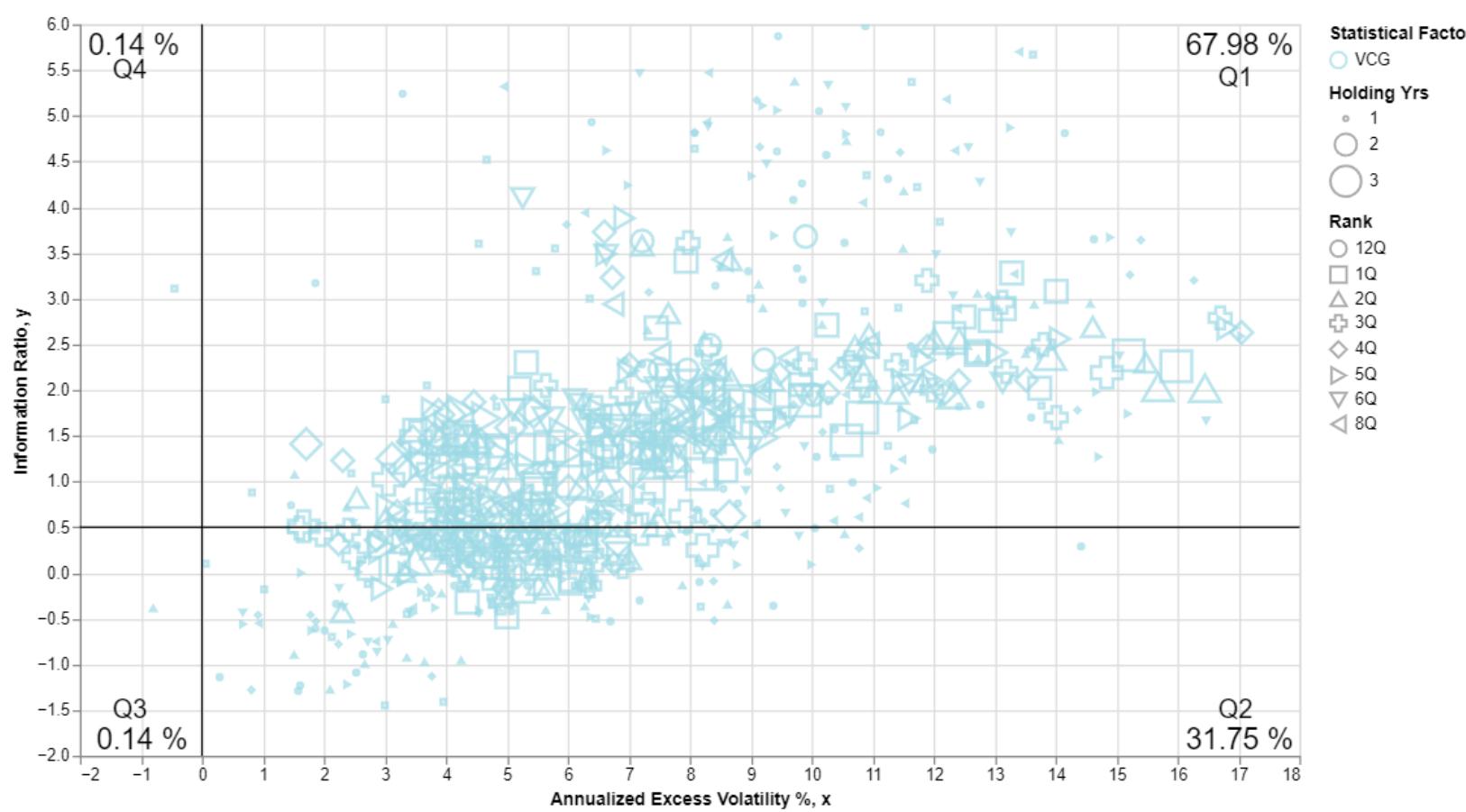
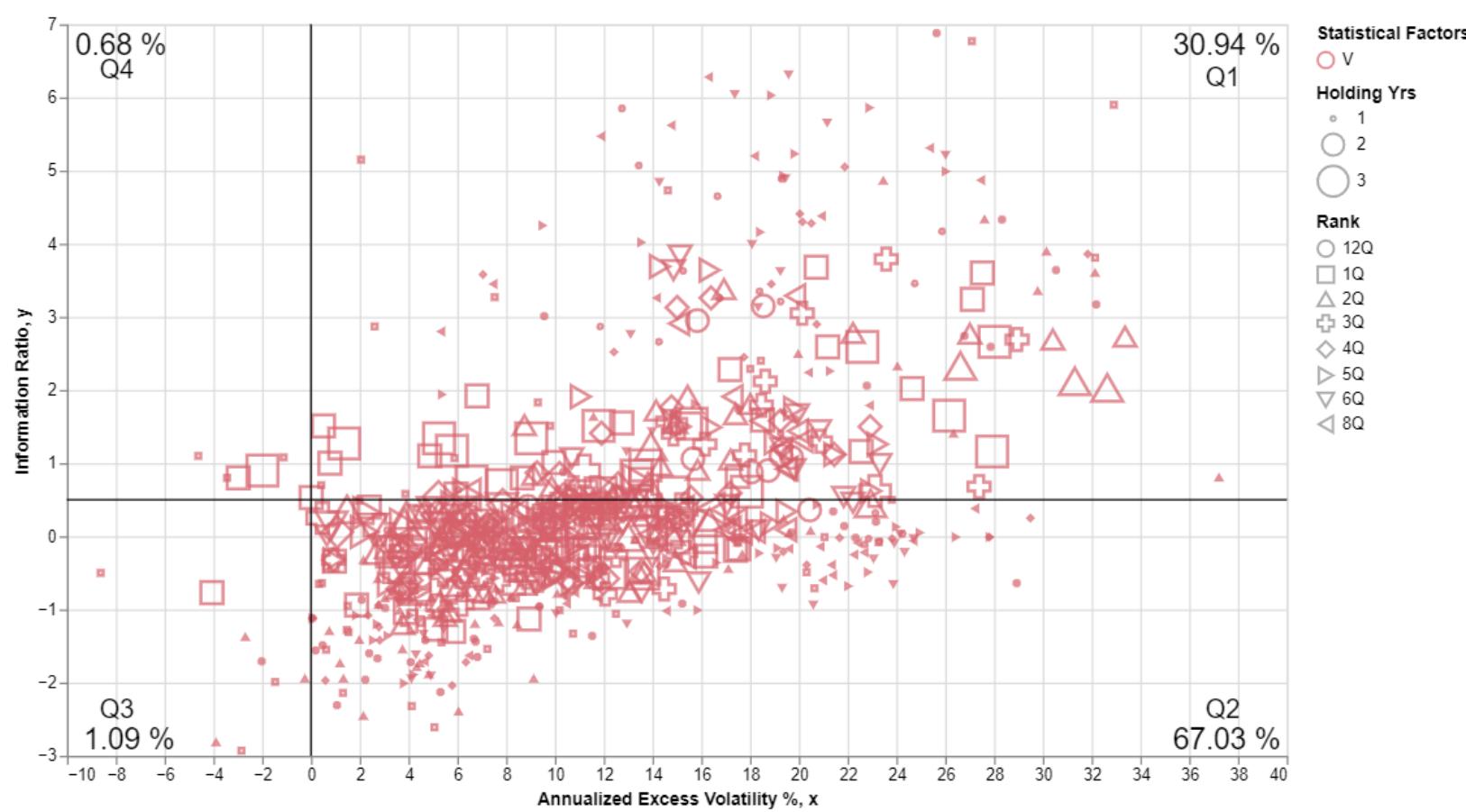
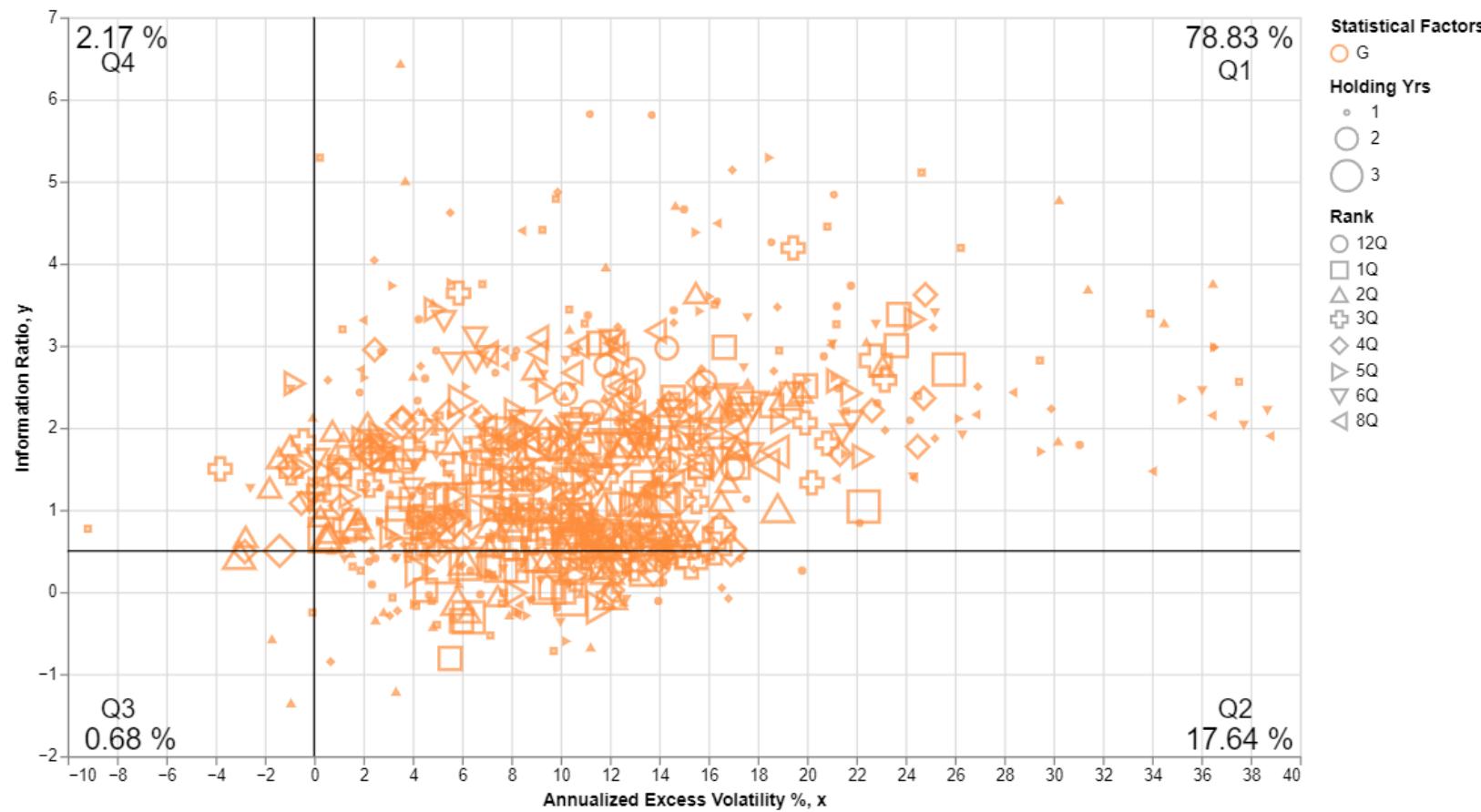


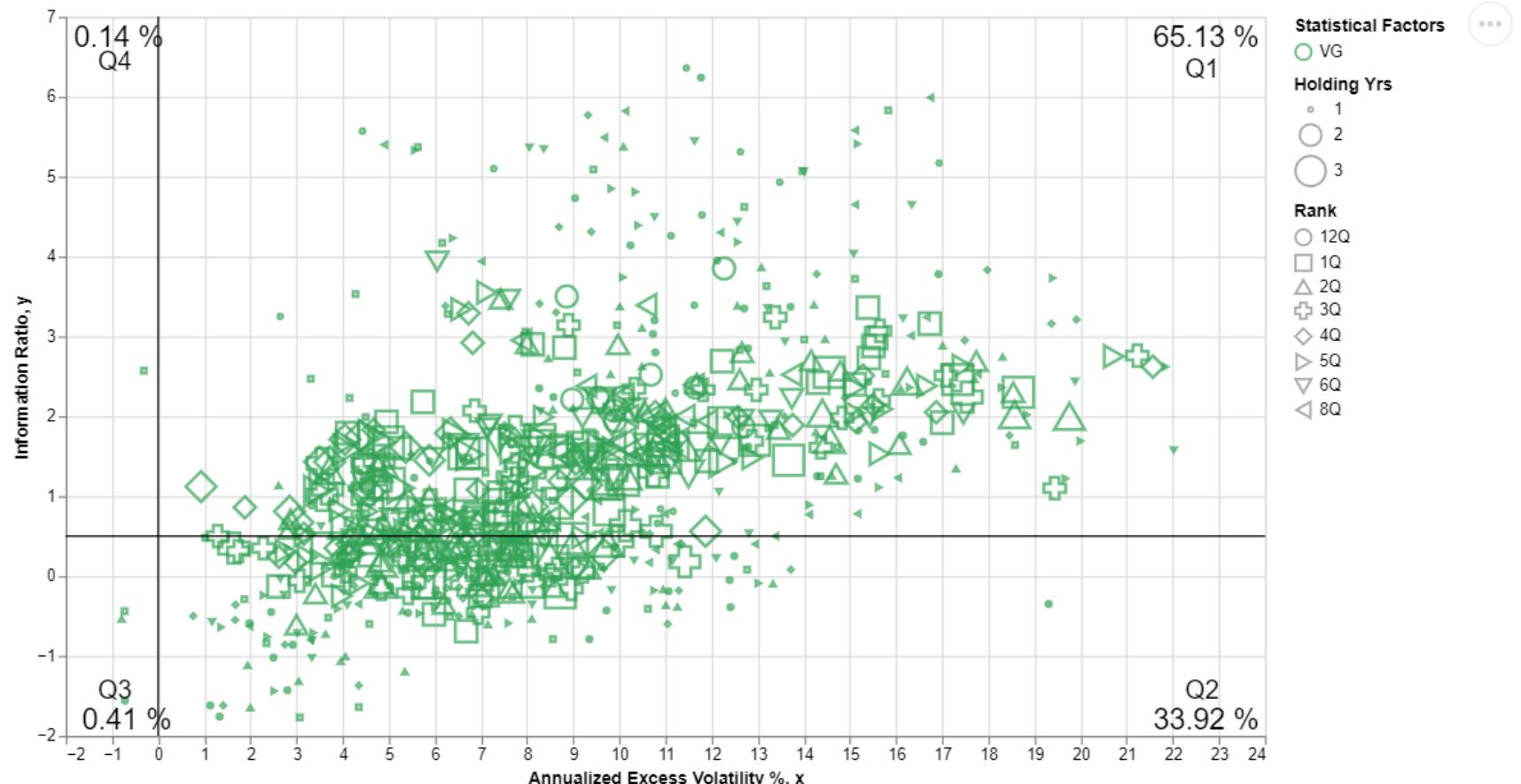


#### 4.3: Annualized Excess Volatility vs. Information Ratio

The Cartesian chart of Annualized Excess Volatility vs. Information Ratio plotted for different statistical factors, for different holding periods and for respective quarterly proxy rankings.

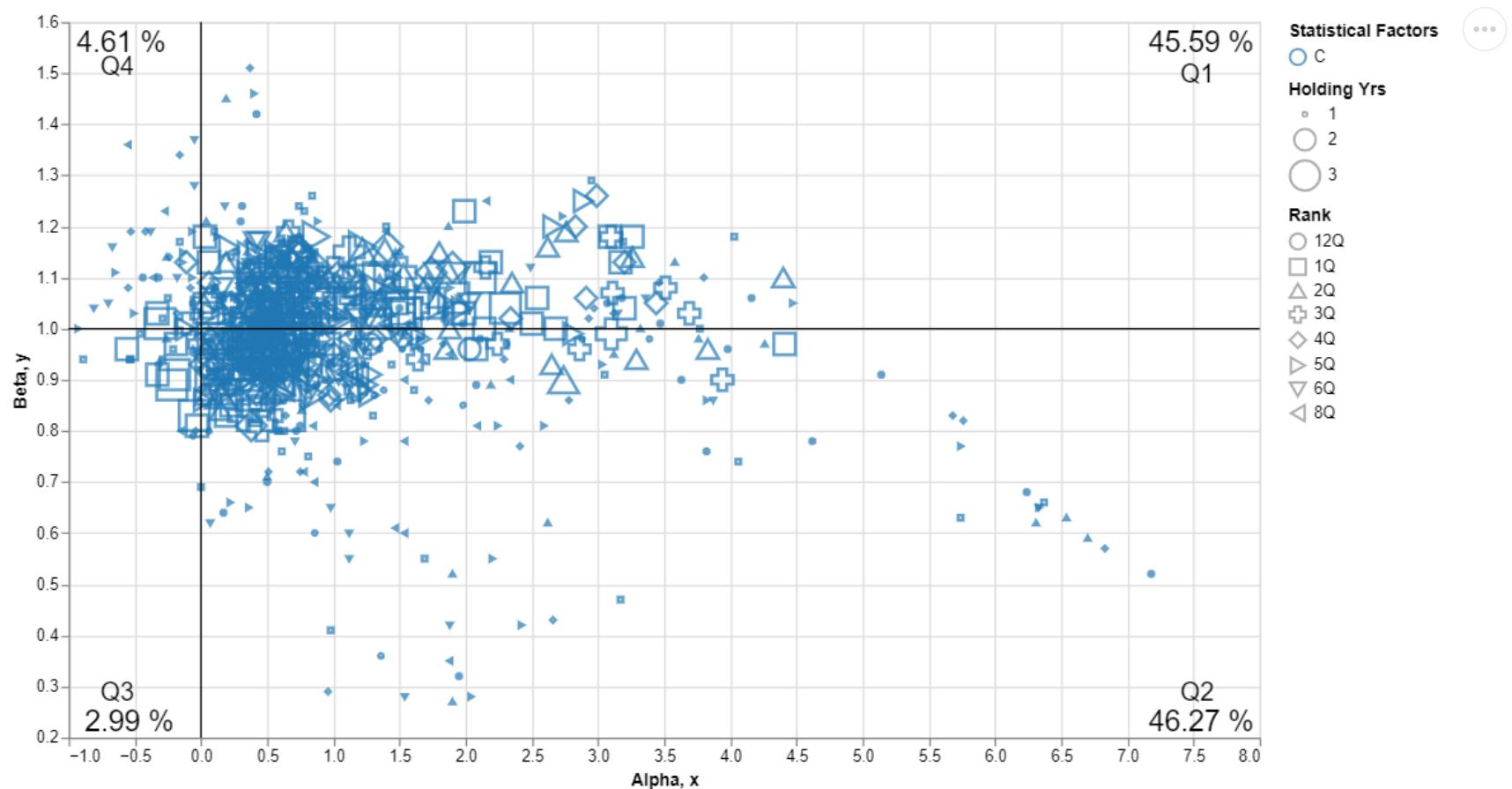
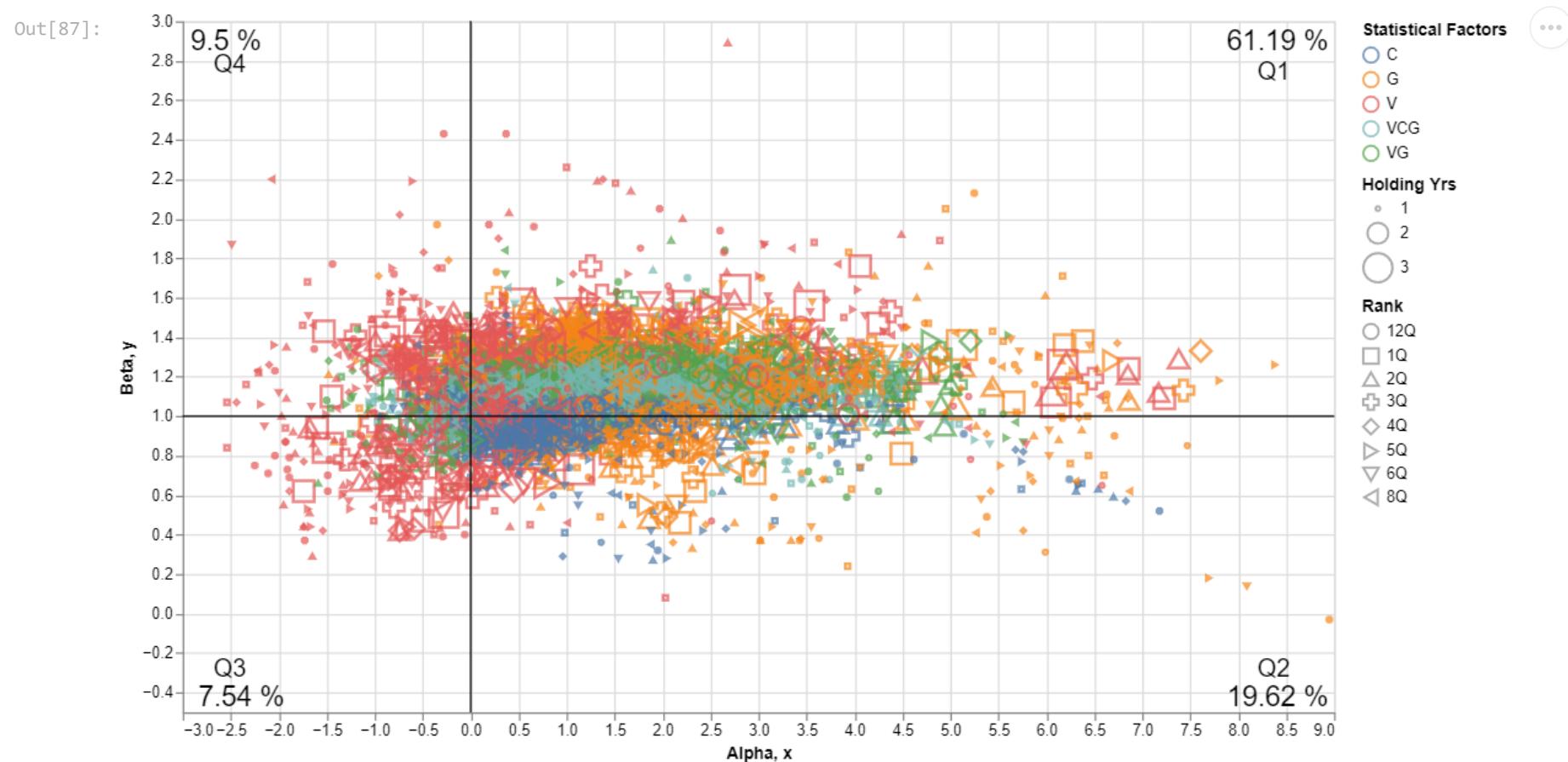


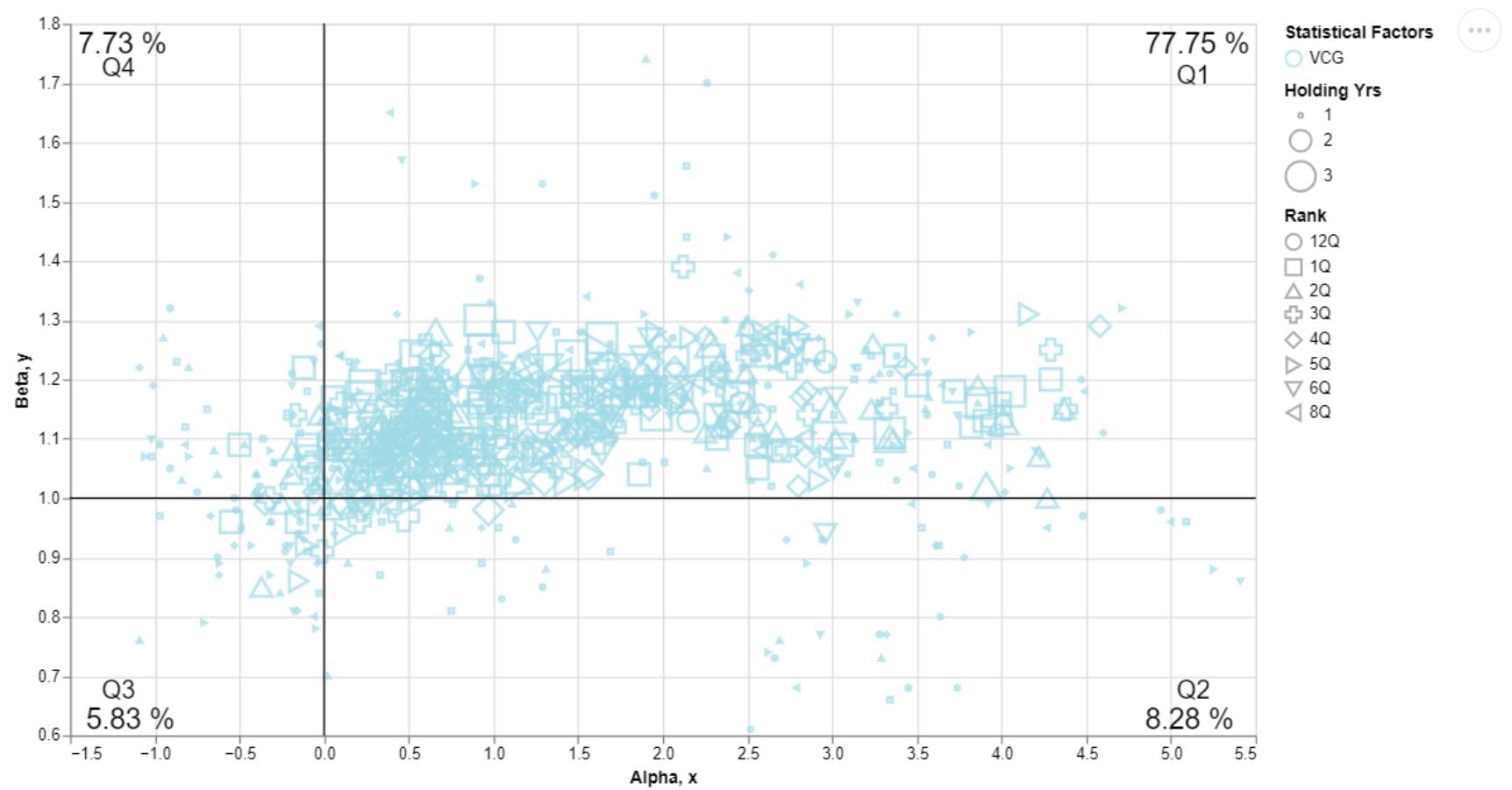
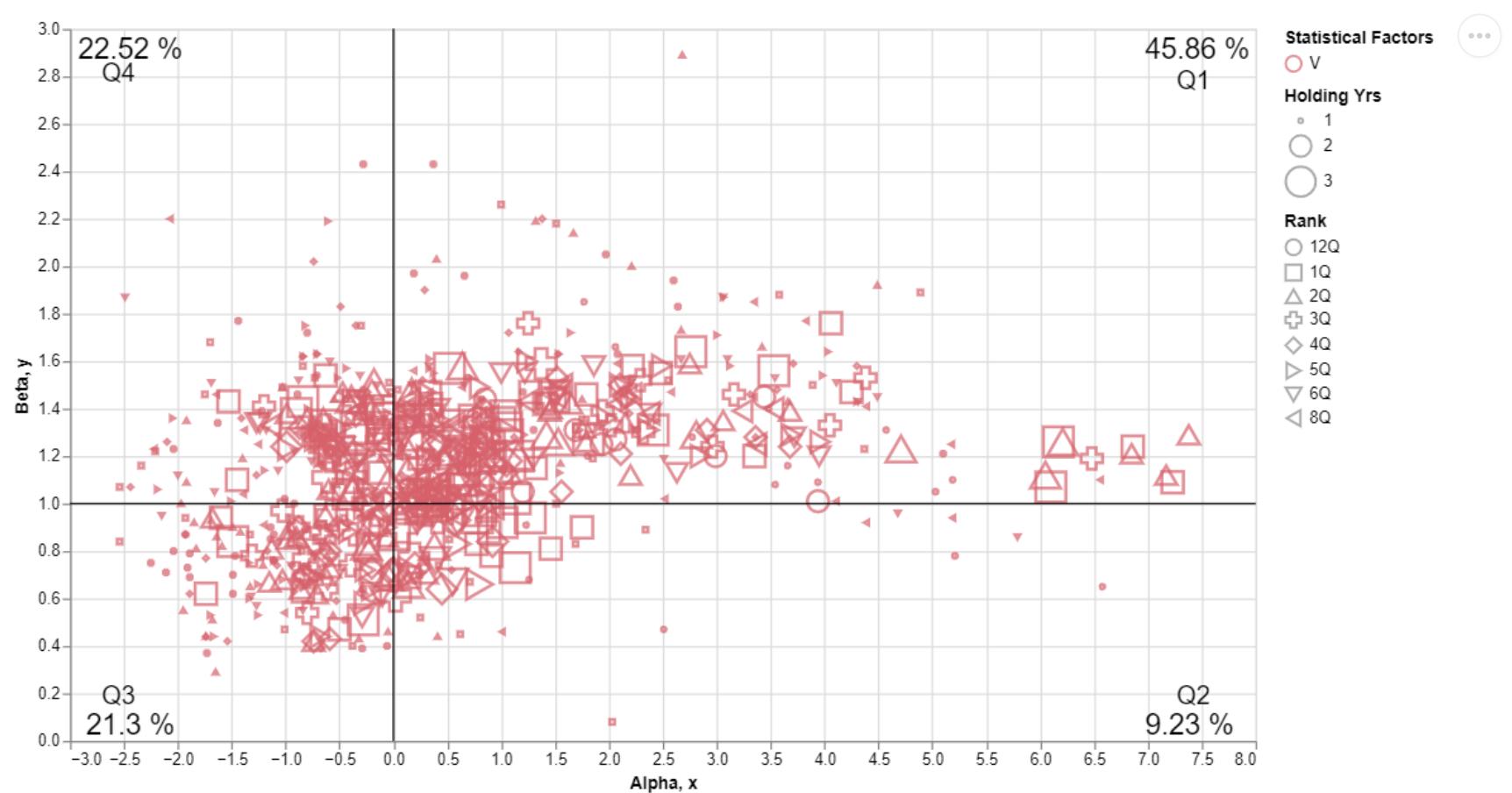
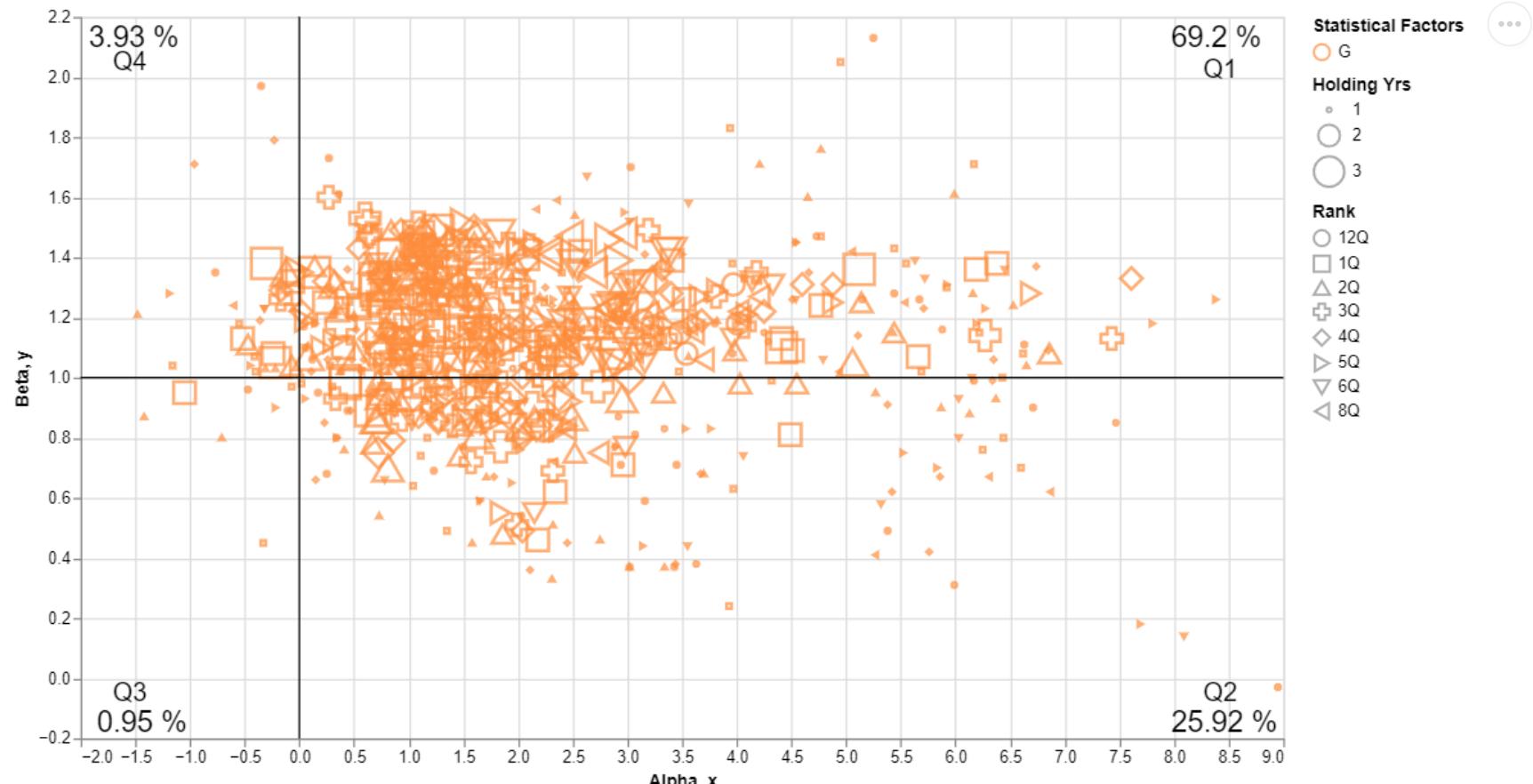


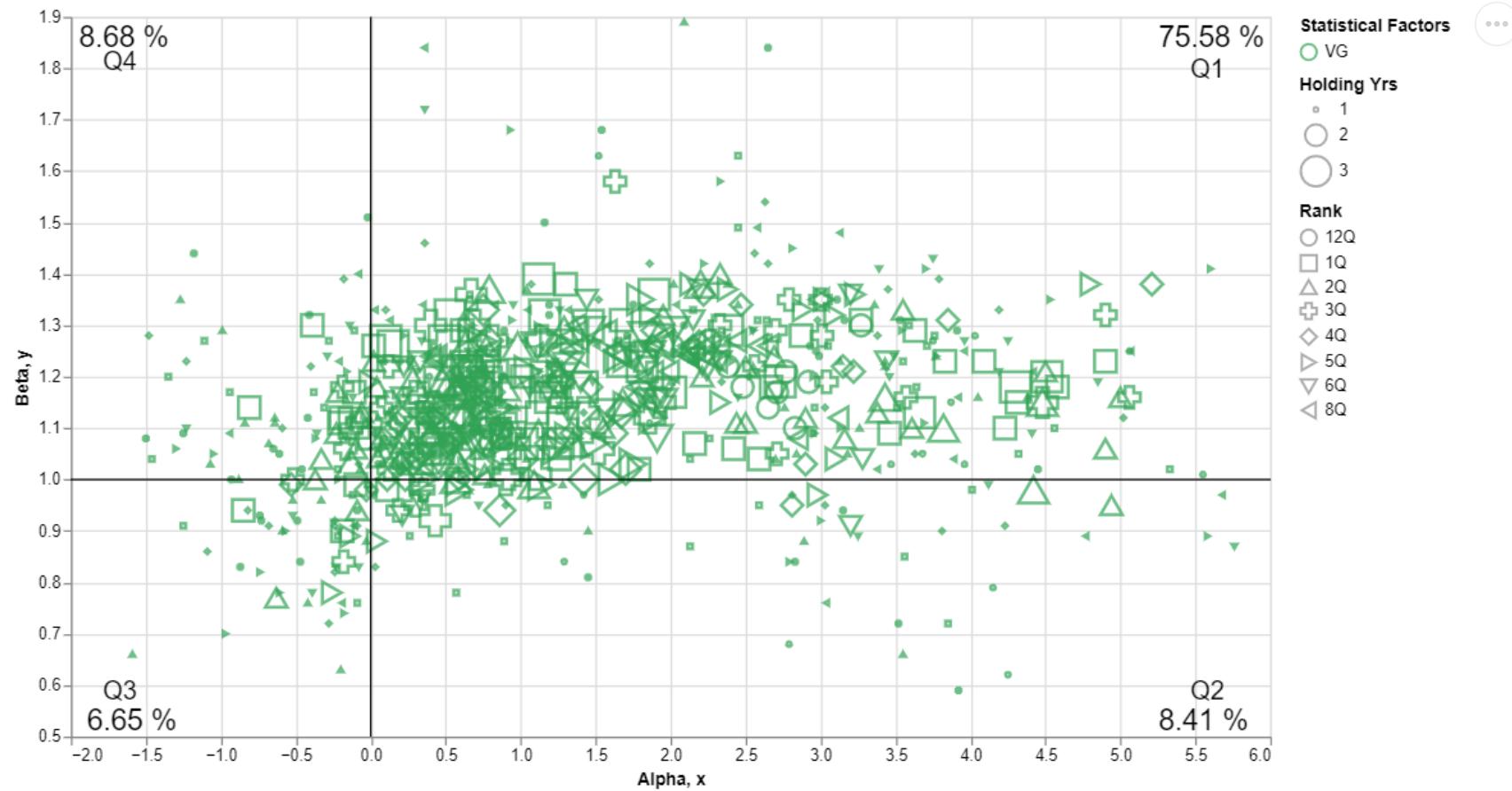


#### 4.4: Alpha vs. Beta

The Cartesian chart of Alpha vs. Beta plotted for different statistical factors, for different holding periods and for respective quarterly proxy rankings.

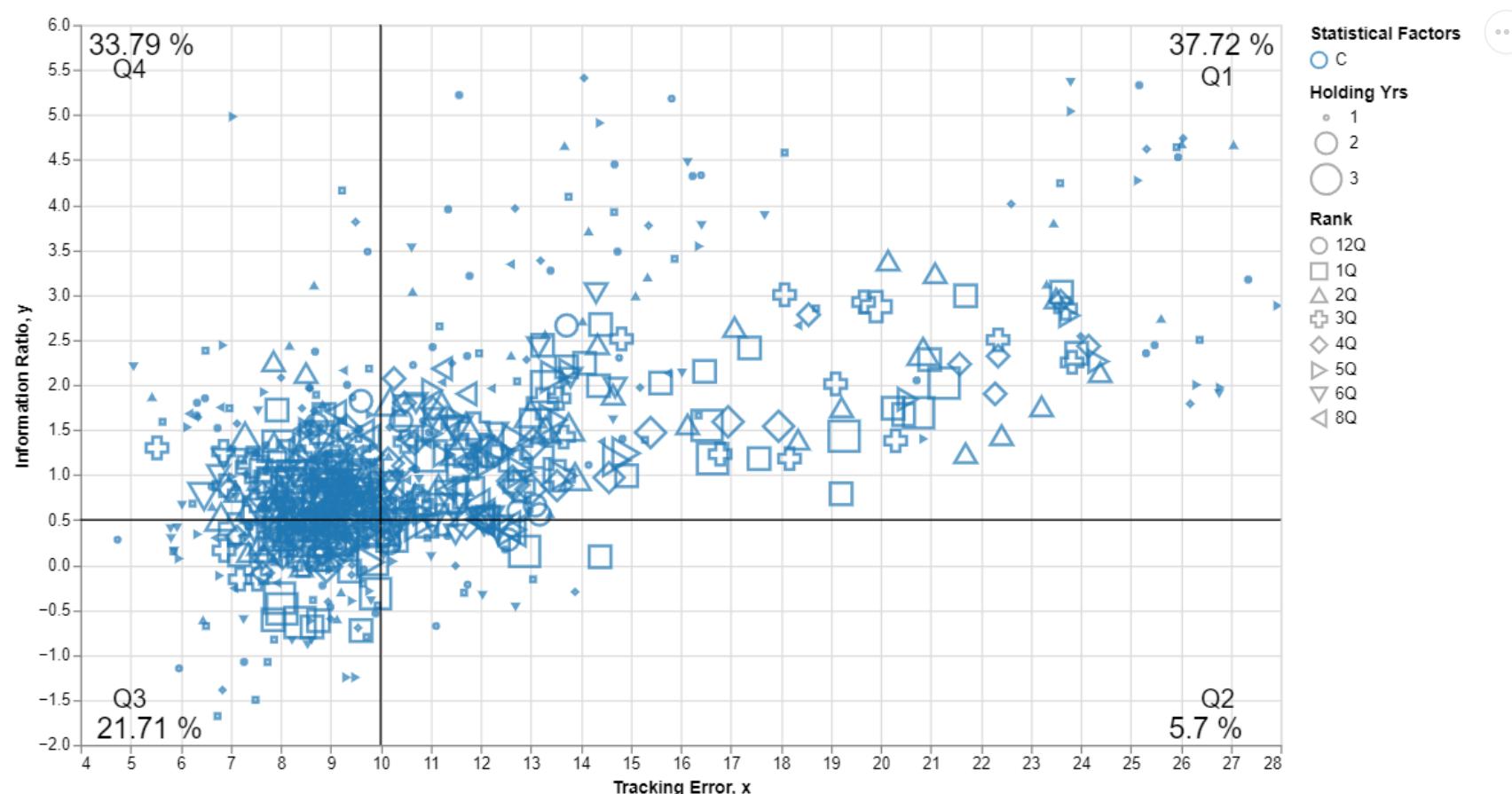
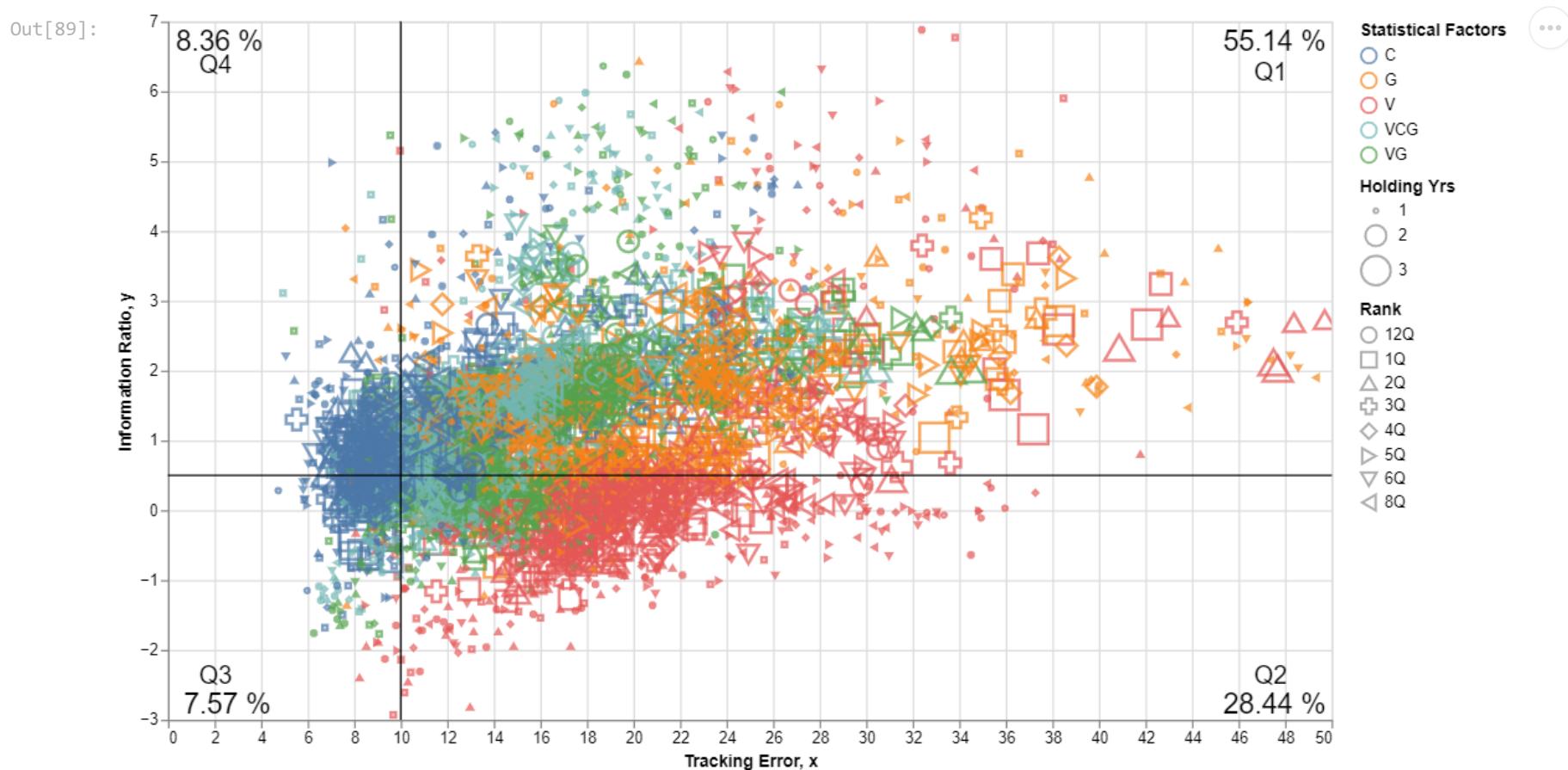


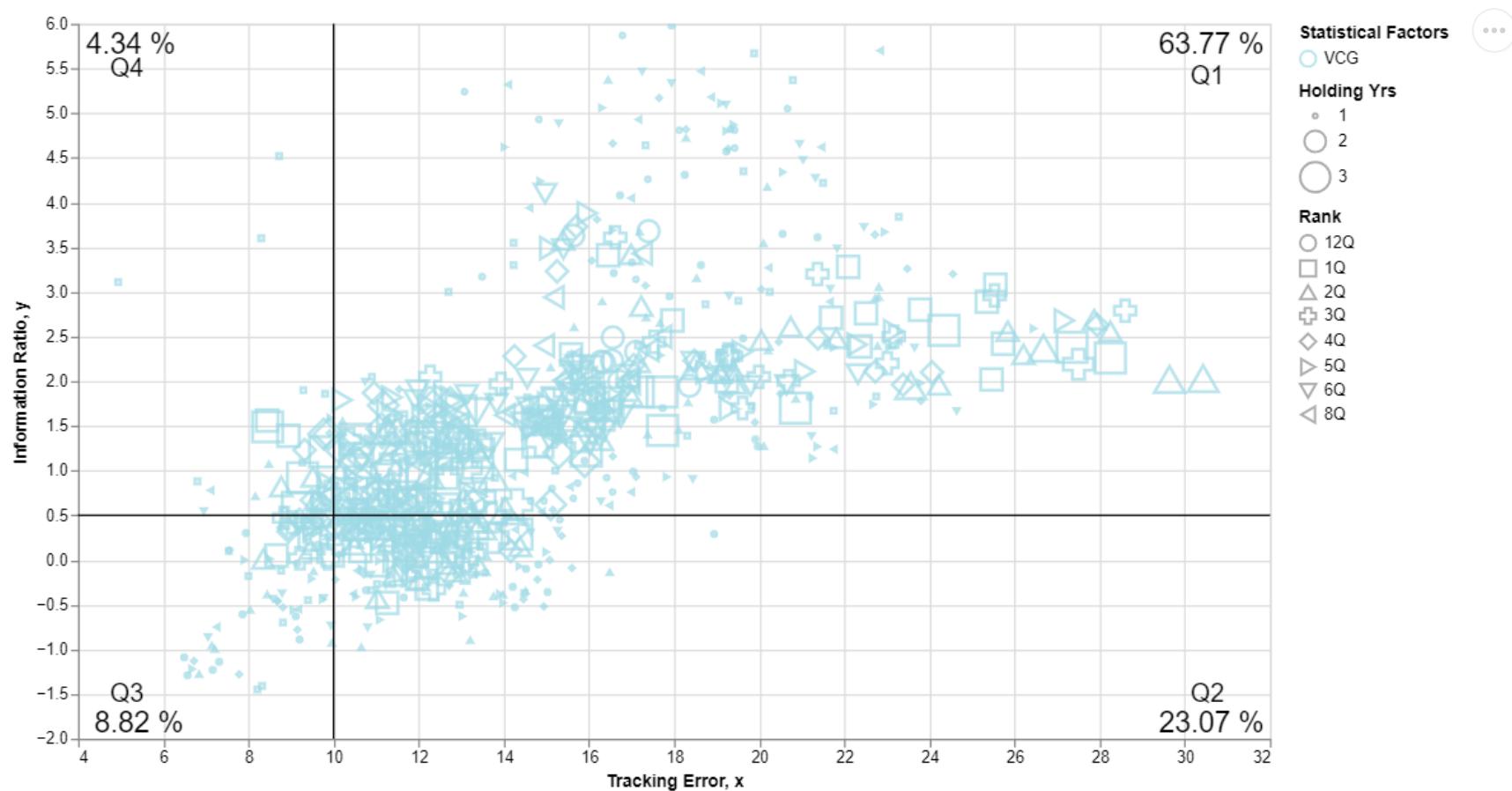
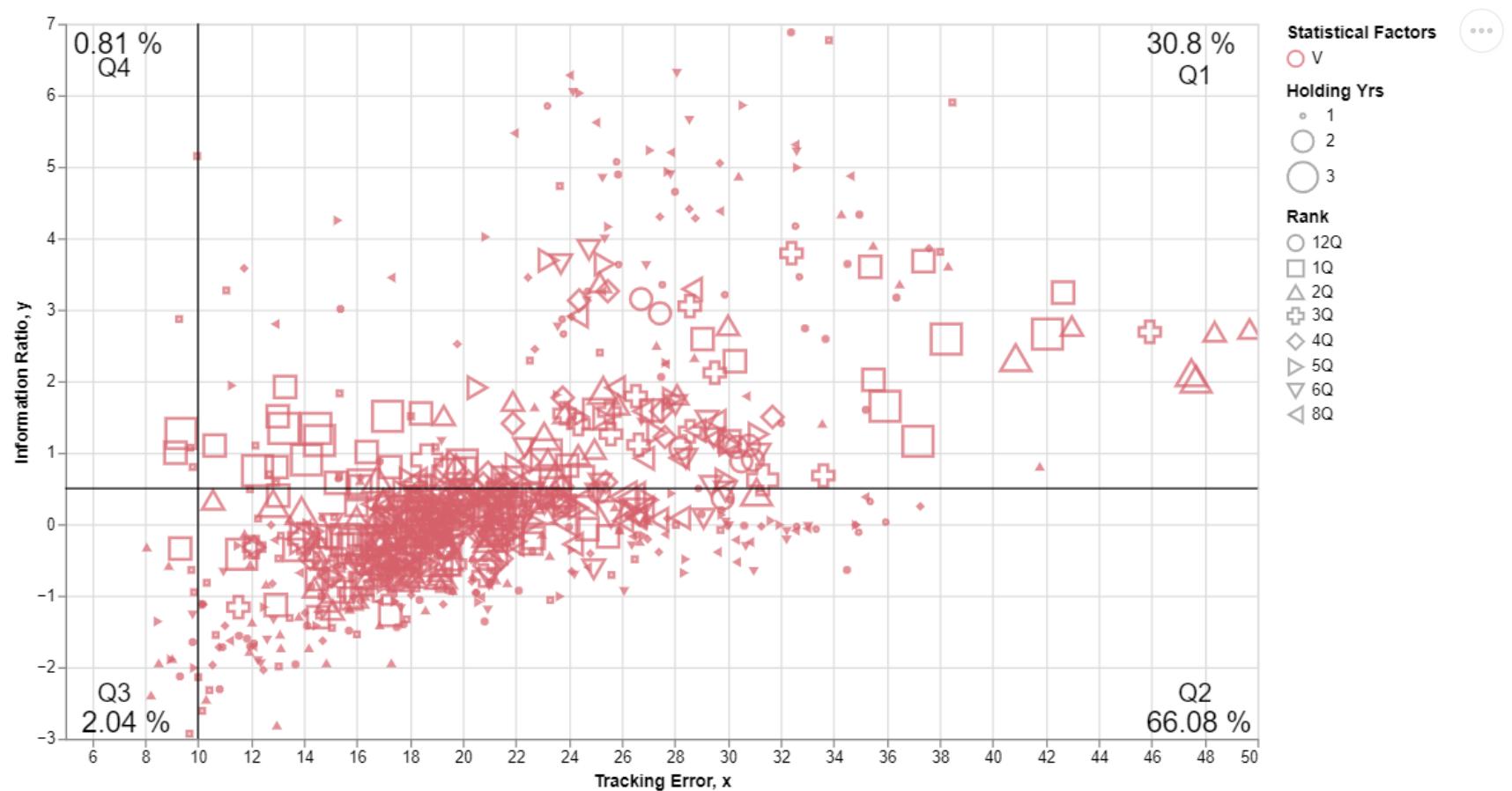
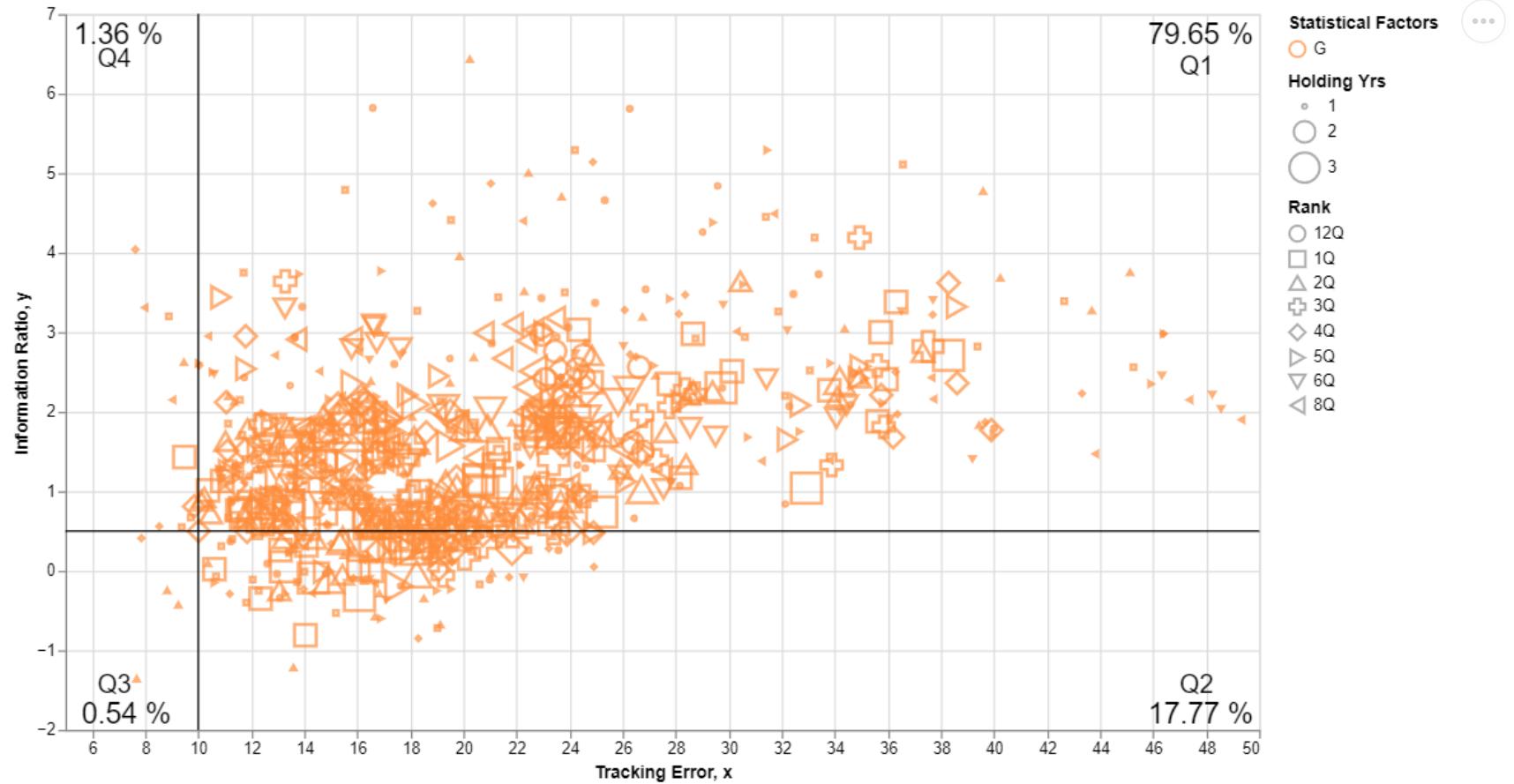


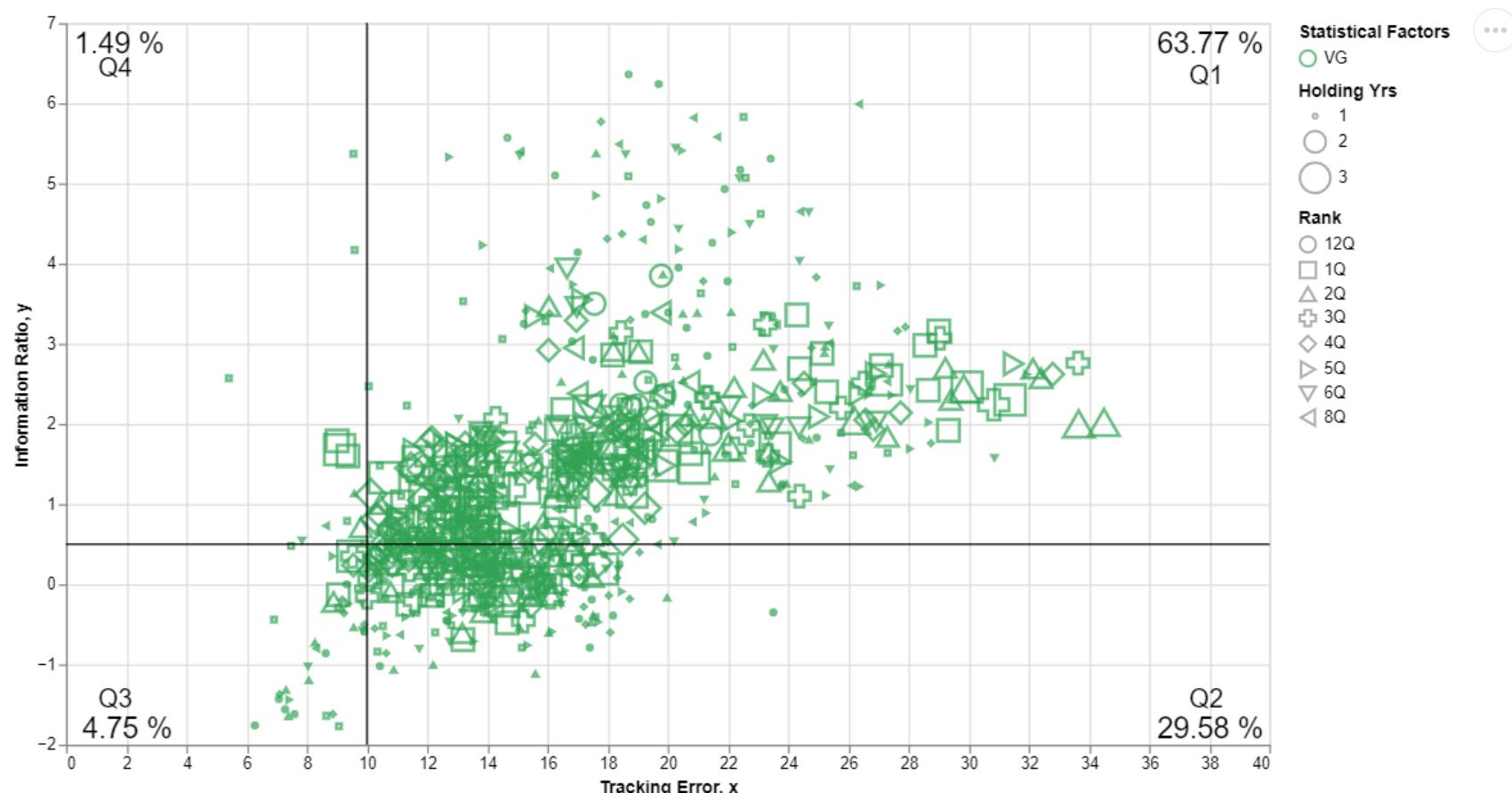


#### 4.5: Tracking Error vs. Information Ratio

The Cartesian chart of Tracking Error vs. Information Ratio plotted for different statistical factors, for different holding periods and for respective quarterly proxy rankings.







#### 4.6: Cartesian Cluster Analysis

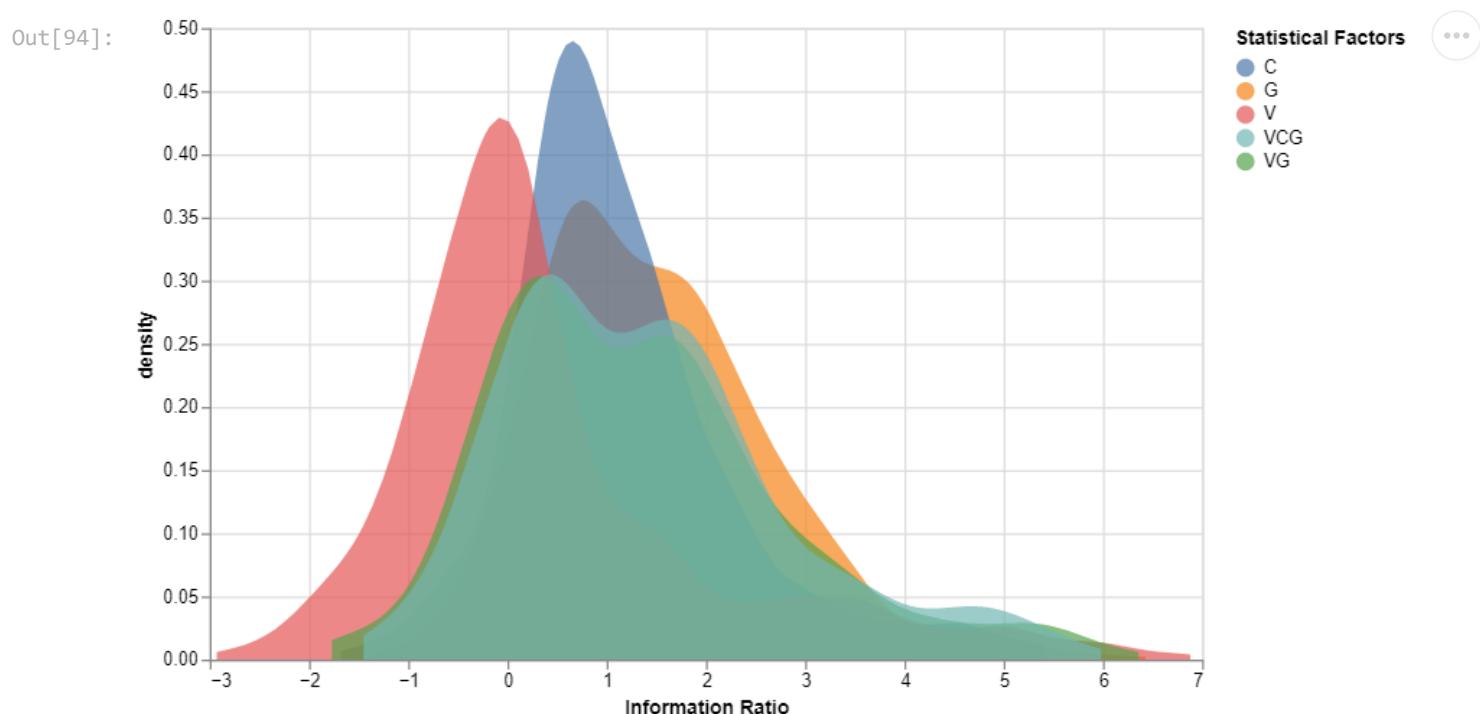
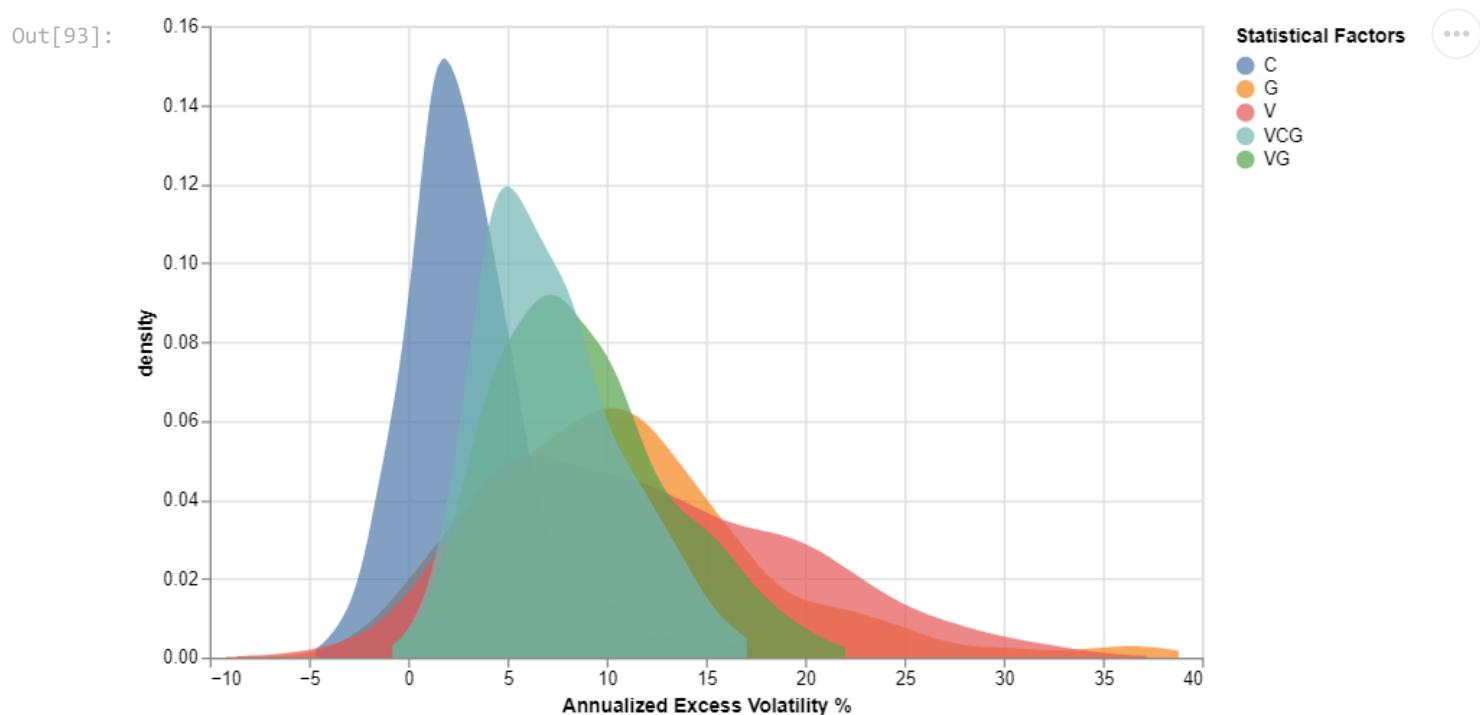
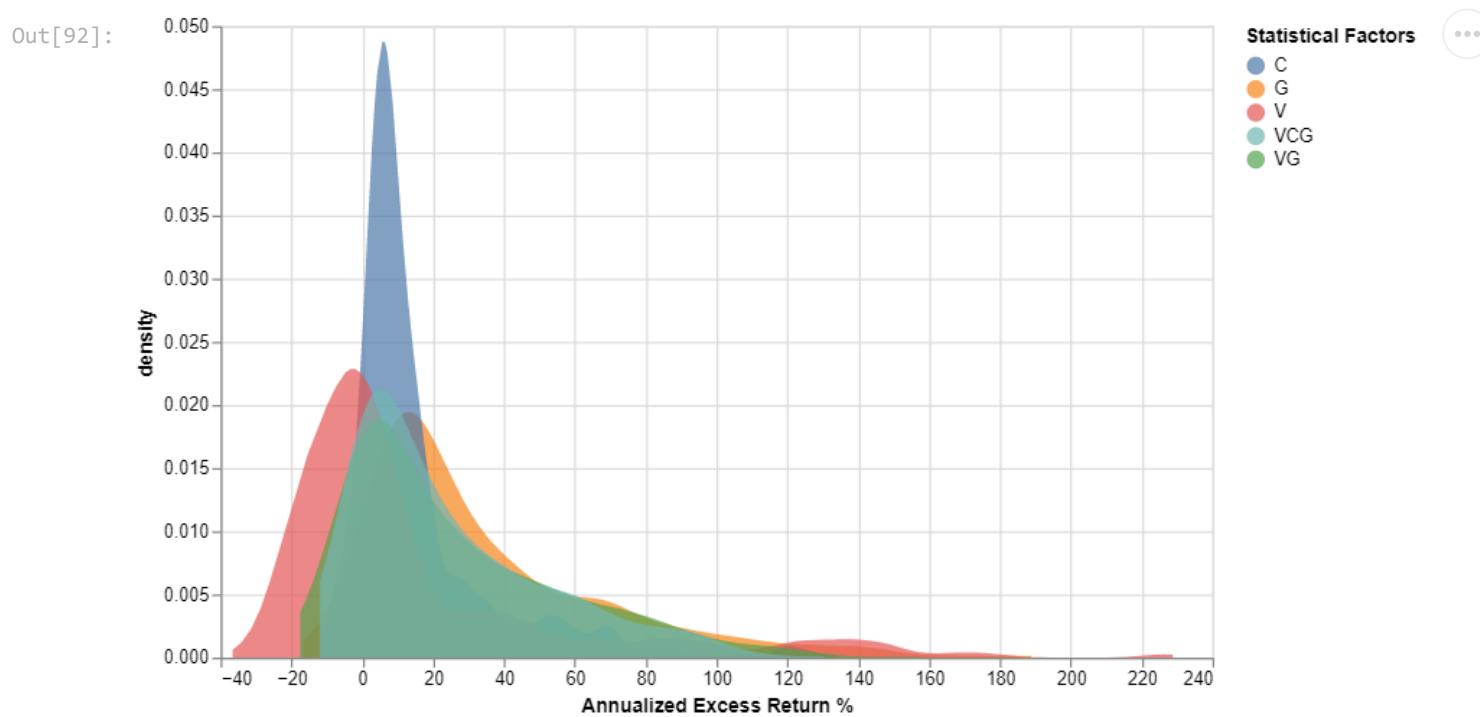
The table below carries the cluster analysis across four quadrants, highlighting positive and negative skew in the dataset, and risk-return characteristics of the various statistical factors. Overall, the VCG factor shows robustness across statistical metrics, while C and V statistical factors are with the most risk and skew.

Statistics	Statistical Factors	Q1	Q2	Q3	Q4	Q1+Q2	Q2+Q3	Q3+Q4	Q4+Q1	Q1+Q3	Q2+Q4
Annualized Excess Return % vs. Annualized Excess Volatility %	C	78.97 %	12.48 %	1.63 %	6.92 %	91.45%	14.11%	8.55%	85.89%	80.6%	19.4%
	G	90.5 %	2.58 %	0.41 %	6.51 %	93.08%	2.99%	6.92%	97.01%	90.91%	9.09%
	V	51.15 %	0.68 %	1.09 %	47.08 %	51.83%	1.77%	48.17%	98.23%	52.24%	47.76%
	VCG	85.62 %	0.14 %	0.14 %	14.11 %	85.76%	0.28%	14.25%	99.73%	85.76%	14.25%
	VG	81.95 %	0.14 %	0.41 %	17.5 %	82.09%	0.55%	17.91%	99.45%	82.36%	17.64%
Annualized Excess Return % vs. Information Ratio	C	71.64 %	19.0 %	8.55 %	0.0 %	90.64%	27.55%	8.55%	71.64%	80.19%	19.0%
	G	81.0 %	11.4 %	6.92 %	0.0 %	92.4%	18.32%	6.92%	81.0%	87.92%	11.4%
	V	31.61 %	19.95 %	48.17 %	0.0 %	51.56%	68.12%	48.17%	31.61%	79.78%	19.95%
	VCG	68.11 %	17.64 %	14.25 %	0.0 %	85.75%	31.89%	14.25%	68.11%	82.36%	17.64%
	VG	65.26 %	16.42 %	17.91 %	0.0 %	81.68%	34.33%	17.91%	65.26%	83.17%	16.42%
Annualized Excess Volatility % vs. Information Ratio	C	63.09 %	21.98 %	5.56 %	8.55 %	85.07%	27.54%	14.11%	71.64%	68.65%	30.53%
	G	78.83 %	17.64 %	0.68 %	2.17 %	96.47%	18.32%	2.85%	81.0%	79.51%	19.81%
	V	30.94 %	67.03 %	1.09 %	0.68 %	97.97%	68.12%	1.77%	31.62%	32.03%	67.71%
	VCG	67.98 %	31.75 %	0.14 %	0.14 %	99.73%	31.89%	0.28%	68.12%	68.12%	31.89%
	VG	65.13 %	33.92 %	0.41 %	0.14 %	99.05%	34.33%	0.55%	65.27%	65.54%	34.06%
Alpha vs. Beta	C	41.66 %	46.27 %	2.99 %	4.61 %	87.93%	49.26%	7.6%	46.27%	44.65%	50.88%
	G	68.11 %	25.92 %	0.95 %	3.93 %	94.03%	26.87%	4.88%	72.04%	69.06%	29.85%
	V	45.05 %	9.23 %	21.3 %	22.52 %	54.28%	30.53%	43.82%	67.57%	66.35%	31.75%
	VCG	76.93 %	8.28 %	5.83 %	7.73 %	85.21%	14.11%	13.56%	84.66%	82.76%	16.01%
	VG	74.22 %	8.41 %	6.65 %	8.68 %	82.63%	15.06%	15.33%	82.9%	80.87%	17.09%
Tracking Error vs. Information Ratio	C	37.72 %	5.7 %	21.71 %	33.79 %	43.42%	27.41%	55.5%	71.51%	59.43%	39.49%
	G	79.65 %	17.77 %	0.54 %	1.36 %	97.42%	18.31%	1.9%	81.01%	80.19%	19.13%
	V	30.8 %	66.08 %	2.04 %	0.81 %	96.88%	68.12%	2.85%	31.61%	32.84%	66.89%
	VCG	63.77 %	23.07 %	8.82 %	4.34 %	86.84%	31.89%	13.16%	68.11%	72.59%	27.41%
	VG	63.77 %	29.58 %	4.75 %	1.49 %	93.35%	34.33%	6.24%	65.26%	68.52%	31.07%

## 5: Statistical Distributions

### 5.1: Area Charts

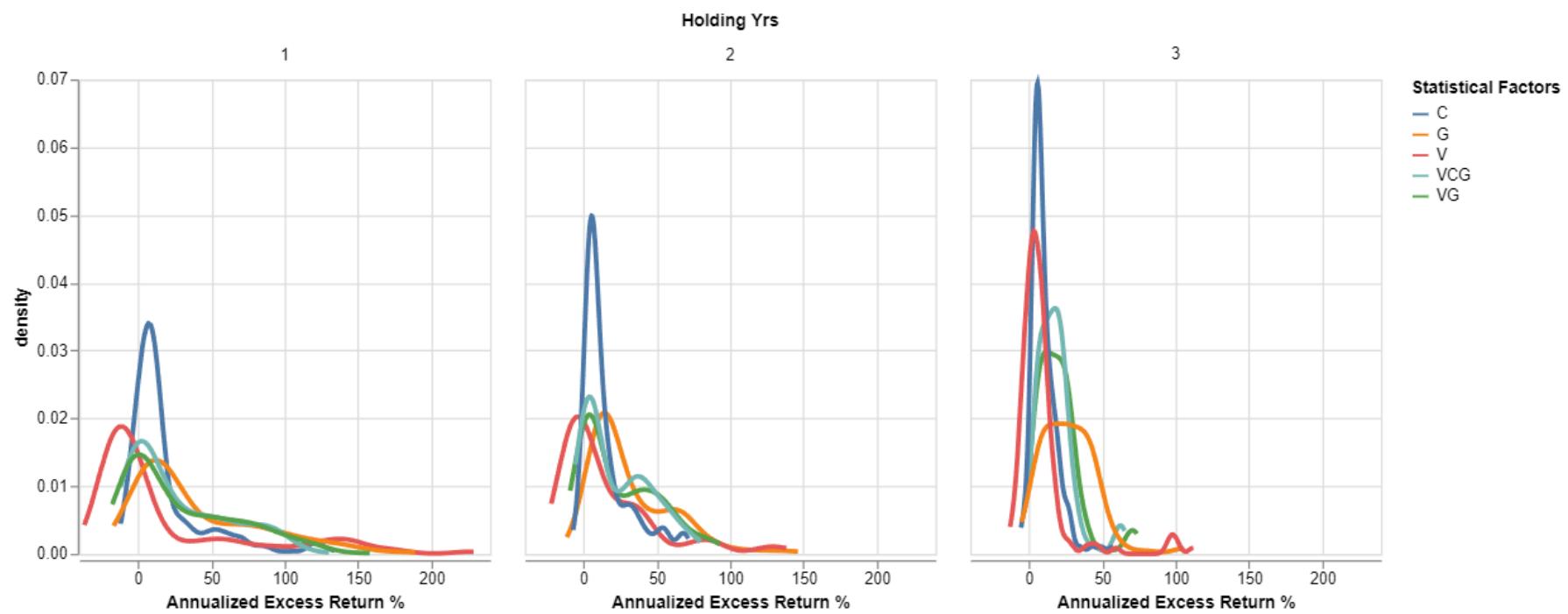
The area charts below showcase the distribution of Annualized Excess Return, Annualized Excess Volatility and Information Ratio across various statistical factors.



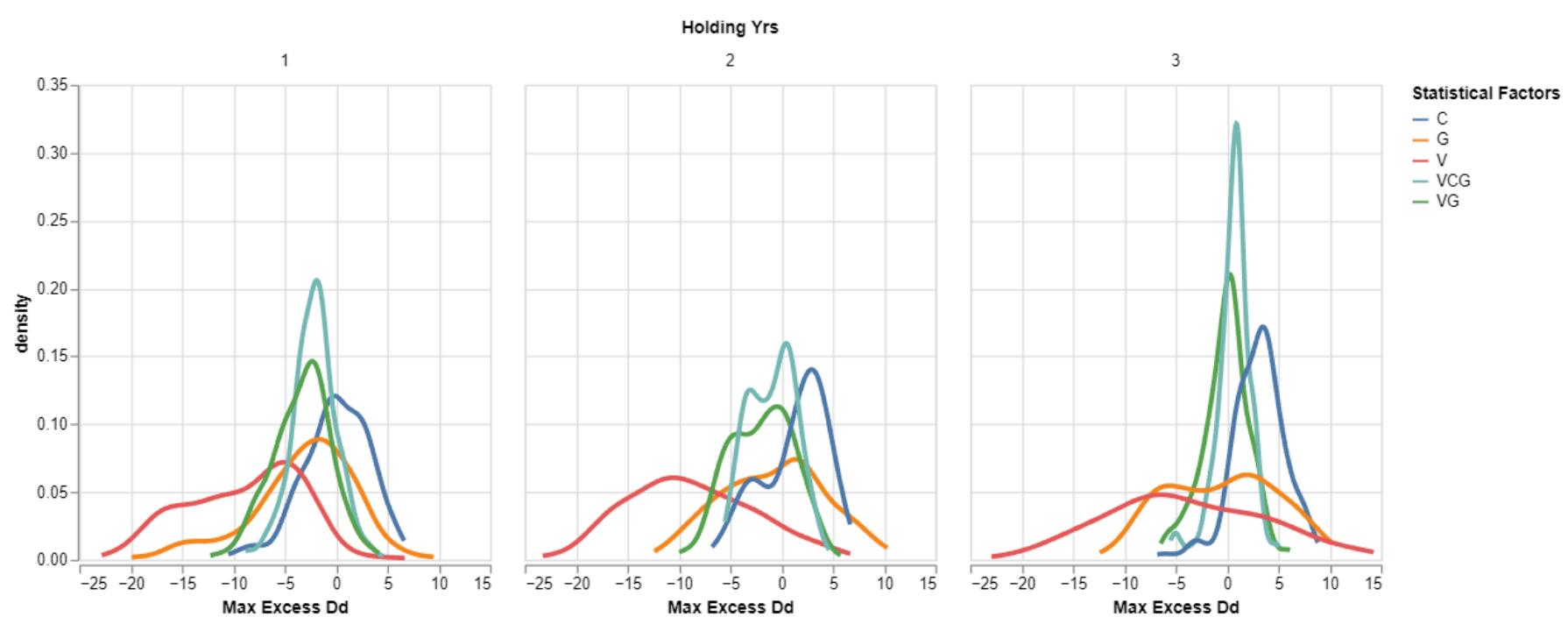
## 5.2: Line Charts

The line charts below showcase the Annualized Excess Return distribution for each holding periods, Max Excess Drawdown distribution for each holding periods and Max Excess Drawdown distribution for each statistical factor. Max excess Drawdown represents the difference between Portfolio Max Drawdown and Benchmark Max Drawdown.

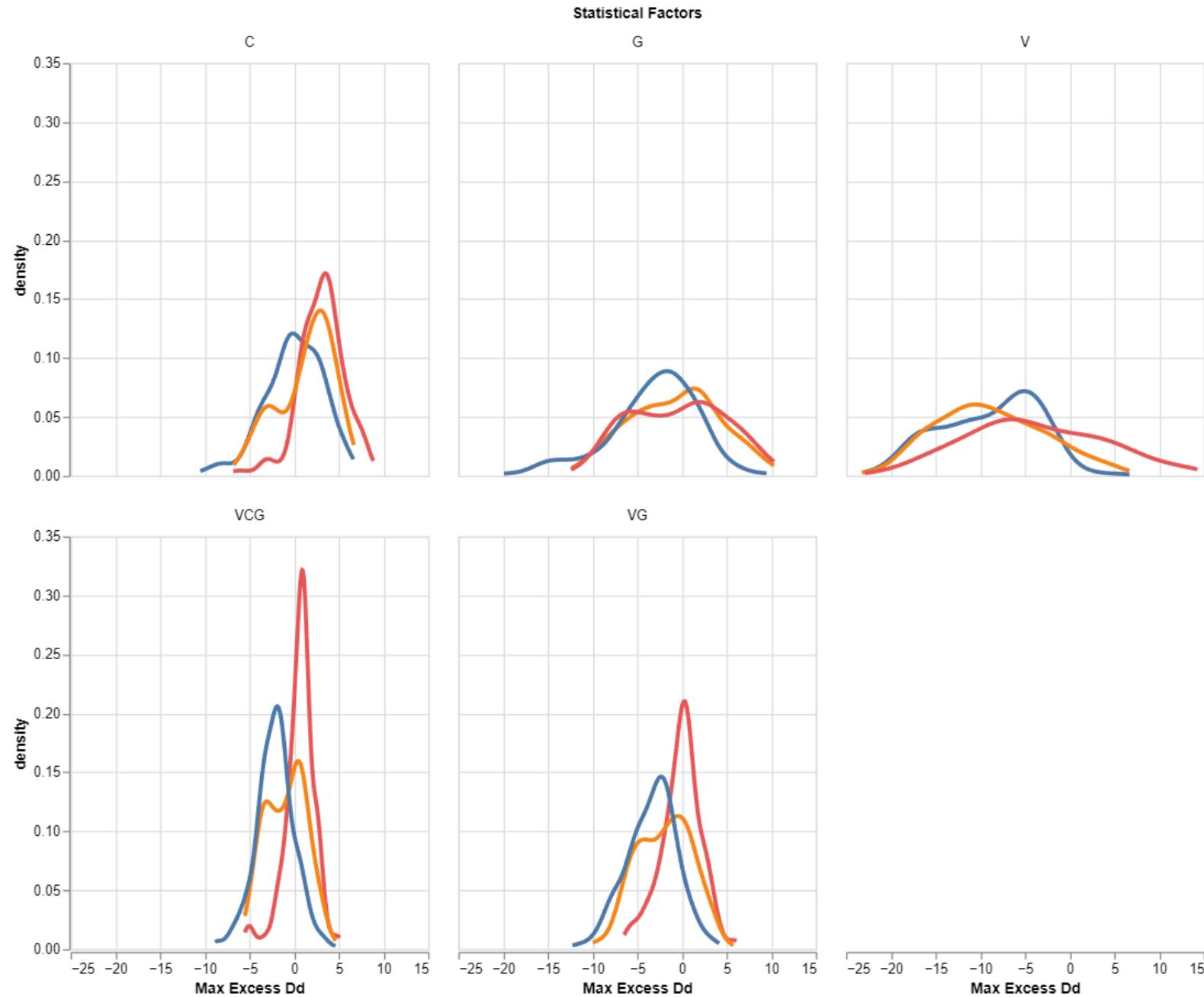
Out[95]:



Out[96]:



Out[97]:



## 6: Modern Portfolio Theory (MPT) Statistics

The table of averaged MPT statistics for each statistical factor and holding periods without outliers.

(**AR** - Annualized Excess Return, **AV** - Annualized Excess Volatility, **TE** - Tracking Error, **IR** - Information Ratio, **Max Excess Dd** - Maximum Excess Drawdown)

Statistical Factors	Holding Yrs	AR	AV	TE	IR	Alpha	Beta	Max Excess Dd
C	1Y	16.06	2.67	10.64	1.19	1.11	0.94	0.13
C	2Y	14.31	3.09	11.34	1.07	0.99	1.01	1.58
C	3Y	10.98	2.9	10.9	0.91	0.76	1.01	2.98
G	1Y	38.69	11.41	20.71	1.6	2.5	1.08	-3.14
G	2Y	30.98	9.94	19.74	1.44	1.99	1.14	-0.64
G	3Y	29.93	10.6	20.1	1.46	1.99	1.19	-0.04
V	1Y	15.26	11.87	20.44	0.3	0.08	1.19	-9.14
V	2Y	14.88	12.44	21.95	0.47	0.72	1.17	-8.98
V	3Y	9.48	10.14	20.75	0.36	0.63	1.11	-4.2
VCG	1Y	25.43	7.31	14.58	1.36	1.36	1.1	-2.22
VCG	2Y	22.55	7.03	14.44	1.31	1.34	1.13	-0.87
VCG	3Y	20.34	6.98	14.45	1.33	1.31	1.14	0.52
VG	1Y	26.82	9.03	16.62	1.27	1.36	1.14	-3.49
VG	2Y	24.16	8.64	16.49	1.22	1.41	1.16	-1.95
VG	3Y	22.59	8.66	16.53	1.29	1.44	1.18	-0.24

## Bibliography

- [1] Matia, Kaushik and Pal, Mukul and Stanley, H. Eugene and Salunkay, H., Scale-Dependent Price Fluctuations for the Indian Stock Market. EuroPhysics Letters, Aug 2003
- [2] M. Pal, M. Shah, A. Mitroi, Temporal Changes in Shiller's Exuberance Data, SSRN, Feb 2011
- [3] M. Pal, Mean Reversion Framework, SSRN, May 2015
- [4] M. Pal, Markov and the Mean Reversion Framework, SSRN, May 2015
- [5] M. Pal, Momentum and Reversion, Aug 2015
- [6] M. Pal, What is Value, SSRN, Sep 2015
- [7] M. Pal, M. Ferent, Stock Market Stationarity, SSRN, Sep 2015
- [8] M. Pal, Reversion Diversion Hypothesis, SSRN, Nov 2015
- [9] M. Pal, How Physics Solved your wealth problem, SSRN, Oct 2016
- [10] M. Pal, Human AI, SSRN, Jul 2017
- [11] M. Pal, The Size Proxy, Aug 2017
- [12] M. Pal, The Beta Maths, SSRN, Mar 2017
- [13] Maureen, O. Bhattacharya, A. ETFs and Systematic Risk. CFA Research Institute, Jan 2020
- [14] M. Pal, [3N] model of life, SSRN, Apr 2021
- [15] M. Pal, The S&P 500 Myth, SSRN, Jul 2022
- [16] M. Pal, The Snowball Effect, SSRN, Jul 2022
- [17] M. Pal, Mechanisms of Psychology, SSRN, Jun 2022
- [18] M. Pal, The [3N] model of life, SSRN, Feb 2023

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