



Interactive reporting in FIA

Andrew Colin

Flametree Technologies

September 2024

CONTENTS

Introduction.....	2
Available formats	2
Generating interactive reports.....	2
Default interactive reports.....	2
Active results.....	2
Report names.....	3
Sector decompositions	4
Multiple interactive reports	5
Decomposition depth	5
Additional settings.....	6
Columns.....	6
Display constraints.....	6
Names of interactive reports	7
Sorted data.....	8
Ranked reports.....	9
Ranked weights, returns and contributions.....	9
Ranked attribution contributions	10
Other interactive report settings.....	11
Further information	11
Mathematical definitions	12
Weight.....	12
Return	12
Contribution.....	12
Active return/contribution.....	12
Smoothing.....	12
Returns and contributions	13



INTRODUCTION

One of FIA's most powerful features is its ability to produce multiple, customised hierarchical reports, both as Excel files and in other formats. Interactive Excel reports can be configured using Excel's drilldown capabilities, allowing data to be summarised or rolled up as required. This is extremely useful when examining complex data output to gain a quick appreciation of the report's results.

AVAILABLE FORMATS

Hierarchical reports contain data on your portfolio and benchmark, summarised at a range of levels, in ways that are defined by the user.

These reports can be generated in CSV, Excel, JSON and SQL-ready formats. Each contains the same information but provided in different formats. Just as for other reports generated by FIA, the following Boolean switches govern which formats are used to generate output:

- **CSVReport**
- **XLSReport**
- **JSONReport**
- **SQLDataReport**

GENERATING INTERACTIVE REPORTS

DEFAULT INTERACTIVE REPORTS

To turn interactive reports on, set

InteractiveAttributionReport = true (or 1)

Interactive reports are generated by default, but can be turned off using the above setting.

ACTIVE RESULTS

If FIA is run on a portfolio and benchmark simultaneously, then data for the portfolio, the benchmark, and the difference between the two is shown, where appropriate. The difference is called *active data*.

For columns where portfolio, benchmark and active data are shown, FIA automatically rolls up the columns so that only active data appears on the report, and a '+' sign allows the user to unpack all three columns.

This behaviour can be overridden by setting **ShowActiveOnly** to true, in which case all columns are shown.

1				
2				
1	2	3		
1	A	B	C	D
1	Interactive report			
2	Portfolio: PORTFOLIO			
3	Benchmark: BENCHMARK			
4	28-MAY-2018 to 30-JUN-2018			
5				
6	Sectors	Weight	Weight	Weight
7	STRATEGIC/SECURITY	Portfolio	Benchmark	Active
18	bonds	15.0000%	50.0000%	(35.0000%)
20	cash	5.0000%	10.0000%	(5.0000%)
29	equities	80.0000%	40.0000%	40.0000%
30	SUMMARY	100.0000%	100.0000%	0.0000%
31				

REPORT NAMES

portfolio name + “_” + benchmark name + “#” + [sector_names] + “_” + interval + “_” + batch id

- *portfolio name* is the value in column 2 of the portfolio weights and returns file
- *benchmark name* is the value in column 2 of the benchmark weights and returns file (only shown if file is supplied)
- *sector names* are the sector names provided in the *ReportSectors* setting in the configuration file (can be left unset)
- *interval* is specified in the configuration file (can be left unset)
- *batch_id* is specified in the configuration file (can be left unset)



FIA also has the ability to write multiple Excel reports into different tabs of the same spreadsheet. To do this, provide a spreadsheet name using **SingleExcelReport**, which puts all Excel reports into a single spreadsheet with that name.

SECTOR DECOMPOSITIONS

The default settings is to use the sectors *currency, security*.

The user can override these default settings by assigning other sectors to **ReportSectors**:

ReportSectors=sector1, sector2,...

Here, decomposition settings are as follows:

- Sectors must be provided as a comma-delimited list, with no comma after the last sector. Spaces are ignored.
- Sectors must either be one of {'*currency*', '*credit*', '*curve*', '*maturity*', '*duration*', '*coupon*', '*security*', '*date*', '*portfolio*'}, or be a user-defined sector set up in Column 3 of the security master file. Use of a sector that is not defined will cause an error.
- If a sector is defined, but its value is not supplied, then its value will be set to 'Undefined' and it will be placed in an 'undefined' category on the report.
- To provide data on individual securities in the report, append 'Security' to the end of the list. This treats 'Security' as a sector type with only one holding.
- Sectors should be in nested order, so that the first sectors provide the broadest decomposition, and sectors below it provide finer decomposition, down to the individual security level. Using the wrong order will not cause an error, but the reports will be very hard to interpret.
- There is no need to include *security* in the ReportSectors list if you just want a sector-level report. For instance, using *credit* as the only sector will generate a report that summarises results down to the credit bucket level, but no further, so that security-level data is neither calculated nor displayed. This can be useful in reducing the size or calculation time of a complex report.
- If you are running sector-based attribution, ensure your report follows the same decomposition as the asset allocation sectors. Reporting on a different set of sectors will not cause an error, but the reports will not give useful information.
- If used, 'Date' must be the first sector defined. If this sector is included, FIA will generate report data for each day for which data is provided. Note that this can generate very large reports.
- If used, 'Portfolio' must be the first sector defined after 'Date'. By including this setting, FIA decomposes reports by subportfolio. For more information, see the accompanying white paper 'Nested Portfolios in FIA'



1				
2				
1	2	3	4	
1	Interactive report			
2	Portfolio: PORTFOLIO			
3	Benchmark: BENCHMARK			
4	28-MAY-2018 to 30-JUN-2018			
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				

Figure 3: Decomposition using **ReportSectors= strategic,sector,duration_bucket**. Report is fully unrolled.

MULTIPLE INTERACTIVE REPORTS

- Unlike other reports in FIA, you can generate multiple interactive reports for a single portfolio or portfolio/benchmark pair, by defining multiple values of **ReportSettings**. Each instance (assuming it has been set up correctly) will generate a separate report.

For example, setting

ReportSectors= strategic,security

ReportSectors= credit,security

ReportSectors= strategic,sector,credit,bondtype,security

in the configuration file will generate three separate interactive reports.

DECOMPOSITION DEPTH

When generating Excel reports, drill-down reports are limited to eight sectors, which reflects Excel's built-in limitation on the depth of drill-down reports. CSV and JSON reports do not have this limitation.



ADDITIONAL SETTINGS

Additional settings allow reports to be customised beyond the sector level. Currently, FIA allows you to

- Select which columns are shown ('Columns')
- Select customised names for interactive reports ('NAME')
- Select which file results are written to ('FILE')
- Sort data in interactive reports ('SORT')
- Rank results ('RANK')

Additional settings are separated from the ReportSectors setting and from each other using a pipe ('|') symbol. To assign values to a setting, enter its name and follow with an equals sign ('=') and the names of the variables you want to assign. For instance,

ReportSectors=Duration,Security|columns=AA,R_BASE,R_A,MD

shows asset allocation, base currency return, attribution contributions and modified duration at the duration bucket and individual security levels;

ReportSectors=Duration,Security|columns=AA,R_BASE,R_A,MD|sort = AA

shows the information in the previous report, sorted by asset allocation;

ReportSectors=Duration,Security|columns=AA,R_BASE,R_A,MD|ranked=R_A,AA,C_BASE,R_BASE

shows the information in the previous report, but also generates ranked reports for attribution contributions, asset allocation, base currency contribution and base currency returns.

COLUMNS

FIA allows the user to select which columns are displayed in an interactive report, using the **columns** setting.

For instance, to decompose a report by Industry, security, and to show weight, base return and local return, set

ReportSectors = Industry, Security | COLUMNS = AA, R_BASE, R_LOCAL

Multiple reports can be used to view the same portfolio in different ways. For instance,

ReportSectors = Industry, Security | COLUMNS = R_A

ReportSectors = Industry, Security | COLUMNS = MD, MD_C, MD_W

will generate one report decomposing the performance contributions of the portfolio by industry and security over the calculation interval, and another showing modified duration, duration contribution, and contribution weight at the end of the calculation interval.

DISPLAY CONSTRAINTS

Note that not all quantities can be shown at all times.

- Some columns will not be shown when no benchmark is available; for instance, price return, which is a measure of base currency return between the same security in the portfolio and the benchmark.



- Some columns will not be shown at particular levels. For instance, asset allocation contribution at levels lower than the asset allocation variable has no meaning.

In addition, the interval over which column data is aggregated can vary. Some are aggregated over the calculation interval, while others are shown only at the last date of the interval.

The following list shows which columns FIA supports. Here,

- *Column ID* shows the mnemonic for each column
- *Single* shows whether the variable can be displayed for a single portfolio
- *Variable* describes what the variable shows

Column definitions in FIA

Column ID	Single	Variable	Comments
MV	X	Market value	Measured in dollars
EE	X	Effective exposure	Measured in dollars
AA	X	Weight	Total weight is always 100%
MD	X	Modified duration	Modified duration at security, sector and portfolio level
MD_C	X	Modified duration contribution	Sum of modified duration contributions is portfolio modified duration
R_BASE	X	Base currency return	
R	X	Total return	Equivalent to R_BASE
R_LOCAL	X	Local currency return	
R_A	X	Attribution contributions	Sum of attribution contributions (including FX) equals base return
TE	X	Tracking error	
TE_A	X	Tracking error decomposed by risk	
MV_W	X	Market value weight	Sum of market values weights is always 100%
EE_W	X	Effective exposure weight	Sum of effective exposure weights is always 100%
MD_W	X	Modified duration weight	Sum of MD weights is 100%
DV01	X	DV01	
W_A	X	Average weight over interval	May not sum of 100% due to changes in exposure over calculation interval
C_BASE	X	Base currency contribution	Sum of base contributions is total base return
C_LOCAL	X	Local currency contribution	Sum of local contributions is total local return
C_FX	X	FX currency contribution	Sum of FX contributions is total FX return
BASE_ME		Base currency management effect	
LOCAL_ME		Local currency management effect	
W_TILDE		Normalised weight	

NAMES OF INTERACTIVE REPORTS

Individual worksheets can be named using the NAME setting. For instance, adding

ReportSectors = Industry, Issuer, Security | COLUMNS = AA, R | NAME = Weights and returns



means that the Excel worksheet generated by this command will

- decompose data by industry, issuer and security;
- show columns for weight and base return;
- have a sheet named **Weights and returns** containing this information.

A CSV or JSON file generated using the same settings will also have the same name.

Note that no quotation marks are required to delineate a worksheet name.

Excel imposes a 31-character limit on the names of worksheets. FIA will therefore flag an error if a supplied worksheet name is longer than 31 characters.

SORTED DATA

Security-level data can be sorted by using the Sort option. For instance, setting

ReportSectors = Industry, Issuer, Security | SORT=R_BASE_A

will sort output by active base currency return, within each sector.

If **SORT** is not set, security-level data is sorted by the name of the security, in ascending alphabetical order. Otherwise, **SORT** must be one (and only one) of the following values.

Valid options are as follows:

Sort code	Mnemonic
AA_P	Portfolio weight
AA_B	Benchmark weight
AA_A	Active weight (difference between portfolio and benchmark weight)
R_BASE_P	Portfolio base currency return
R_BASE_B	Benchmark base currency return
R_BASE_A	Active base currency return (difference between portfolio and benchmark base currency return)
R_LOCAL_P	Portfolio local currency return
R_LOCAL_B	Benchmark local currency return
R_LOCAL_A	Active base currency return (difference between portfolio and benchmark base currency return)



C_BASE_P	Portfolio base currency contribution
C_BASE_B	Benchmark base currency contribution
C_BASE_A	Active base currency contribution (difference between portfolio and benchmark base currency contribution)
C_LOCAL_P	Portfolio local currency contribution
C_LOCAL_B	Benchmark local currency contribution
C_LOCAL_A	Active local currency contribution (difference between portfolio and benchmark local currency contribution)

The order in which sectors are displayed is not modified by the value of **SORT**. For instance, credit buckets will continue to be shown in the canonical order AAA, AA+, AA, AA- etc. However, security-level data within each sector will be ordered according to the value of **SORT**.

FIA can use a sorting order even when the variable on which the sort is based is not displayed.

RANKED REPORTS

RANKED WEIGHTS, RETURNS AND CONTRIBUTIONS

Ranked reports show the largest and smallest weights, returns and contributions of individual securities and sectors in the portfolio and benchmark, in ascending or descending order. If an interactive report is calculated using a given sector, ranked reports will show data for that sector in ranked order, as well as for individual securities.

The ranked report piggybacks off the values calculated in the interactive report, using the partitioned values calculated and displayed in the main report.

To generate a ranked report, add the *'ranked='* option to the **ReportSectors** setting, in the same way as for the *'columns='* and *'name='* options. As before, the *'ranked='* option must be separated from other options by a pipe (|) symbol. Options can be provided in any order.

At present, there are four valid values for *'ranked'*, each corresponding to a particular type of report. These are

Mnemonic	Refers to
AA	weights
R_BASE	base currency returns
C_BASE	base currency contributions
R_A	attribution contributions

For example,

ReportSectors=Duration,Security|ranked=AA, R_BASE



will generate additional ranked reports for weights and base currency returns.

The integer-valued configuration setting **RankCount** allows you to select how many ranked items are displayed. For instance, if **RankCount=5** (the default), then the top and bottom five of each of the above quantities are shown on the corresponding report.

RANKED ATTRIBUTION CONTRIBUTIONS

FIA also allows you to display ranked contributions from individual risks, shown in the same way as other ranked data. For instance, if the largest contribution to return was credit spread from BBB rated securities, then this will be the first item shown on the ranked attribution report. This information allows rapid interpretation of the attribution report, highlighting the main drivers of return.

Together with these ranked contributions, FIA also displays contextual information showing the context of these returns. In the above example, the top line will show the weight of BBB rated securities, the modified duration of that sector, and the change in yield of that sector. The product of the three quantities will be close to the given contribution.

This collated information is shown as contextual because, unless there is a very simple case, the relationship will not be exact. Weights, risks, and market drivers all change over time, and smoothing will adjust the contributions generated by the portfolio.

For this reason, the drivers shown are unlikely to combine exactly to the displayed contribution. However, they will be useful in interpreting the *context* (portfolio positioning, market conditions) in which gains or losses were made.



ACTIVE			
Highest contributors			
Risk	Sector/security	Contribution	Driver
Credit	Portfolio	2.4482%	Active average weight = 0.0000 Portfolio MD = 3.6915 Benchmark MD = 3.7633 Portfolio dY from credit = -0.0032 Benchmark dY from credit = -0.0029 Net P contribution = 1.1975 Net B contribution = 1.0903 Net contribution = 0.1071
Credit	5y-6y/IADB_575_150611	1.2588%	Active average weight = 36.7350 Portfolio MD = 5.4027 Benchmark MD = 0.0000 Portfolio dY from credit = -0.0025 Benchmark dY from credit = 0.0000 Net P contribution = 0.4864 Net B contribution = -0.0000 Net contribution = 0.4864
Credit	5y-6y	1.2516%	Active average weight = 25.4975 Portfolio MD = 5.4027 Benchmark MD = 5.5109 Portfolio dY from credit = -0.0025 Benchmark dY from credit = -0.0027 Net P contribution = 0.4864 Net B contribution = 0.1654 Net contribution = 0.3209
Credit	3y-4y/ABN_55_150908	0.6833%	Active average weight = 30.7130 Portfolio MD = 3.4514 Benchmark MD = 0.0000 Portfolio dY from credit = -0.0031 Benchmark dY from credit = 0.0000 Net P contribution = 0.3289 Net B contribution = -0.0000 Net contribution = 0.3289
Credit	3y-4y	0.6826%	Active average weight = 19.4368 Portfolio MD = 3.4514 Benchmark MD = 3.3628 Portfolio dY from credit = -0.0031 Benchmark dY from credit = -0.0029 Net P contribution = 0.3289 Net B contribution = 0.1103 Net contribution = 0.2186

Part of a contextual attribution report for a simple fixed income portfolio, showing the largest contributors to active return, and their drivers.

OTHER INTERACTIVE REPORT SETTINGS

Addition Boolean settings for interactive reports are as follows:

- **BlankZeros** shows zero values as blanks
- **Unfold** ungroups all nested data on interactive reports
- **ShowActiveOnly** hides portfolio and benchmark data and only shows active data.
- If defined, **SingleExcelReportFile** tells FIA to write all Excel output to a single Excel file with name given by the specified value. For instance,
SingleExcelReportFile=output
tells FIA to write all Excel reports to tabs of an Excel file called output.xlsx.

FURTHER INFORMATION

For more information, please contact

Andrew Colin PhD

+61 413 385 057 andrew.colin@flametree.global



MATHEMATICAL DEFINITIONS

WEIGHT

The weight of a security is its market value, divided by the market value of the entire portfolio. This means that

$$\sum_i a_i = 1$$

where a_i is the weight of security i .

RETURN

The return of a security is supplied in base and local currency terms. The return due to foreign exchange movements is therefore given by

$$1 + r_{FX} = \frac{1 + r_B}{1 + r_L}$$

The return R of a portfolio of assets is given by

$$R = \frac{\sum_i a_i r_i}{\sum_i a_i}$$

where a_i and r_i are, respectively, the weight and return of security i .

CONTRIBUTION

Over a single interval, the contribution c_i of a security to a portfolio's return is given by

$$c_i = a_i r_i$$

so that the total return R of a portfolio over that interval is given by

$$R = \sum_i c_i$$

ACTIVE RETURN/CONTRIBUTION

The active return, or contribution, of a portfolio over a benchmark is given by the difference in each quantity between the portfolio and benchmark. 'Difference' can be calculated in arithmetic or geometric terms, depending on the user's requirements.

SMOOTHING

FIA adjusts contributions over more than one interval so that they always aggregate to the overall return of the portfolio over the entire interval. This smoothing can either be additive or geometric, depending on user requirements.



RETURNS AND CONTRIBUTIONS

Two types of returns are available: local and base. Local return is the return of the asset in local currency, while base return is the return of the asset in terms of the base currency of the portfolio.

Over any combination of periods:

- The local return of a portfolio is always equal to the sum of the local performance contributions.
- The base return of a portfolio is always equal to the sum of the base performance contributions.
- The active local return is identical to the active local management effect.
- The active base return is identical to the active base management effect.
- The sum of the (smoothed) AA, SS, price effect, and FX is the total active return.

The sum of the smoothed returns without FX does not exactly equal the local management effect. The reason is that base and local returns are calculated from first principles, without any smoothing; smoothing is only applied to the attribution effects, which distorts them slightly but guarantees that they sum to the active base return. So aggregating AA, SS and price effect results in a number that is very close, but not identical, to the overall active local return, which is the local management effect.