

# R/RMETRICS Generator Tool for Google Motion Charts

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- 1 Motivation
  - Example: Rastered Risk Surfaces
- 2 Google Motion Charts
  - Google Public Data Exporter
  - Motion Charts
- 3 Building a Motion Chart
  - Procedure
  - R Data Frame
- 4 Summary

# Motivation: Multivariate Data Charts

- ▶ Multivariate data charts take the graphical display of a given analysis one step further.
- ▶ Offering multi-dimensional views of all metrics enhances a report.

## Properties

- ▶ x/y Axes
- ▶ color
- ▶ size

**Four Dimensional** plots can help to identify unique opportunities or anomalies quicker and simpler.

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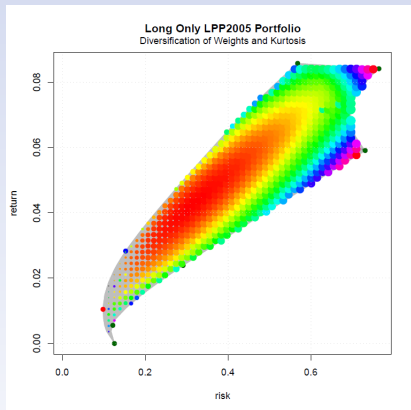
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# Example: Rastered Risk Surfaces



**Figure:** Rastered Risk Surface of the LPP2005 dataset. The Color distribution shows the minimum variance of the portfolio weights  $\min(\text{var}(\omega))$ . The Size of the points grows with the *Excess Kurtosis* ( $\mathcal{K}^* \equiv \mathcal{K} - 3$ ) of the asset classes.

Rastered plot of a **risk metrics surface** over the portfolio's feasible set

<b>Dimension</b>	<b>Property</b>
<i>X-Axis</i>	Risk
<i>Y-Axis</i>	Return
<i>Color</i>	$\text{var}(\omega)$
<i>Size</i>	Kurtosis ( $\mathcal{K}^*$ )
<b>Time</b>	<b>Date</b>

# Google Public Data Exporter

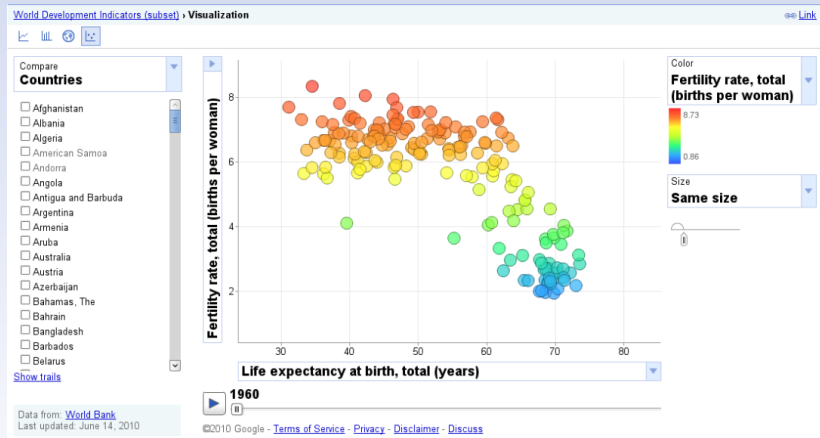


Figure: Fertility Rate Evolution for Different Countries. Google Public Data Exporter

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# Motion Charts



## Advantages

- ▶ Motion charts add a *dynamic* component to multivariate data charts.
- ▶ The evolution of data can be displayed and tracked dynamically.
- ▶ Velocity and acceleration of the characteristic parameters of a dataset could be studied.

**Figure:** Google Motion Chart of the ECON85 Dataset. The robust risk vs. return is shown for 23.04.1996. The size of each point and the height of each bar corresponds to the CVaR risk associated with it. The opaque bubbles span the efficient frontier.

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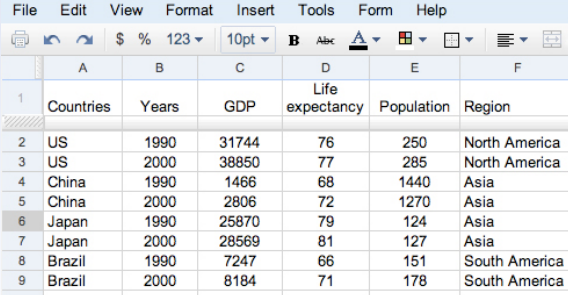
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# Motion Charts

Name	Date [YYYY-MM-DD]	Stats or Props (Cov, mean, $\Sigma$ , $\mu$ , cVaR, ...)	Class
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**Table:** Layout of the R data frame to create Motion Charts.



The image shows a spreadsheet interface with a menu bar (File, Edit, View, Format, Insert, Tools, Form, Help) and a toolbar with various icons. The spreadsheet data is as follows:

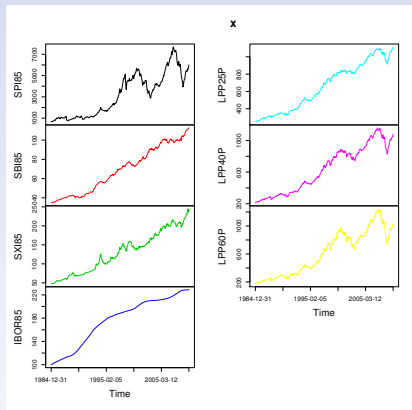
	A	B	C	D	E	F
1	Countries	Years	GDP	Life expectancy	Population	Region
2	US	1990	31744	76	250	North America
3	US	2000	38850	77	285	North America
4	China	1990	1466	68	1440	Asia
5	China	2000	2806	72	1270	Asia
6	Japan	1990	25870	79	124	Asia
7	Japan	2000	28569	81	127	Asia
8	Brazil	1990	7247	66	151	South America
9	Brazil	2000	8184	71	178	South America

**Figure:** Example of the spreadsheet data organization.

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# Long Term Swiss Investment Portfolio (1985–2010)



**Figure:** Time Series of the Long Term Swiss Investments portfolio and Pictet's Pension Fund Benchmarks (LPP25, LPP40, LPP60).

## Composition

- ▶ EQUITY MARKET (**SPI85**) : SPI Total Return (SWX) and SBC Index (SNB).
- ▶ BOND MARKET (**SBI85**): SW AAA/BBB (SWX), SBI (SWX) and PICX (SNB).
- ▶ REIT MARKET (**SXI85**): SXI (SWX) and RuedBlass (SWX).
- ▶ MONEY MARKET (**IBOR85**): Inter Bank Offered Rates (SWX) and (SNB).
- ▶ BENCHMARKS (Pictet LPP2000).

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- ▶ Determine length and frequency of the rolling time window.

```
> data(ECON85)

># Rolling Window Selection
># Quarterly increments of a 3-yr window.
>period = 3*12
>step = 3
>end = rev(seq(228, 0, by = -step))
>end = end[end>=period]
>start = end - period + 1
```

- ▶ Define the statistics to be used.

```
># Set Estimator
>Spec <- portfolioSpec()
>setEstimator(Spec) = "covMcdEstimator"
```

# R Data Frame

- ▶ Perform a Rolling Portfolio Optimization for all time windows. Calculate the required risk measures.
- ▶ Generate a *Data Structure* with the resulting data for the **asset classes**, the **benchmarks** and some typical **portfolio strategies**.
- ▶ Load the `.csv` spreadsheet into Google Docs and insert a Google Motion Chart.

```
># Data Frame
> class(spreadSheet)
[1] "data.frame"
> str(spreadSheet)
'data.frame':   650 obs. of  9 variables:
 $ Asset      : Factor w/ 10 levels "EWP","IBOR85",..: 3 4 5 6 1 10 8 7 9 2 ...
 $ Year      : Class 'Date'  num [1:650] 8765 8765 8765 8765 8765 ...
 $ assetCovs : num  0.025 0.05 0.096 0.015 0.162 0.015 0.183 0.011 0.082 0 ...
 $ assetMeans: num  0.147 0.16 0.177 0.072 0.149 0.072 0.24 0.105 0.181 0.07 ...
 $ assetSigmas: num  0.022 0.041 0.075 0.008 0.179 0.008 0.339 0.025 0.011 0 ...
 $ assetMus   : num  0.147 0.16 0.177 0.072 0.149 0.072 0.24 0.105 0.181 0.07 ...
 $ assetCVarS: num  -0.148 -0.282 -0.457 -0.044 0.1 -0.044 -0.459 -0.08 -0.246 0.043 ...
 $ assetVaRs  : num  -0.097 -0.171 -0.255 -0.046 0.087 -0.046 -0.427 -0.053 -0.062 0.045 ...
 $ Class     : Factor w/ 6 levels "Benchmark","Bond",..: 1 1 1 5 5 5 4 2 6 3 ...

> write.table(spreadSheet, "econ85.csv", sep = ";")
```

## Linking R and Motion Charts

- ▶ with R.rsp documents in any format (e.g. automatic reports or statistical analyses) can be generated dynamically using R.
- ▶ it is **ONE** way to link R and *Motion Charts*.

## Procedure

```
#Add the R.rsp package
>source("http://www.braju.com/R/hbLite.R")
>hbLite("R.rsp")

#Select the html file
>browseRsp("econ85data.html")
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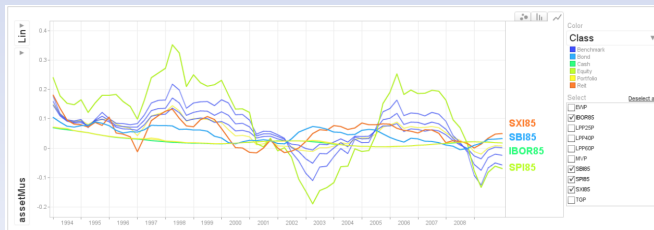
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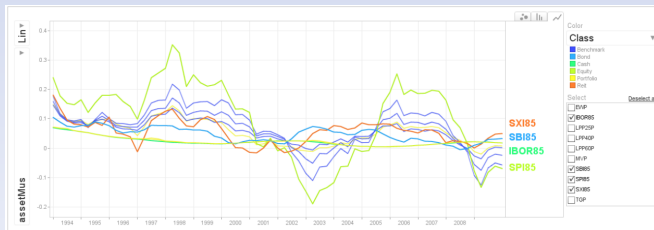
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## Summary

- ▶ Motion Charts provide dynamical visualization of data metrics.
- ▶ Several properties can be compared and interchanged.
- ▶ They provide a graphical idea of the main features of a given dataset.

Thank You!

# Summary



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