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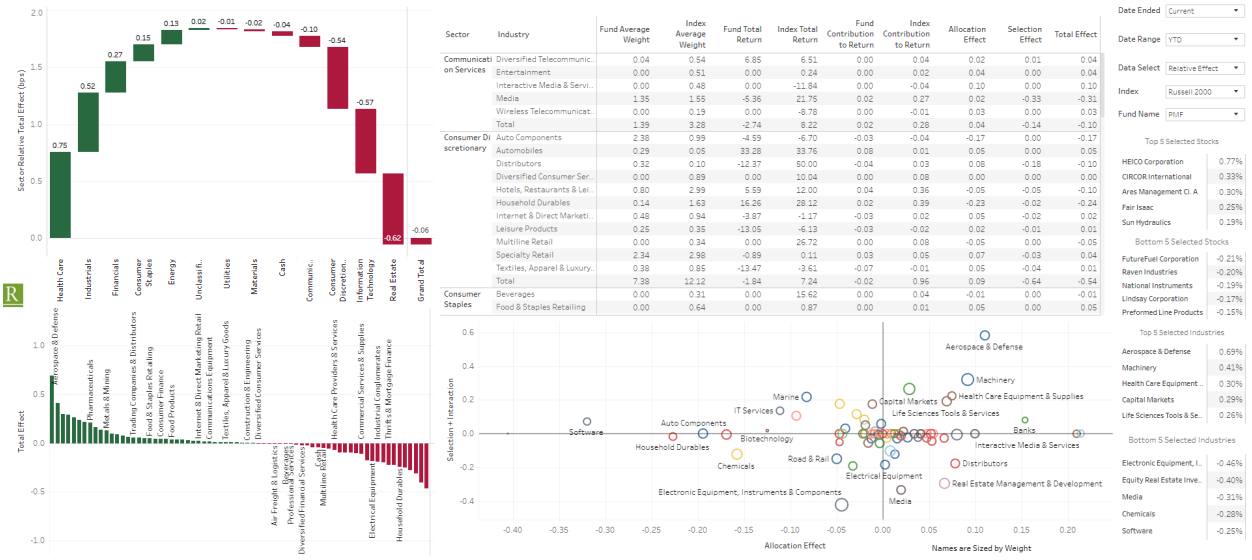
Royce & Associates

Tableau Attribution/Contribution

Maintenance and Development Guide



Introduction:

The Royce Portfolio Attribution/Contribution workbook on Tableau is a powerful tool that allows users to discover what factors lead to their fund's performance. As opposed to the old process of using pivot tables in Excel and searching through the raw data from Factset, the Tableau workbook automatically centralizes the data and presents it in a visual format, allowing the user to quickly make deductions about what factors were most important to performance.

The workbook can be found here.This will direct you to a landing page that shows Allocation, Selection, and Total Effect for three different time periods.Other dashboards that you will be able to find on this Tableau workbook include stock and sector attribution analysis, individual fund attribution and contribution, selection vs construction, raw data, and more. The Portfolio Attribution/Contribution workbook is all about making it easy to not only see the broad picture of what changes a fund experiences in a period of time but also pinpoint the potential causes for said changes, helping the user to make better informed decisions in the future.

Data Sources:

The PAC (Portfolio Attribution/Contribution workbook) uses one published data source on the ranybi01 Tableau server, Attribution. This data source is extracted from the

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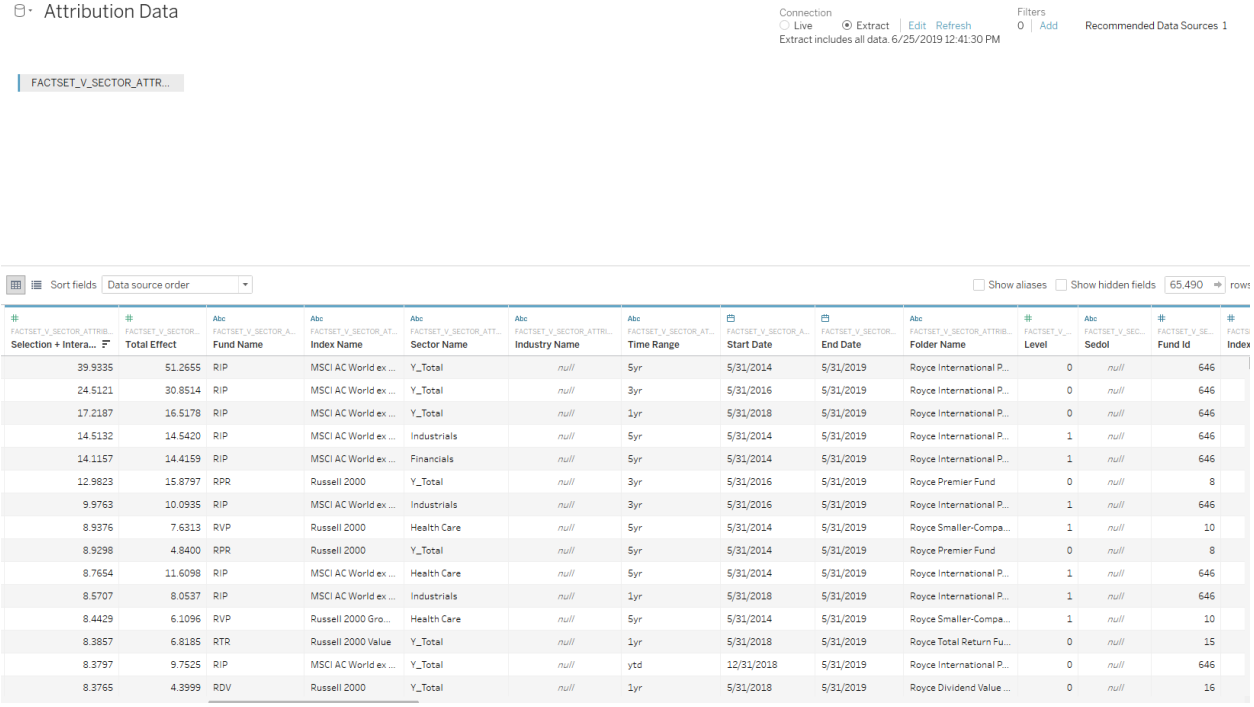
PERFORMANCE Microsoft SQL server, ranysql02. The data source uses an embedded username and password that allows any user to connect to the data source without specific login credentials.



Selection + Intera...	Total Effect	Fund Name	Index Name	Sector Name	Industry Name	Time Range	Start Date	End Date	Folder Name	Level	Sedol	Fund Id	Index
39.9335	51.2655	RIP	MSCI AC World ex ...	Y_Total	null	5yr	5/31/2014	5/31/2019	Royce International P...	0	null	646	
24.5121	30.8514	RIP	MSCI AC World ex ...	Y_Total	null	3yr	5/31/2016	5/31/2019	Royce International P...	0	null	646	
17.2187	16.5178	RIP	MSCI AC World ex ...	Y_Total	null	1yr	5/31/2018	5/31/2019	Royce International P...	0	null	646	
14.5132	14.5420	RIP	MSCI AC World ex ...	Industrials	null	5yr	5/31/2014	5/31/2019	Royce International P...	1	null	646	
14.1157	14.4159	RIP	MSCI AC World ex ...	Financials	null	5yr	5/31/2014	5/31/2019	Royce International P...	1	null	646	
12.9823	15.8797	RPR	Russell 2000	Y_Total	null	3yr	5/31/2016	5/31/2019	Royce Premier Fund	0	null	8	
9.9763	10.0935	RIP	MSCI AC World ex ...	Industrials	null	3yr	5/31/2016	5/31/2019	Royce International P...	1	null	646	
8.9376	7.6313	RVP	Russell 2000	Health Care	null	5yr	5/31/2014	5/31/2019	Royce Smaller-Compa...	1	null	10	
8.9298	4.8400	RPR	Russell 2000	Y_Total	null	5yr	5/31/2014	5/31/2019	Royce Premier Fund	0	null	8	
8.7654	11.6098	RIP	MSCI AC World ex ...	Health Care	null	5yr	5/31/2014	5/31/2019	Royce International P...	1	null	646	
8.5707	8.0537	RIP	MSCI AC World ex ...	Industrials	null	1yr	5/31/2018	5/31/2019	Royce International P...	1	null	646	
8.4429	6.1096	RVP	Russell 2000 Gro...	Health Care	null	5yr	5/31/2014	5/31/2019	Royce Smaller-Compa...	1	null	10	
8.3857	6.8185	RTR	Russell 2000 Value	Y_Total	null	1yr	5/31/2018	5/31/2019	Royce Total Return Fu...	0	null	15	
8.3797	9.7525	RIP	MSCI AC World ex ...	Y_Total	null	ytd	12/31/2018	5/31/2019	Royce International P...	0	null	646	
8.3765	4.3999	RDV	Russell 2000	Y_Total	null	1yr	5/31/2018	5/31/2019	Royce Dividend Value ...	0	null	16	

The data source itself is just a view created by Ruby Yocum called FACTSET_V_SECTOR_ATTRIBUTION_SALES_VERSION. The table contains contribution, characteristic, and sector level attribution data among other things. (For a full list of fields in this view, open up the attribution data source from the Data Source Updater workbook in **R:/Tableau/workbooks**) This data is imported from Factset at the end of each month and is added to the current database. Though this data source is quite simple to use for Tableau and does not require any complicated joins or pivots, one very important and counterintuitive thing to note is the field known as column level (or Level, the alias used in Tableau). This field can be a value from 0 to 4 and is one of the main ways we sort data within this workbook. Generally, the lower the Level, the less granular the data is and vice versa. Level 0 is data for the entire fund during a specific time period, Level 1 is at the sector level, Level 2 is industry, and Level 3 is the individual stock. For levels 0 through 3, even though it seems that they should aggregate to lower level data (i.e. level 2 data should add up to level 1 data for a fund), **many times data will not add up correctly**. Attribution calculations done by Factset are completed at the sector level, so industry attribution will not add up to the sector level, and individual stocks in level 3 will never add up perfectly to level 2. This can be explained by the fact that we do not store the several thousand names that go in and out of the Russell 2000 that would actually add up to explain every aspect of performance attribution and contribution. Keeping in mind these different levels of data is very important for making sense of how certain visuals are constructed on the workbook. Apart from these standard rows in the data source, Level 4 contains all other information that does not fit into the standard fund, sector, industry, stock hierarchy. This

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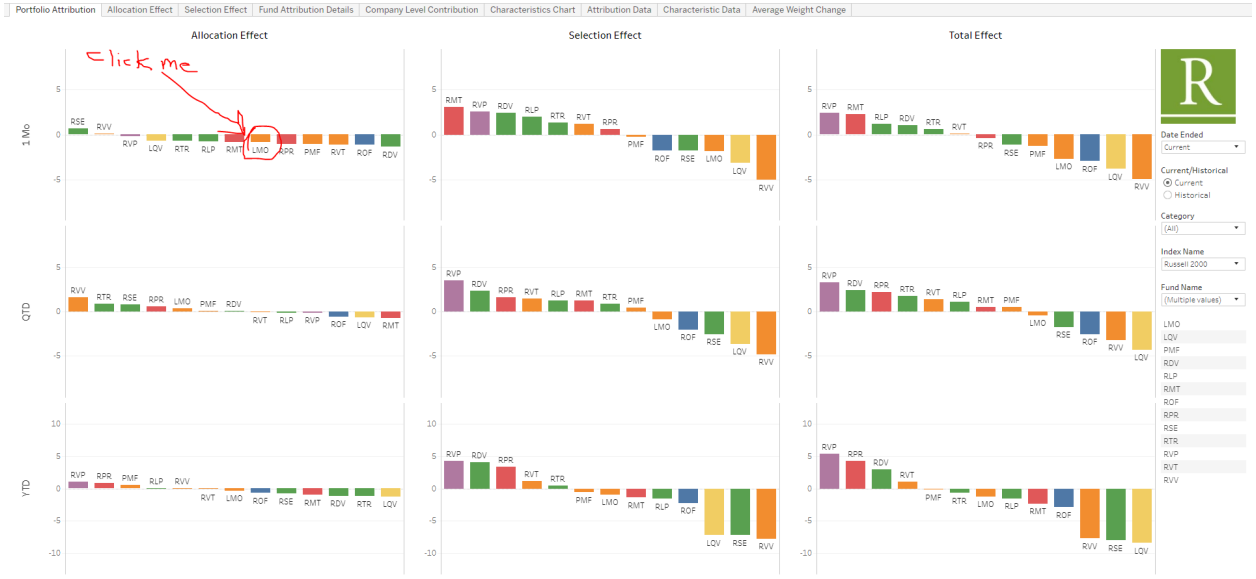
includes data like net cumulative return, expense impact, gross cumulative return, and residual. This data is only included on one or two visuals as it is not as important as the other levels of data, but it is still kept in the same view. Level 4 data can be found by using the other two primary fields we use to organize data in this data source. These fields are end date, which declares when the data was retrieved from Factset, and time range, which defines what time period attribution and contribution were calculated for (i.e. 1 month, QTD, YTD) Level 4 data is found for every end date but only shown during the 1 month time period to prevent duplication errors.

Navigation:

As stated before, this workbook is all about enabling its users to see broad images of performance attribution data and then letting them adjust settings to look at more detailed views regarding specific funds, time periods, and factors. From the starting page, a user can click on any of the funds in the nine effect graphs in order to bring up a different dashboard for that fund and time period. Clicking on allocation or selection effect graphs will bring the user to a dashboard that displays that factor broken down by the sector level. Clicking on a fund when on one of these dashboards or on one of the TE graphs on the landing page will bring up the Fund Attribution Details dashboard, which shows detailed information about all aspects of that fund. The other dashboards in this worksheet can be accessed by clicking on one of the tabs on the top of the screen.



Workbooks:

There are two Tableau workbooks that are currently used to operate and update the Attribution/Contribution dashboard. Both are located in **R:\Tableau\Workbooks**

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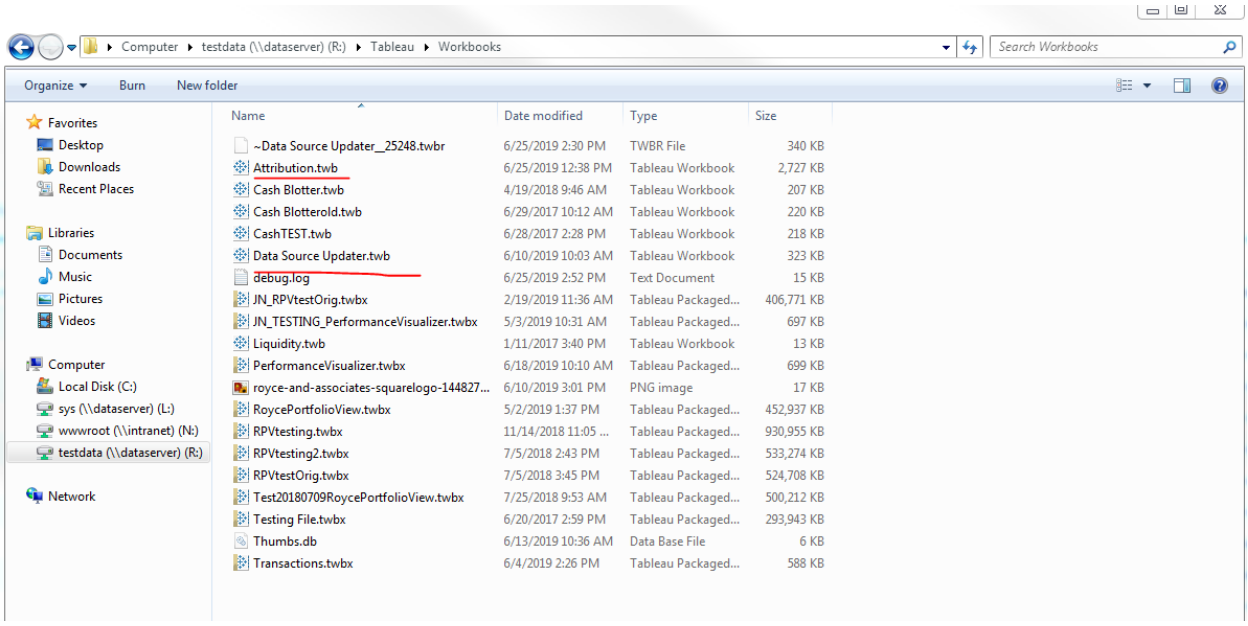

The data source updater is a supplementary tool that allows changes to be made to the published versions of the Attribution/Contribution data sources.