RRG Weights

Whitepaper

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Since I was introduced to Relative Rotation Graphs, I have been constantly playing with them and trying to see how they can give me insights into what is happening in the market. I love looking at different Asset Classes, Currencies and portfolios. My favourite group however will always be the SP500 GICS Level 1 sectors with the SP500 as the Benchmark because I know that the total of the ten Sectors must be fully encompassed by the Benchmark. The ten Sectors embody all the elements that can contribute to the SP500 itself. That means that when I look at the RRG, which measures relative performance of each Sector against the Index, there has to be balance in both directions.
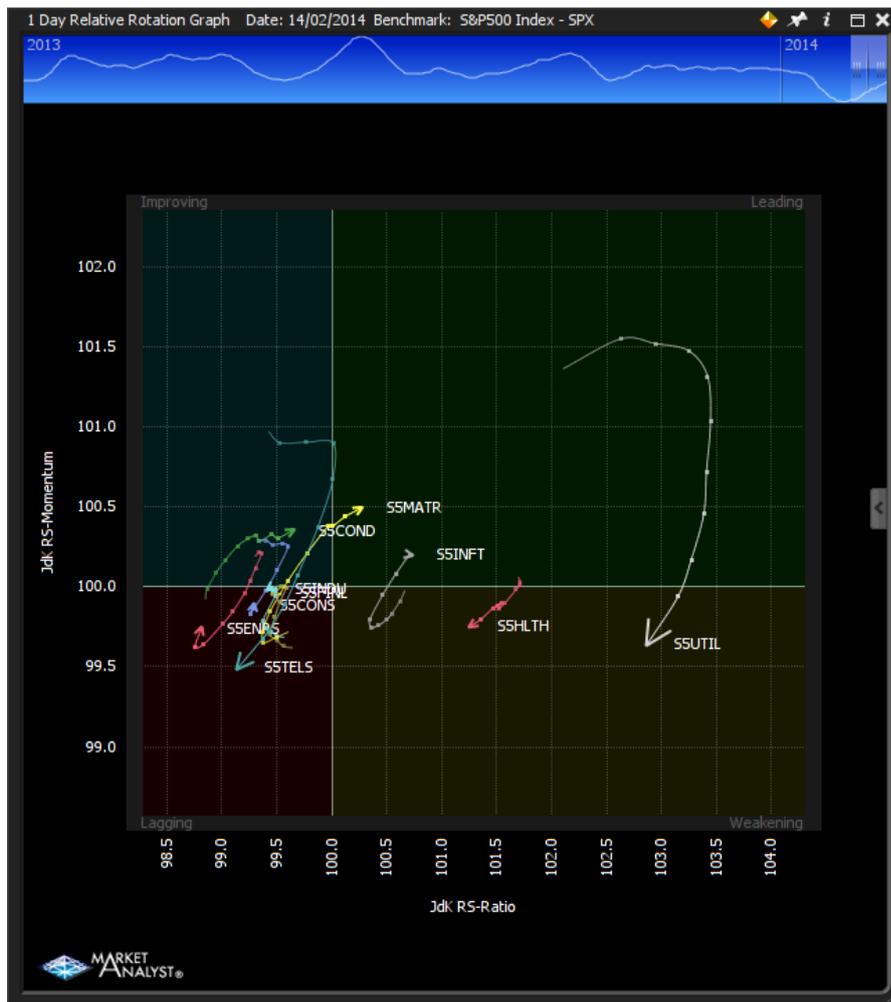

Figure 1 SP500 GICS Level 1 Sectors verses SP500 - Data from Bloomberg

Consider Figure 1, we can see the ten Sectors based on their relative strength against the SP500. An immediate stand out is the Utilities (S5UTIL) way out on its own on the right while there is a group of Sectors clustering on the left. Based on what we were saying before, if these ten embody all that contributes to the Index, and we consider the Index to be the very centre of the chart, everything has to be balanced around that point. It has to follow mathematical rules as we are dealing with what can only be described as a closed universe (no other stocks are contributing).

We can see that there is a group of six on the left side of the 100 line, that's like a group of children on one side of a seesaw while less are sitting on the right side. Figure 2 shows that to have balance it is only possible if the bigger group is closer to the apex than the smaller (L_2 is smaller than L_{end}).
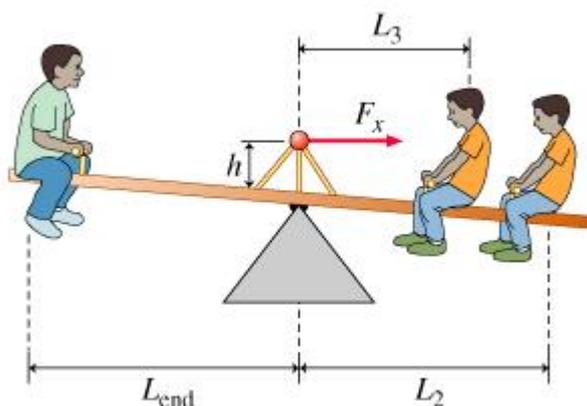
Figure 2 Balance comes from a combination of distance from the apex and the mass of each

As an exercise to check that we have balance, we can sum up all the negative amounts and the positive amounts and we would expect them to be equal since it is a balanced universe. I've done this in a Watchlist in Figure 3

Code	Last	Change (%)	RRG Ratio ^	From 100 +
S5ENRS	628.70	0.25%	98.8	-1.2
S5TELS	146.96	-0.70%	99.1	-0.9
S5CONS	427.20	-0.46%	99.3	-0.7
S5INDU	443.66	0.12%	99.4	-0.6
S5FINL	291.68	0.16%	99.5	-0.5
S5COND	517.43	0.10%	99.6	-0.4
S5MATR	290.48	-0.07%	100.3	0.3
S5INFT	592.92	0.05%	100.7	0.7
S5HLTH	677.65	0.68%	101.3	1.3
S5UTIL	204.50	0.25%	102.9	2.9

Type Code or Name to add an item to the watchlist

Figure 3 SP500 Sectors with RRG Ratio and Distance from 100

We list the RRG Ratio and then the distance that ratio is from 100. The totals we get are on the left 4.3 and on the right 5.2! Hang on, that's not balanced we have a 17% discrepancy!

There is another aspect to the seesaw example that I have not been considering and it is a fundamental oversight in some Intermarket Analysis based on sectors (I'll come back to this later on). The missing element maybe obvious to you, but it took me a little bit of thinking to work out. It's the weight of each sector. Again in our seesaw example, have a look at Figure 2, you can see that the one child is bigger than the 2, so not only do we need to factor in the distance but also the weight of each child (Sector).

How do we do that? Fortunately if you are using a data source like Bloomberg, we can fuse in the fundamental MarketCap of each Sector as an External Data Field and then put that into a formula to get weight of each. Here is the formula I used to workout the Sector weight as a percentage of the total SP500.

> *MC1=DATAFIELD(FIELD=CUR_MKT_CAP);*
> *MCBM1 = DATAFIELD(GETDATA(CODE=SPX:BLMB), FIELD=CUR_MKT_CAP);*
> *(MC1 / MCBM1) * 100*

Let's have a look at the charts on this. First we set that script as the bubble size on the RRG data points. See Figure 4, bigger bubbles means bigger percentage.

Figure 4 SP500 GICS Level 1 Sectors showing Sector size

Now we can see that Utilities is a feather weight weighing in at just 2.9%. It can get a long way from the origin since it is so light. This chart also shows that Financials (S5FINL) and Information Technology (S5INFT) are the gorillas of the SP500.

To include the weights in our calculations, all we need to do is simply add up the product of the weight with the distance. Let's do that in the Watchlist. For the Weight I am simply using the Market Cap since I do not want to introduce any rounding errors and having it as a percentage will not give me any extra information.

Code	Last	Change (%)	RRG Ratio ^	From 100	Weight	Weighted Distance
S5ENRS	627.05	-0.01%	98.8	-1.2	9.87	-1.99
S5TELS	145.91	-1.41%	99.0	-0.9	2.12	-0.37
S5CONS	425.31	-0.90%	99.2	-0.7	10.28	-1.35
S5INDU	441.29	-0.41%	99.4	-0.6	10.74	-1.02
S5FINL	290.74	-0.16%	99.5	-0.5	15.80	-1.37
S5COND	515.23	-0.33%	99.8	-0.4	12.34	-0.45
S5MATR	289.91	-0.27%	100.4	0.3	3.49	0.23
S5INFT	592.16	-0.07%	100.7	0.7	19.11	2.25
S5HLTH	677.65	0.68%	101.2	1.3	13.30	2.71
S5UTIL	204.99	0.49%	102.5	2.9	2.94	1.23

Type Code or Name to add an item to the watchlist

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Figure 5 SP500 Sectors with weight and weighted distance added

In Figure 5 you can see the weights of each sector. Interestingly they sum up to 100.51%, the slight variance has more to do with the different times that data is received and updated. The SP500 updates more often than the Sectors and the Market Cap has its own delays so we get slight variances.

The last column in Figure 5 is the product of the MarketCap of the Sector with the distance of the RRG Ratio from the 100 apex (divided by 10^{-11} to make it a sensible number). So the sums for this then become 6.55 on the Left Side and 6.42 on the right, that's a 2% variance compared to 17% in the unweighted case.

The script for this one is:

```
MC1=DATAFIELD(FIELD=CUR_MKT_CAP);
R1 = JDKRS(INDEX=SPX:BLMB);
MC1 * (R1-100)
```

The result of this is that we have been able to show within 2% that the GICS Level 1 Sectors are balanced in a RRG. That's great from a theoretical point of view but how can we use that information? For the most part there are a couple of key lessons that we can take away from this:

First, when we do Intermarket Analyst based on Sectors, we cannot consider all the Sectors to be equal because clearly they are not. The heavier Sectors will exert more torque the further away from the apex they are (now that will make an interesting study). In fact examining historical sector

rotations and extrapolating to today can actually be dangerous because the environment is so different.   Let's look at the situation 20 years ago as an example.
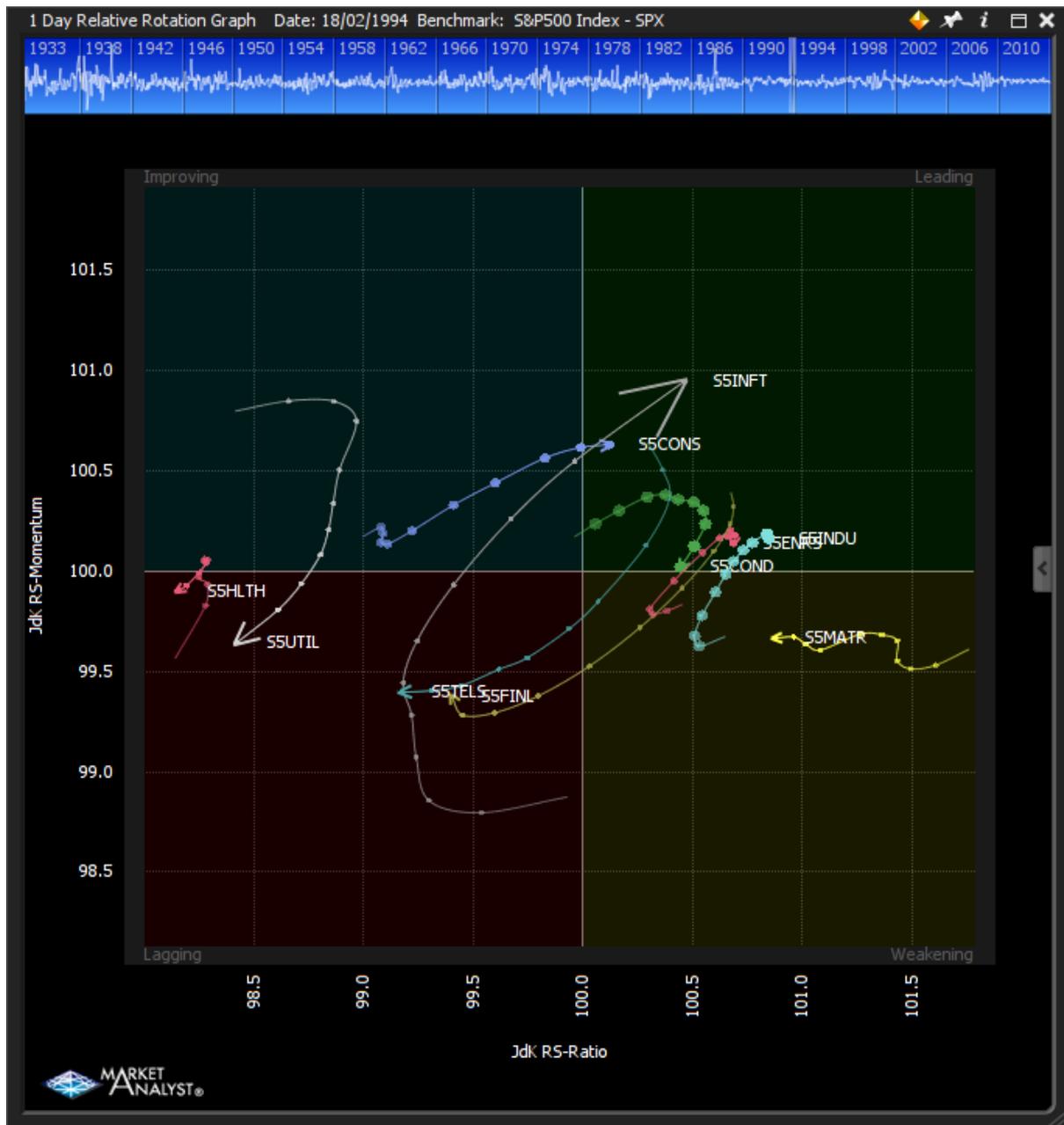
Figure 6 SP500 Sectors with weights 18th Feb 1994

Here we can see that Industrials and Consumer Discretionary are the biggest at 15% and 16% respectively. In fact the spread is more even with the smallest sector being Utilities at 6%. So at that time, with a smaller difference between Sectors, we could almost ignore the weights and treat them as equals and apply all the theories and see them hold. Today I don't think we have that luxury. There is more research that will need to be done in this area.

 The other big take away that impacts Portfolio Selection is that if my goal is to gain alpha over the Index then I need to consider the weights. Back to the seesaw, by virtue of his weight, to have balance the largest child cannot move too far away from the apex of the seesaw. In the same way, the largest Sector (or equity in a portfolio) cannot move far from an Index that it is contributing to. The further it moves away, the more it effects the value of the Index, dragging the Index with it. The

only exception to this is when one large Sector is moving in one direction and there is another large Sector moving the opposite direction maintaining the balance across the chart. That in itself presents a fantastic pairs trading opportunity, but I digress. If I want to achieve alpha, I need a base of the heaviest Sectors, and then layer in the lighter sectors that are improving by going overweight on them.

Since securities in the RRG tend to rotate in a clockwise fashion, we are looking for securities in the chart that are moving from under-performing the Index with enough velocity to break through (watch for another Market Analyst White Paper on the Physics parallels of RRG).

Now that we are considering weight too, we can make some decisions on position sizing by going overweight on the lighter Sectors since we know that they have the greatest capacity to move a long way from the index without dragging the index along. Obviously that can happen in both positive and negative directions so they do present the greatest risk too.
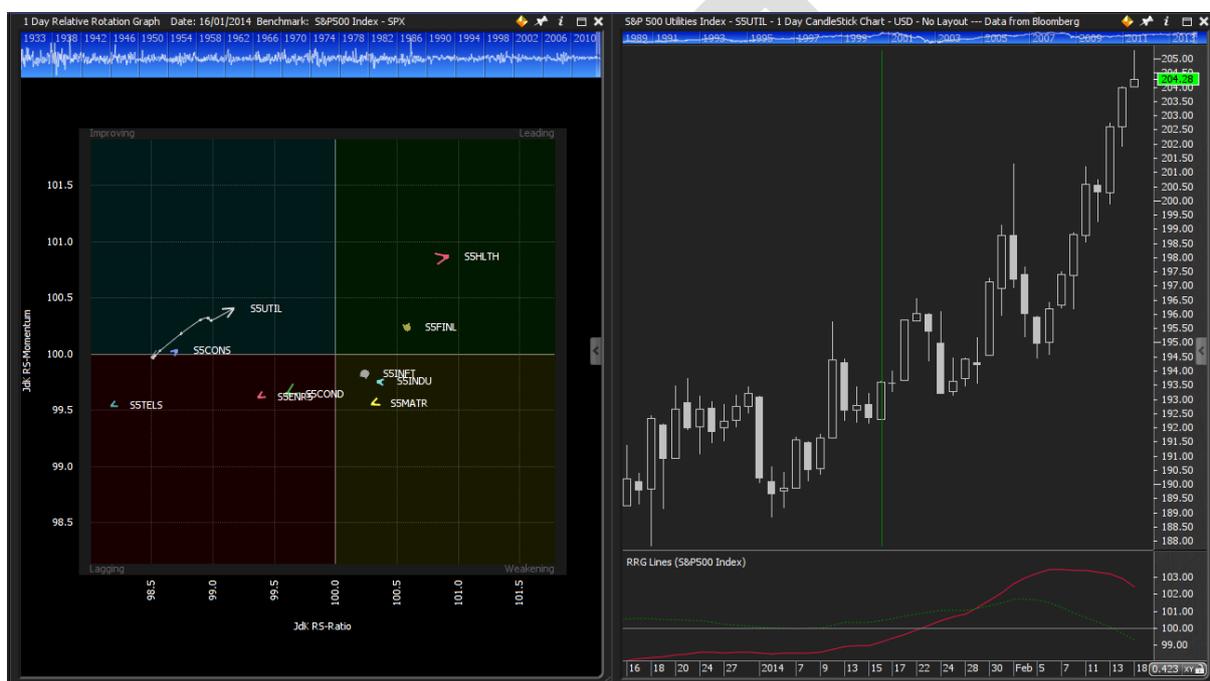
Figure 7 RRG at 16th Jan 2014

On the 16th Jan 2014, Utilities (The only item showing the arrow in the RRG chart) was in one of the "perfect" RRG positions, at this point it is still under-performing the SP500 (it is on the left side of the chart) but the trajectory is showing that it is heading in the right direction and the space between the observations (the dots) being wide shows good velocity. The chart on the right has a green line on the 16th to show that date on the price chart.

We have identified the Sector that we are interested in, the next step is to drill into the Utilities to see what selections we can make from the sector. When we do this we need to make a choice if we are going to keep SP500 as the Benchmark or now look at each of the stocks compared to the Utilities Sector. I prefer the latter as I am still interested in the weights and to take that same selection philosophy into the Sector. By doing this I can look for low weighted stocks that have the greatest ability to give my significant gains over the index.

Figure 9 shows the results with weights of each stock compared to the weight of the Sector.
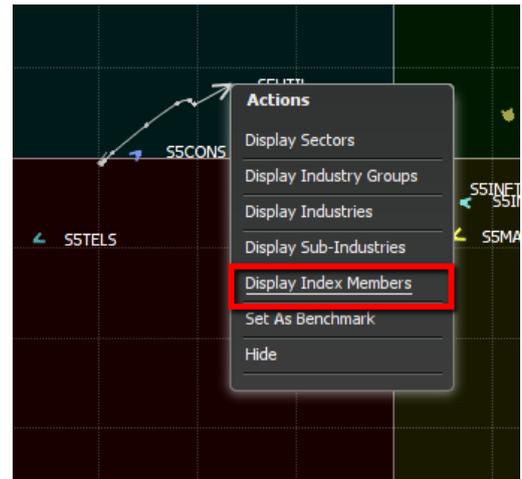
*Figure 8 Drilling into the Sector*
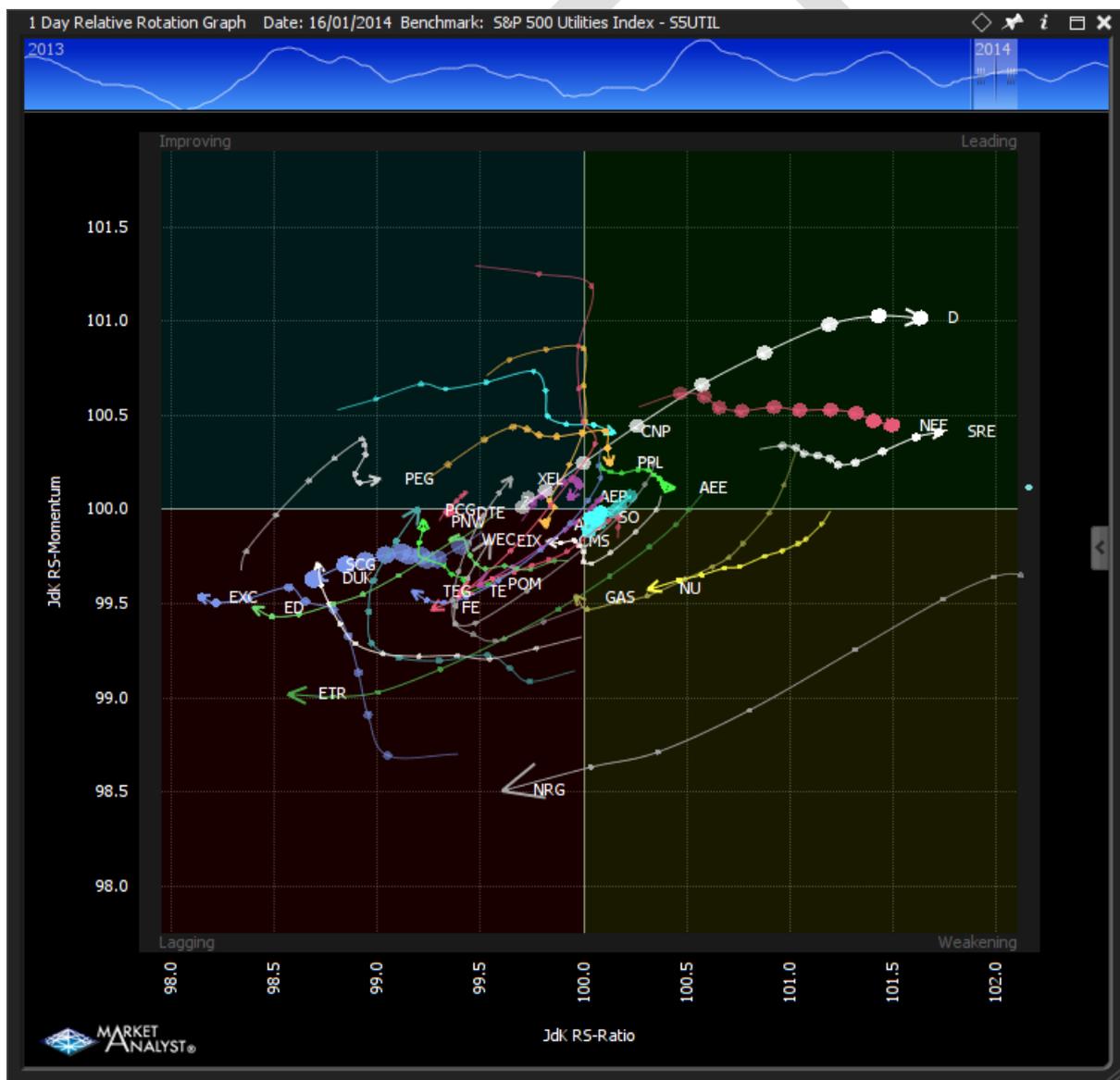
Figure 9 Utilities Sector Stock 16th Jan 2014

The best opportunity that I can see in Figure 9 is PEG, it is in the top left quadrant, is heading in the right direction and has low weight (3.3%). It is at this point that I would be opening up that chart and confirming with my other analysis techniques. Figure 10 shows the performance of the stock since the 16th.
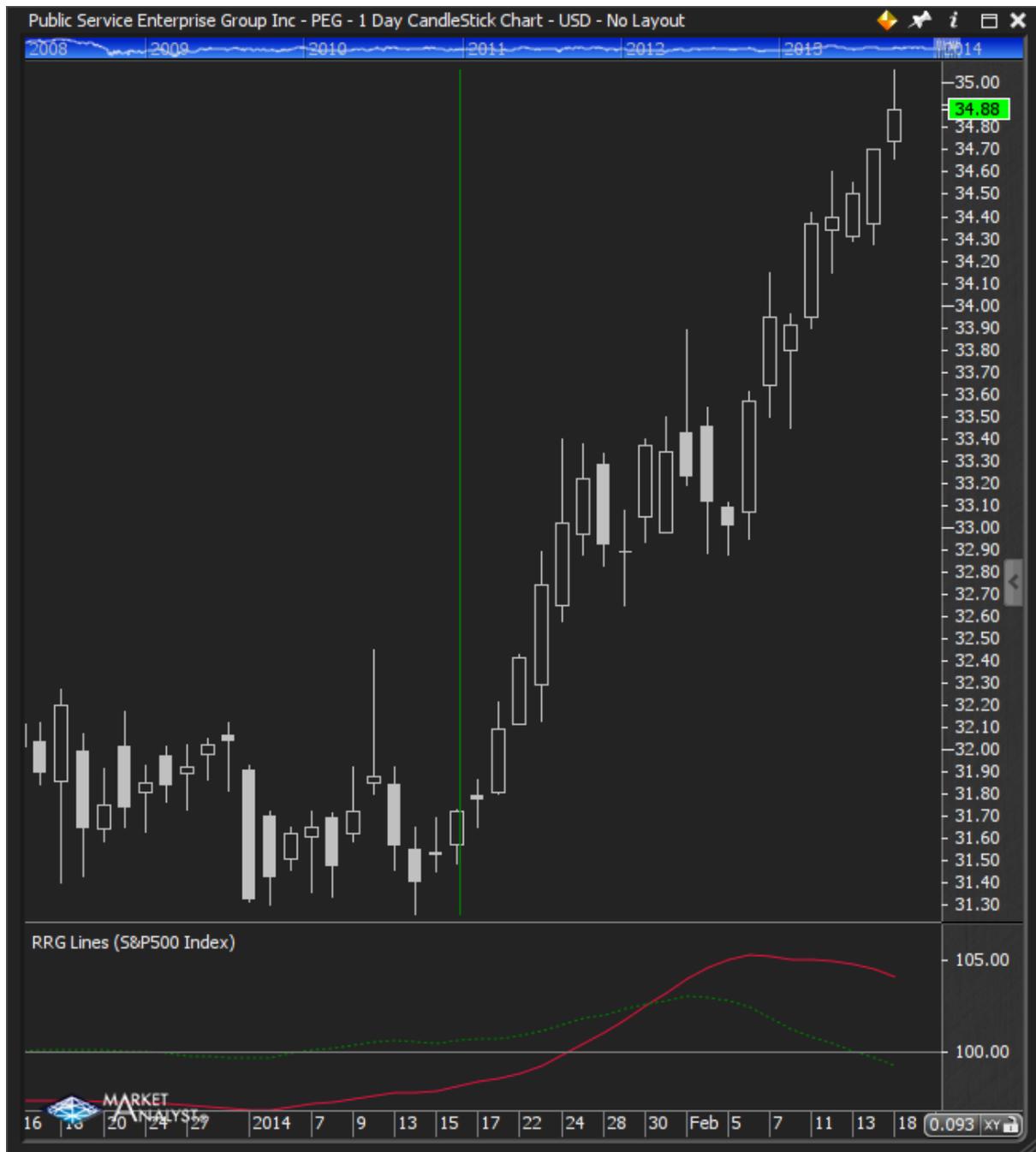
Figure 10 PEG showing performance since 16th Jan 2014

If we fast forward to today (18th Feb 2014) and then remove all the other securities from the RRG, let's have a look at PEG in Figure 11. I have also increased the tail length of PEG so I can see the path that it took through the RRG.
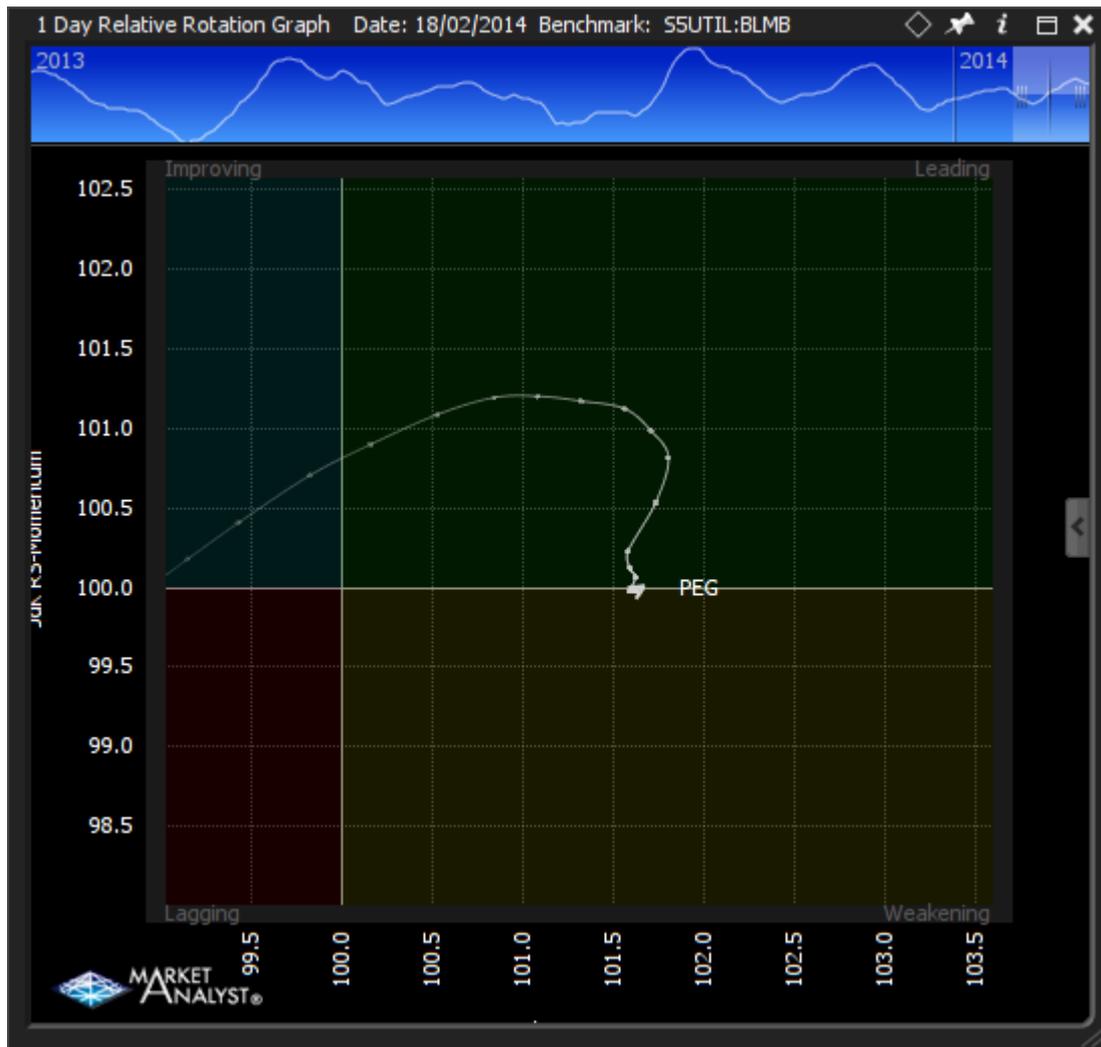
Figure 11 PEG against S5UTIL 18th Feb 2014

PEG out-performed as expected and even though it is starting to weaken, it is still out-performing the S5UTIL Index. The RRG successfully assisted me in finding a great trade. It is always interesting to bring this back to the SP500 and see how the performance has been against the Index (particularly if the SP500 is my Benchmark). Remember in Figure 1 that Utilities was out on its own? Let's contrast that to PEG by adding PEG to that same RRG in Figure 12.
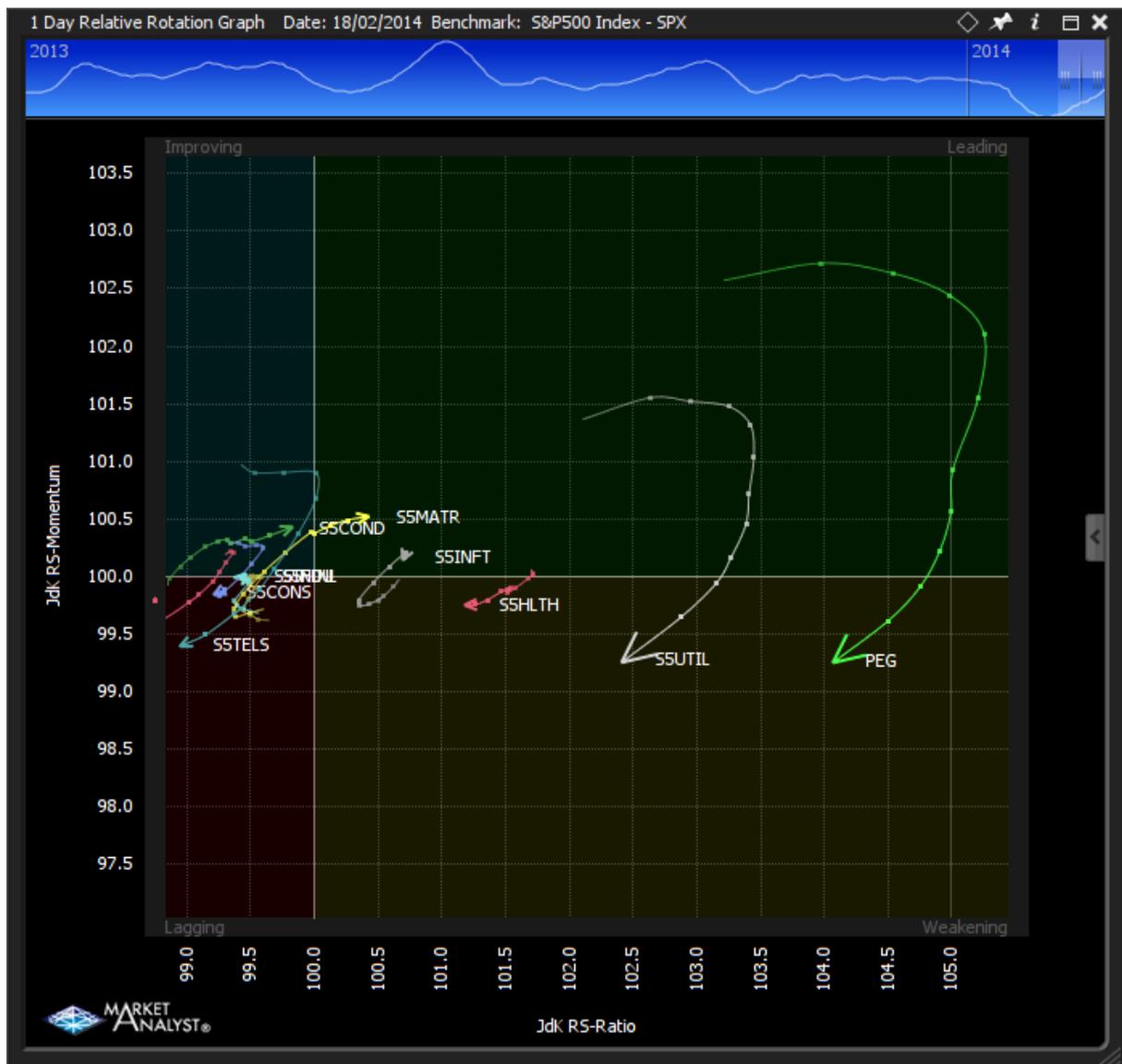
Figure 12 SP500 GICS Level 1 Sectors with PEG Added

We can see that PEG outperformed the SP500 by more than the Utilities Sector but it has the same general shape as the Utilities. This makes sense since PEG was the outperforming stock in the outperforming Sector. The ability to drill in and make these selections is a powerful advantage for anyone that needs to make selections like these.

As with all strategies in the market, you need to test these for yourselves to have confidence in them. This paper is merely presenting that RRG coupled with weights can give a different perspective in understanding both Intermarket Analysis and Portfolio Selection. If you do not have access to these charts and would like to try them for yourself, contact one of our Market Analyst offices and we'd be happy to help you set up a trial account so you can experiment with these charts.