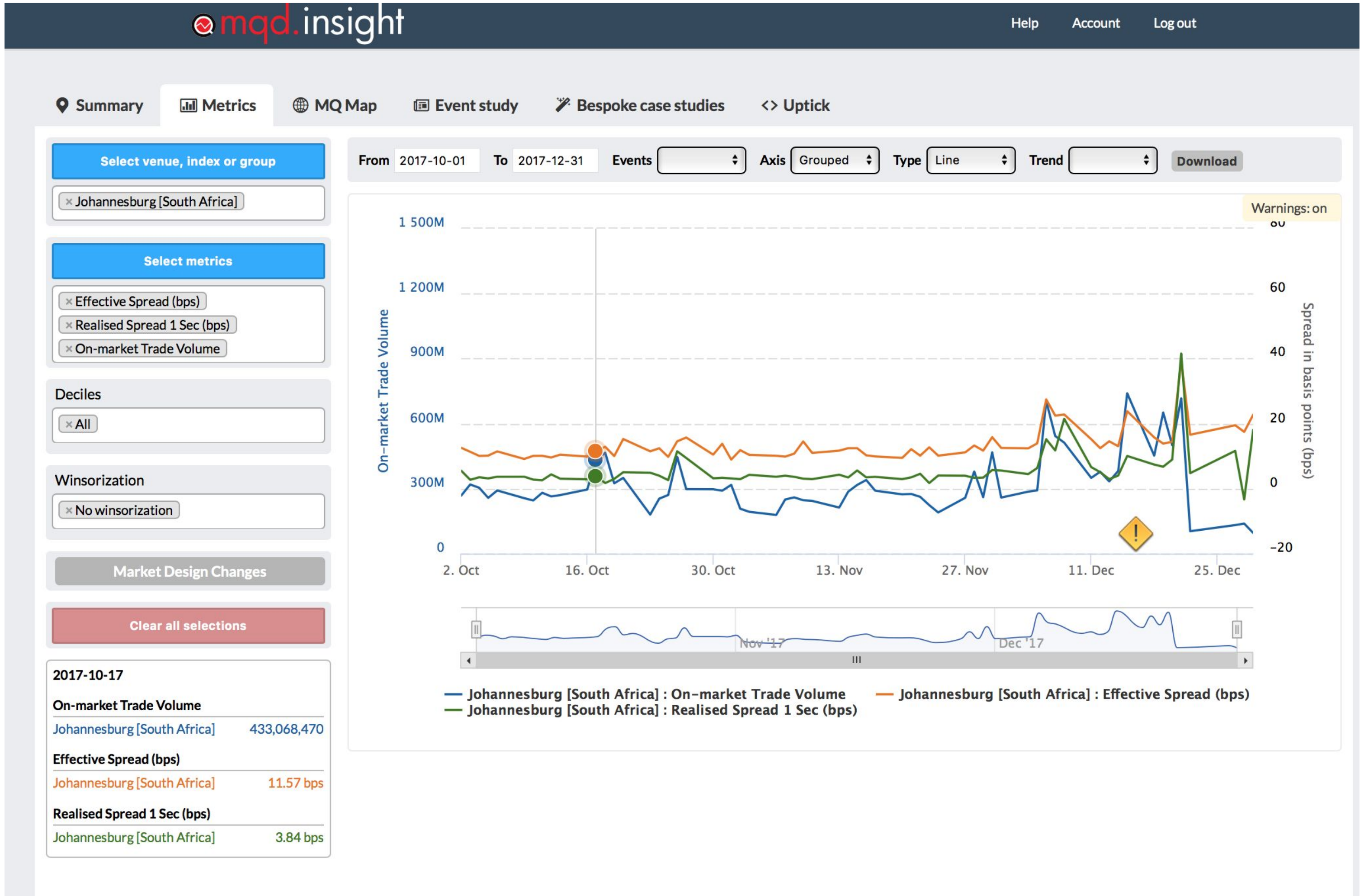
Quality assurance after market set up



Juliane Krug

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CMCRC
ASSURING MARKET QUALITY

16 March 2018

Proceeding of setting up a market

1. Set up market-config file - **DONE**
2. Create dependencies for required metrics -
3. Create jobs
4. Run short test period
5. Verify set up - QA
6. If required redo step 1., 4. to 5. till satisfying
7. Run 6 months period on the workflow, monitor, address errors, assure data production
8. Visualize data on MQD-QA
9. QA of all metrics, set warnings, handle data errors. If needed adjust market-config file and rerun

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Introduction

What you have done so far:

- You researched the market.
- You set up the cmcrc-marketconfig-data files. - **DONE**
- You created the dependencies and jobs for the metrics required. - **NEED TO DO THIS - *PROBABLY DONE BEFORE***
- You managed the workflow and assured that you computed daily stats data for a test period.

Why do we need to stop now?

- Verify the settings about the market before running data extensively -> cost & time.
- Discover previously unseen patterns in the trading data.
- Confidence about more complex metric.
- **Hence: QA=Quality assurance!**

Introduction

"Verify the settings about the market….." **What does that mean?**

- You set up the cmcrc-marketconfig-data files to your best knowledge.
- You know have data for general metrics such as volume, number of trades, value.

➡ You need to compare those information to data from external sources!

What external sources?

- The homepage of the exchange.
- Yahoo Finance!

Introduction

How do you decide when and how long you test period should be:

- This depends on the availability of data, to which you want to compare your data to.
- Find information about data such as the daily volume of a security on the homepage of the exchange.
- For which time period are the information given?
  - If you find monthly data, you should run a test period of 1-2 months.
  - If you find weekly data, you should run a test period of 10-15 trading days.
  - If you find daily data, you should run a test period of 5-10 trading days.
- Exchanges do usually not provide more information than those summary statistics.
- Run initially only metrics you have data for comparison for –usually dailystats_generate/sync.

➡ **QA on a security and market level**

Market settings QA on a security level

Collecting the external data

- Try first the homepage of the exchange, find reports/statistics/marketing material on a security level
- Collect min. 8 different (large-/mid-/small-cap) securities on each 2 different trading days.
    - That is the minimum. More is better, and necessary if you observe irregularities during QA!
- Finding these information might not be easy to find, but most exchanges provide them.
- Create an excel sheet, reporting all available information on at least 2 trading day.
- This defines the period you need to run as a test period on the workflow.

Market settings QA on a security level

Collecting the external data

Example for Paris/France:

- Here the data needed is in monthly reports, covering all 4 Euronext markets:
  - https://www.euronext.com/en/reports-statistics/cash/monthly-statistics

- Other markets might only present the most recent information, accordingly run the test period!

Monthly Statistics

Statistics

2017

2018 | 2017 | 2016 | 2015 | 2014 | 2013 | 2012 and before

DATE	TITLE	PRODUCT TYPE	REGION	FILE	
29 Dec 2017	Cash market - Monthly statistics	Stocks	Europe	XLSX	–

DATE	TITLE	FILE
29 DEC 2017	Cash Market - Monthly Statistics	XLSX
30 NOV 2017	Cash Market - Monthly Statistics	XLSX
31 OCT 2017	Cash Market - Monthly Statistics	XLSX
09 OCT 2017	Cash Market - Monthly Statistics	XLSX
31 AUG 2017	Cash Market - Monthly Statistics	XLSX
31 JUL 2017	Cash Market - Monthly Statistics	XLSX
30 JUN 2017	Cash Market - Monthly Statistics	XLSX
31 MAY	Cash Market - Monthly Statistics	XLSX

DATE	TITLE	PRODUCT TYPE	REGION	FILE	
29 Dec 2017	Euronext Paris sectorial indices - Complete historical key figures / Historique complet des indices sectoriels	Nationalindices, Sectorial	Paris	XLSX	+
29 Dec 2017	Euronext Paris indices - Complete historical figures / Historique complet	Nationalindices	Paris	XLSX	+
29 Dec	Euronext Paris - New listings (historical document)	Stocks	Paris	XLSX	+

Market settings QA on a security level

EURONEXT MONTHLY CASH

June 2017

LIST OF EQUITIES

A	B	C	V	W	Y	Z	AA	AB	AD	AE	AF	AG	AI	AJ
					Month -Electronic order book - Single counted				Year to date -Electronic order book - Single counted				Month -Electronic order book and Regulated reported trades	
	ISIN code	Stock Name	Last Price in euros	Change in % MoM	Number of trades	Number of shares traded	Turnover in thousand euros	Daily average in thousand euros	Number of trades	Number of shares traded	Turnover in thousand euros	Daily average in thousand euros	Number of shares traded	Turnover in thousand e
1	FR0010285965	1000MERCIS	45.49	5.6	676	35,140	1,539.6	70.0	2,177	122,518	5,343.6	42.1	35,140	1
2	BE6275904041	4.ST SERVICES	-	-	0	0	0.0	0.0	0	0	0.0	0.0	0	
3	BE0974275076	4ENERGY INVEST	7.10	-3.0	190	38,661	287.1	13.1	927	235,244	1,339.0	10.5	38,661	
4	CH0299791381	4SERVICE CLOUD	0.10	-60.0	9	13,816	1.7	0.1	40	140,021	15.6	0.1	13,816	
5	FR0010050773	A TOUTE VITESSE	2.32	-42.0	14	6,101	10.8	0.5	18	6,613	13.5	0.1	6,101	
6	FR0000076887	A.S.T. GROUPE	8.26	1.6	2,458	312,074	2,488.2	113.1	13,457	2,036,546	14,265.2	112.3	312,074	2
7	FR0010795476	A2MICILE EUROPE	28.80	1.1	65	5,680	168.5	7.7	1,199	321,427	8,656.1	68.2	5,680	
8	NL0000852564	AALBERTS INDUSTR	34.86	-3.2	76,696	7,258,151	260,281.8	11,831.0	386,055	39,882,840	1,374,380.7	10,821.9	7,478,439	268
9	NSCEX0000109	AARDVAK INV	-	-	0	0	0.0	0.0	1	244	0.2	0.0	0	
10	BE0974293251	AB INBEV	96.71	-6.9	197,687	30,867,619	3,133,549.0	142,434.0	1,180,496	172,447,190	17,650,610.8	138,981.2	31,063,871	3,154
11	FR0010557264	AB SCIENCE	10.60	3.4	15,513	3,109,296	31,547.8	1,434.0	142,738	27,422,818	368,916.6	2,904.9	3,109,296	31
12	BE0946377455	ABATTOIR	-	-	0	0	0.0	0.0	2	500	23.9	0.2	0	
13	US00287Y1091	ABBVIE	64.57	8.5	4	150	9.7	0.4	68	3,857	230.8	1.8	150	
14	FR0004040608	ABC ARBITRAGE	6.45	0.5	5,026	1,182,345	7,564.7	343.8	37,462	8,137,350	53,934.7	424.7	1,182,345	7
15	CH0044947239	ABC ORTHODONTICS	-	-	0	0	0.0	0.0	0	0	0.0	0.0	0	
16	FR0013185857	ABEO	30.40	-0.3	1,160	56,285	1,793.6	81.5	5,032	332,826	9,050.6	71.3	56,285	1
17	FR0012333284	ABIVAX	13.02	-4.6	6,240	673,987	9,241.1	420.1	76,344	9,808,456	143,670.2	1,131.3	673,987	9
18	BE0003877942	ABLYNX	11.29	0.8	11,630	2,005,098	23,497.4	1,068.1	81,926	17,560,980	205,872.0	1,621.0	2,021,298	23
19	NL0011540547	ABN AMRO Group	23.21	1.1	222,199	61,580,081	1,414,833.5	64,310.6	910,737	241,454,844	5,542,742.3	43,643.6	129,903,317	2,970
20	BE0974278104	ABO GROUP	2.94	9.7	37	21,480	60.9	2.8	285	134,157	364.0	2.9	21,480	
21	FR0000064602	ACANTHE DEV.	0.70	-1.4	387	815,987	572.1	26.0	1,589	3,807,256	2,486.7	19.6	815,987	
22	NL0009767532	ACCELL GROUP	28.69	-3.9	9,988	946,778	28,329.0	1,287.7	51,409	6,294,223	179,123.2	1,410.4	1,034,378	31
23	BE0003696102	ACCENTIS	0.04	0.0	136	5,596,930	219.6	10.0	1,043	36,698,742	1,440.3	11.3	5,596,930	
24	FR0010567032	ACCES INDUSTRIE	7.29	-15.2	180	24,623	230.2	10.5	507	123,443	853.9	6.7	24,623	
25	FR0000120404	ACCOR	41.05	-2.9	149,336	19,920,765	833,350.5	37,879.6	845,974	125,479,754	4,987,874.0	39,274.6	19,930,065	833
26	GB00BQQFX454	ACCSYS	0.88	-1.1	687	1,246,851	1,103.6	50.2	5,013	9,795,190	8,138.4	64.1	1,246,851	1
27	FR0010762740	ACEP FRANCE	1.97	-10.9	3	1,550	3.1	0.1	34	12,234	26.7	0.2	1,550	
28	FR0010493510	ACHETER-LOUER.FR	0.06	-33.3	1,756	42,123,685	3,409.7	155.0	11,378	347,400,491	21,703.7	170.9	42,123,685	3
29	BE0003764785	ACKERMANS V.HAAREN	146.20	-3.6	21,775	674,230	100,673.0	4,576.0	146,360	4,334,497	617,636.4	4,863.3	675,130	100
30	FR0000076861	ACTEOS	4.34	-9.6	1,913	387,669	1,712.6	77.8	8,399	2,494,449	7,571.5	59.6	387,669	1
31	FR0000076655	ACTIA GROUP	8.54	-2.5	3,188	748,424	6,494.7	295.2	21,632	5,033,431	44,626.6	351.4	748,424	6
32	FR0010979377	ACTIVIUM GROUP	0.90	12.5	19	5,253	4.2	0.2	74	16,436	13.1	0.1	5,253	
33	BE0010012210	ACVLHO	-	-	0	0	0.0	0.0	0	0	0.0	0.0	0	
34	FR0000053076	ADA	9.31	0.6	52	1,912	17.7	0.8	422	41,269	376.8	3.0	1,912	
35	BE0974269012	ADC SIIC	0.09	-10.0	26	86,091	8.2	0.4	115	391,571	39.1	0.3	86,091	
36	FR0000062978	ADL PARTNER	18.44	-0.3	726	93,935	1,811.6	82.3	2,436	220,461	4,022.9	31.7	93,935	1
37	FR0011184241	ADOCIA	20.25	-5.6	7,183	719,694	15,429.6	701.3	88,612	7,059,427	184,552.9	1,453.2	719,694	15

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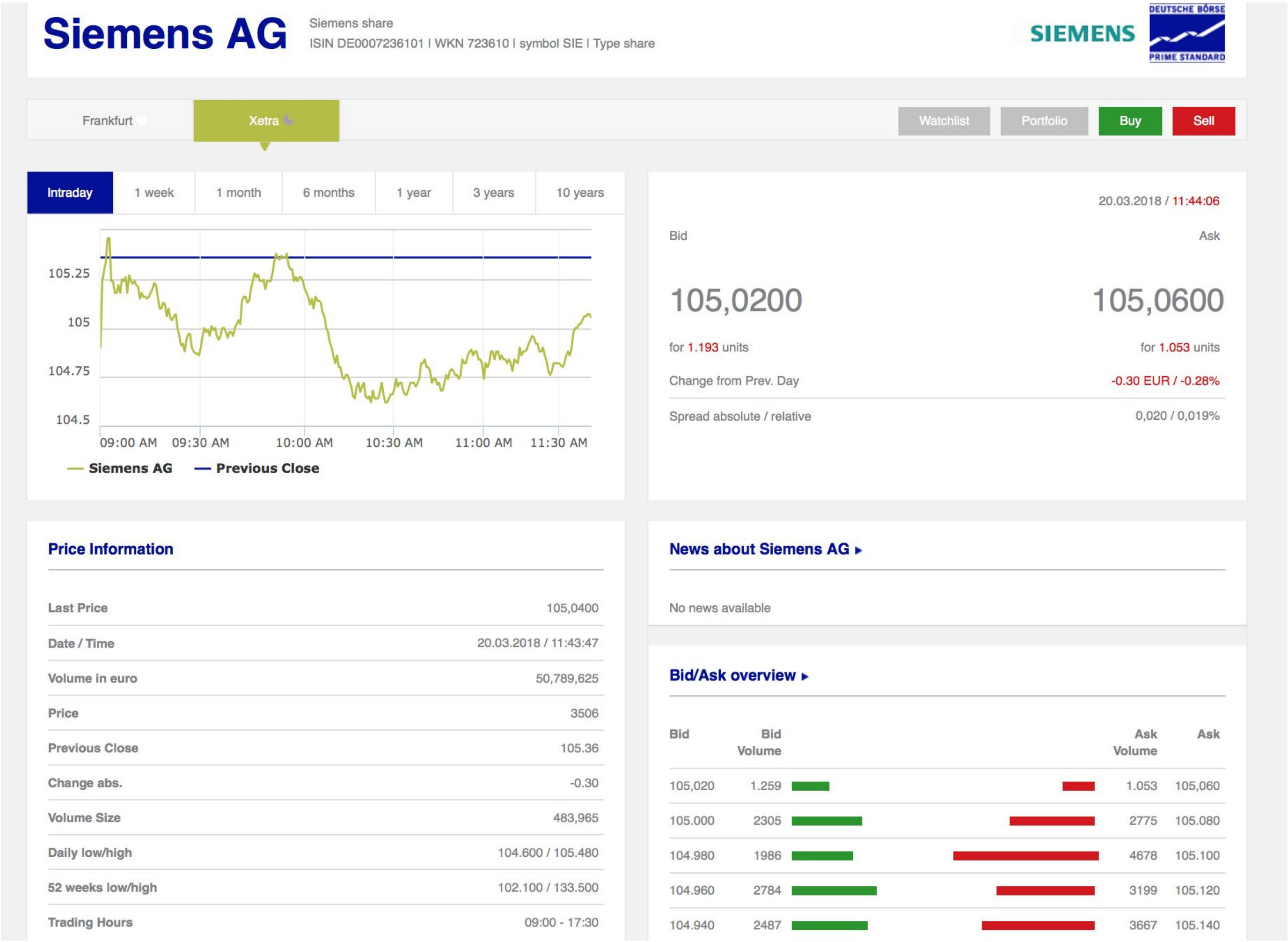
Market settings QA on a security level

Collecting the external data

- **Example** for just 1 security on 2 trading days for Frankfurt/Germany.
    - Please stick with the recommendation on slide 6!
- Siemens, Large-cap, 1 June week 2017:

http://en.boerse-frankfurt.de/stock/Siemens-share



Market settings QA on a security level

Collecting the external data

- **Example** for just 1 security on 2 trading days for Frankfurt/Germany.
- Siemens, Large-cap, 1 June week 2017.
- XETRA provides the Volume, however we can also compare things as the daily High/Low
    - Careful with the Closing price: Definitions of different institutions vary!

Price History | Tick Data | Performance | Price History Bid/Ask

Price History Siemens AG

Start Date: 20 . February 2018
Finish Date: 20 . March 2018
stock market: XETRA

Show Historical Prices

Price History Siemens AG

Date	Opening Price	Closing Price	Daily High	Daily Low	Turnover	Volume (pcs.)
19/03/2018	106.5400	105.3600	106.7600	104.9000	269,509,210	2,549,140
16/03/2018	106.9800	107.1600	107.5800	106.2400	873,234,722	8,152,544
15/03/2018	105.5000	106.2000	106.5000	105.3200	281,148,074	2,651,310
14/03/2018	104.8000	105.3200	105.8600	104.6000	253,373,605	2,408,403
13/03/2018	106.8000	105.1000	107.2200	104.7200	250,634,389	2,366,691
12/03/2018	106.7000	106.8000	107.0200	106.0600	198,993,258	1,866,789
09/03/2018	106.0000	105.7000	106.3400	105.1200	246,447,860	2,333,669
08/03/2018	104.4200	105.5400	105.9000	103.8400	233,985,430	2,230,795

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Market settings QA on a security level

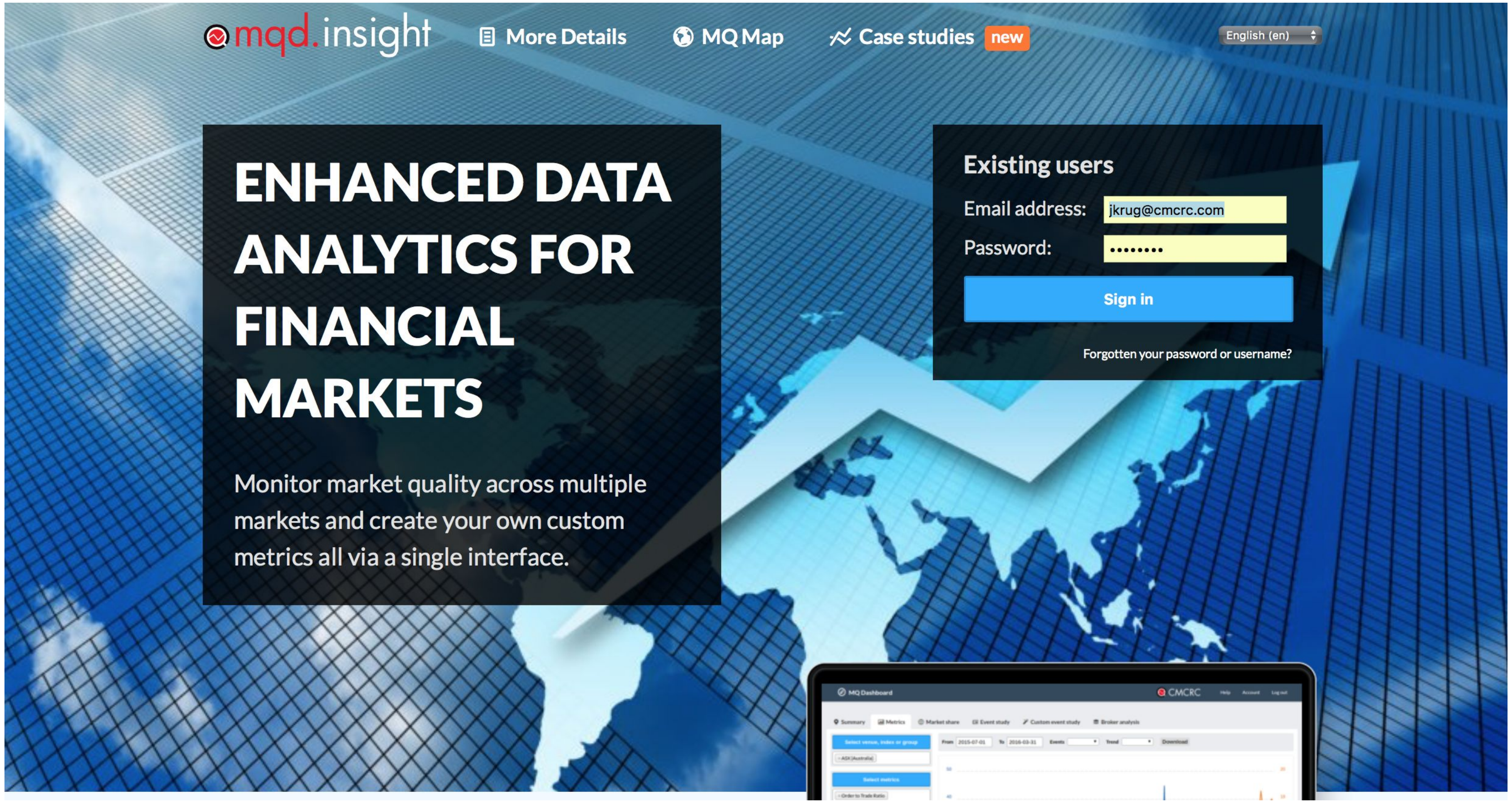
Collecting the external data

- **Example** for Frankfurt/Germany.

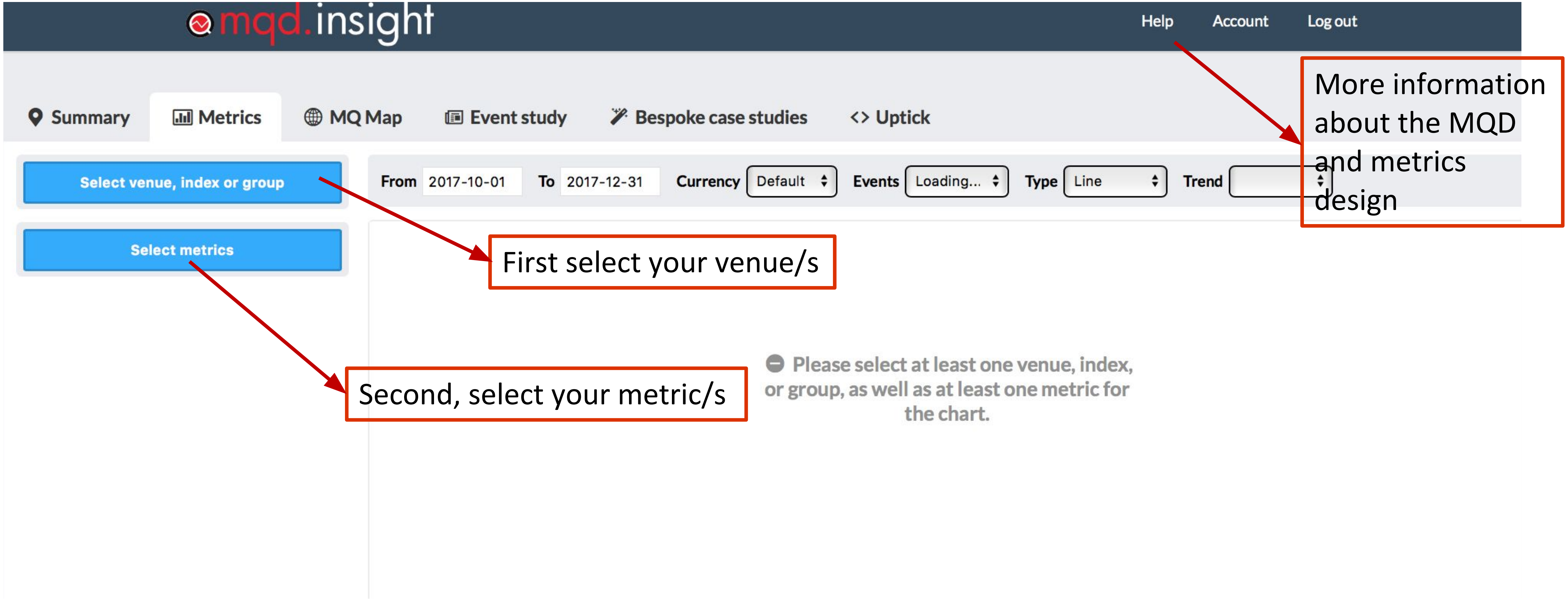
	EXCHANGE						MQD					
	Source http://en.boerse-frankfurt.de/stock/pricehistory/Siemens-share/ETR/1.6.2017_18.6.2017#Price%20History											
Date	Open	Close	High	Low	Turnover	Volume	Open	Close	High	Low	Turnover	Volume
8/6/17	126.9	127.95	128.15	126.8	139,133,760	1,090,408						
7/6/17	127.3	126.9	128.15	126.65	184,673,395	1,452,502						
6/6/17	128.5	127.5	129.1	127.5	207,695,394	1,621,091						
2/6/17	127.5	129.5	129.8	127.5	217,873,794	1,687,396						
1/6/17	127.05	126.85	127.65	125.9	172,945,263	1,364,129						

Market settings QA on a security level

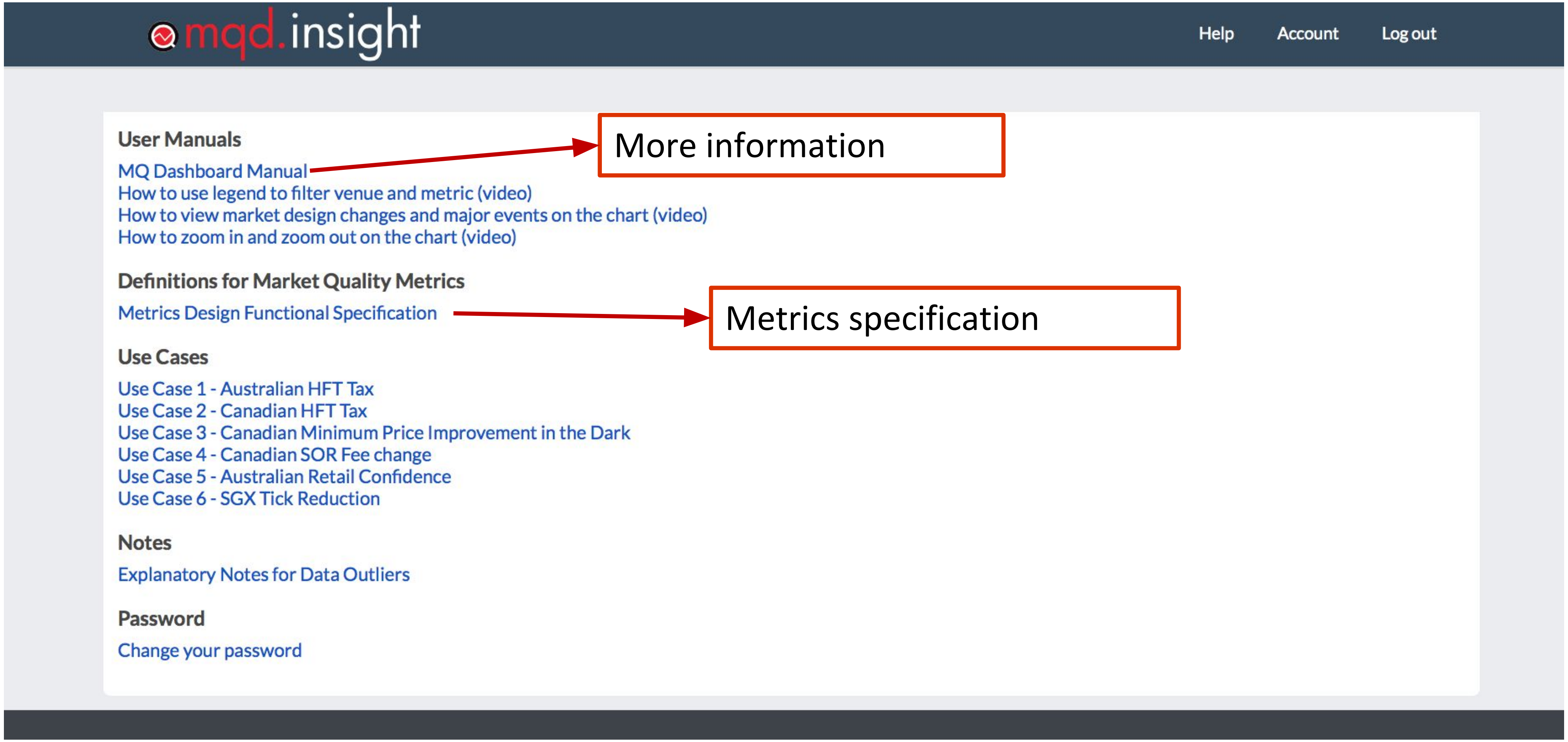
Back to the MQD-QA, where you can now see your **new computed data**



About the MQD (-QA)



About the MQD (-QA)



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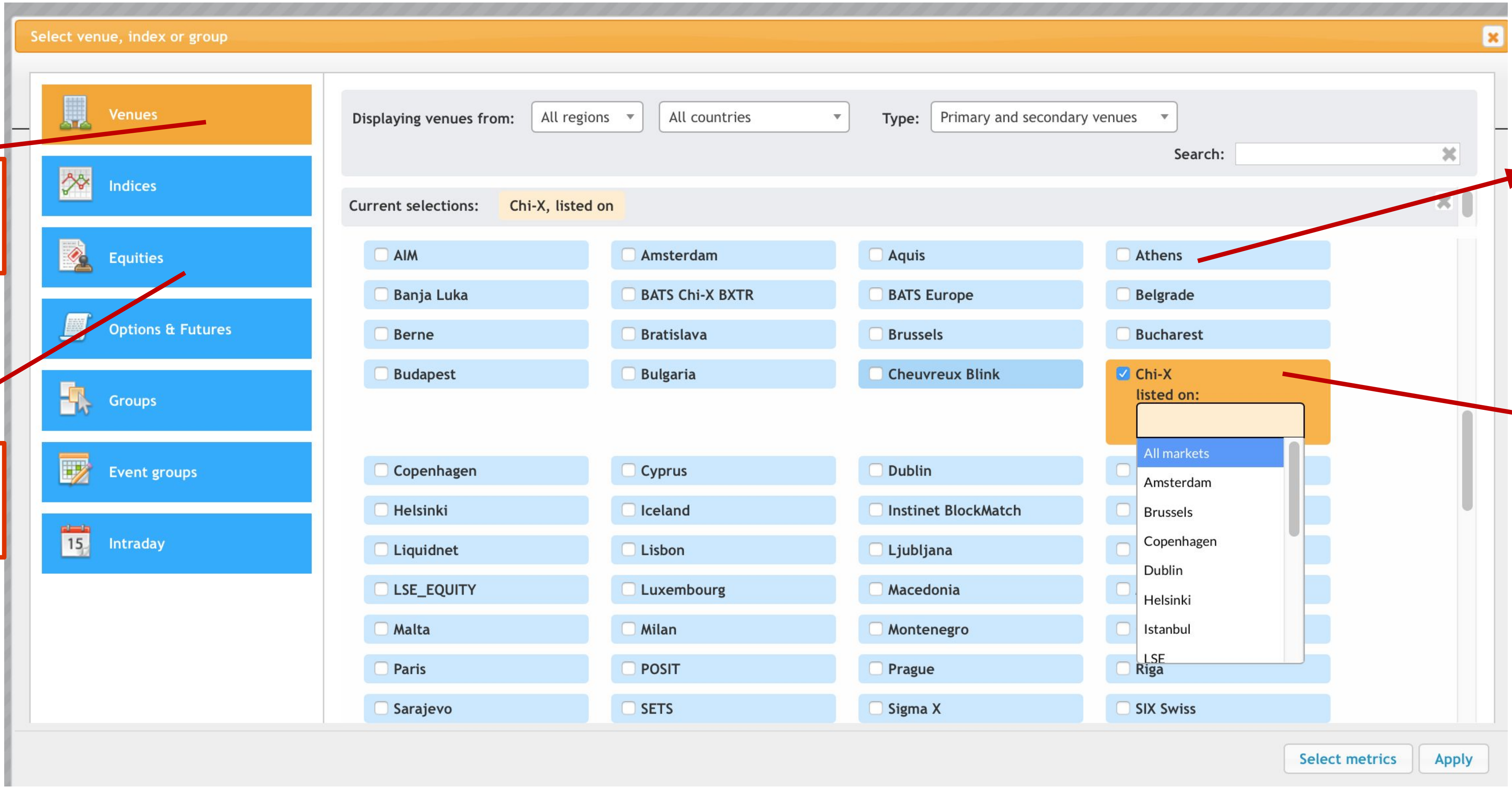
About the MQD (-QA): Select your venue/s

Trading venues

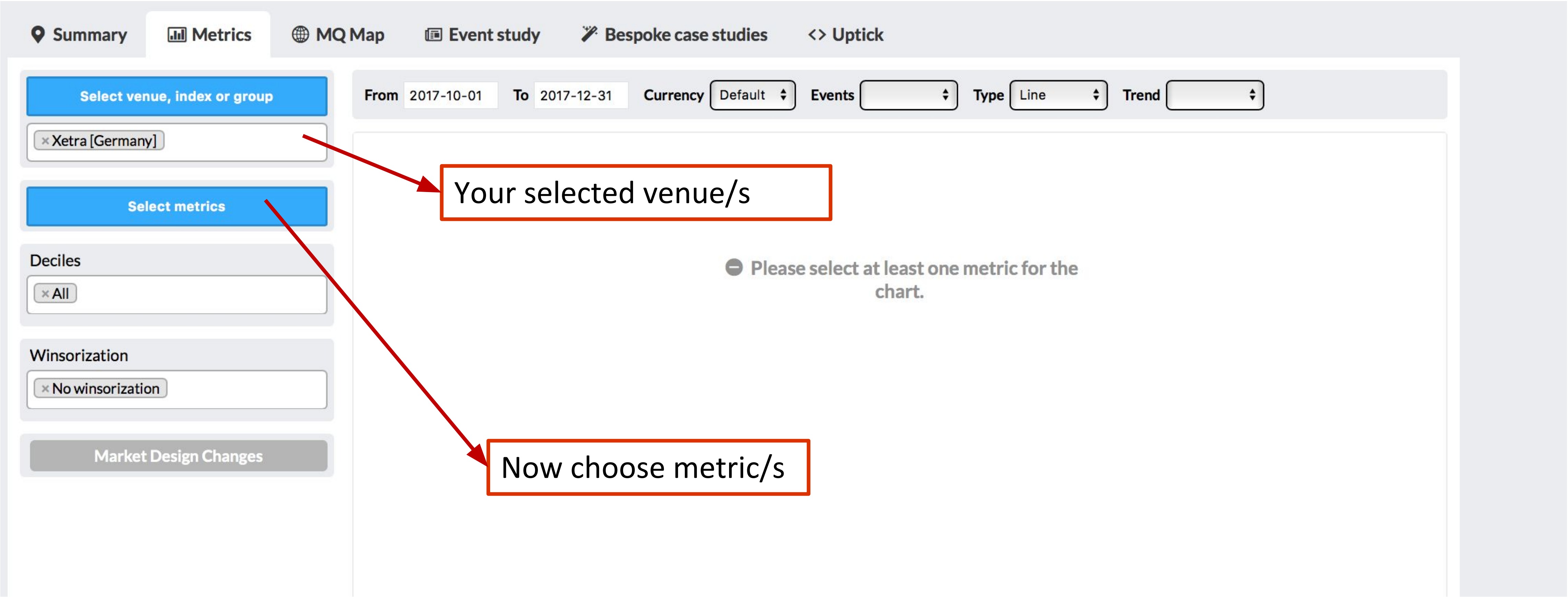
Single securities



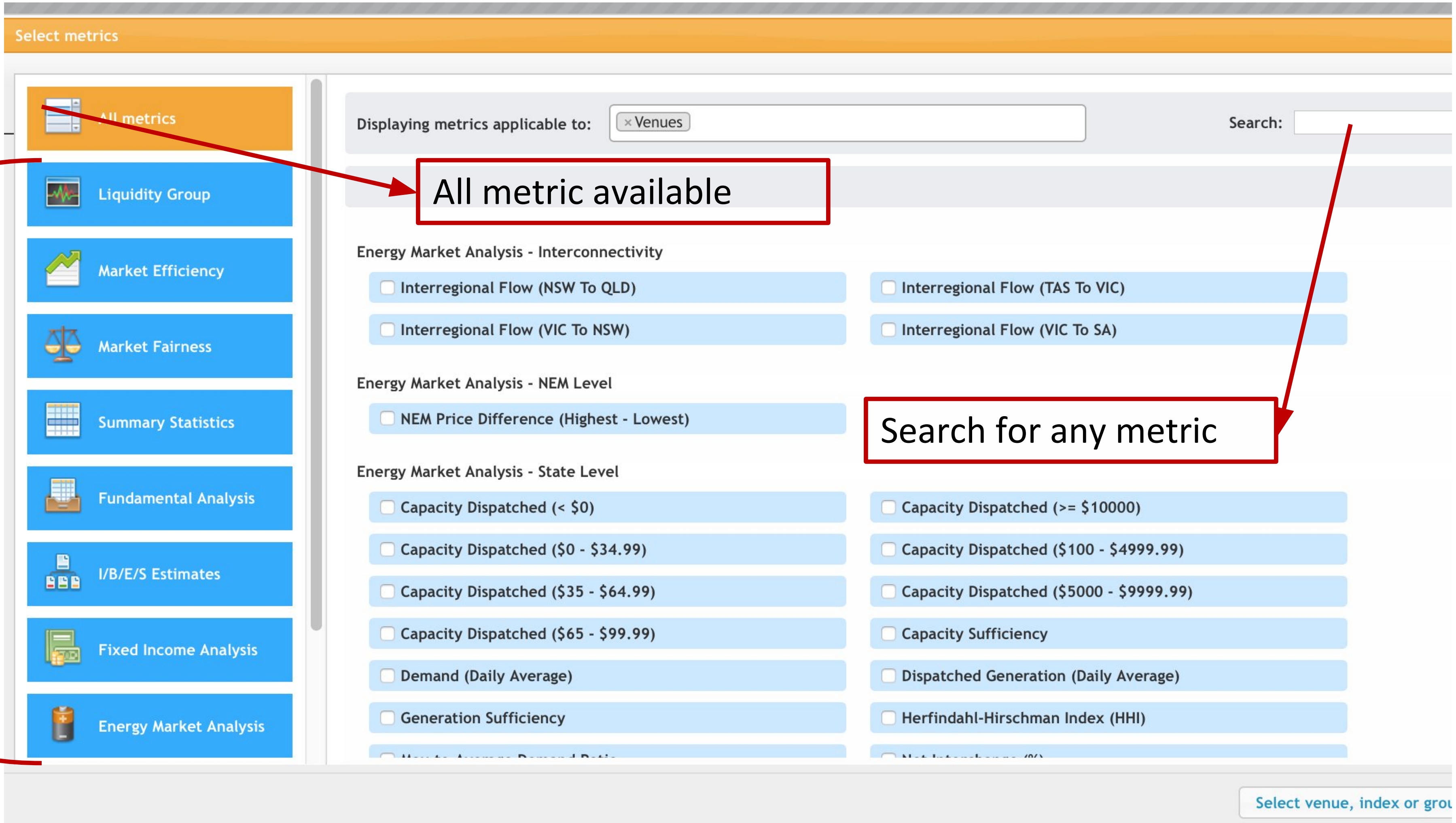
Trading venues, single listing

Trading venue with several listing markets, which can be displayed seperately

About the MQD (-QA): Select your metric/s



About the MQD (-QA): Select your metric/s



All metric available

Search for any metric

Metrics are placed into different categories

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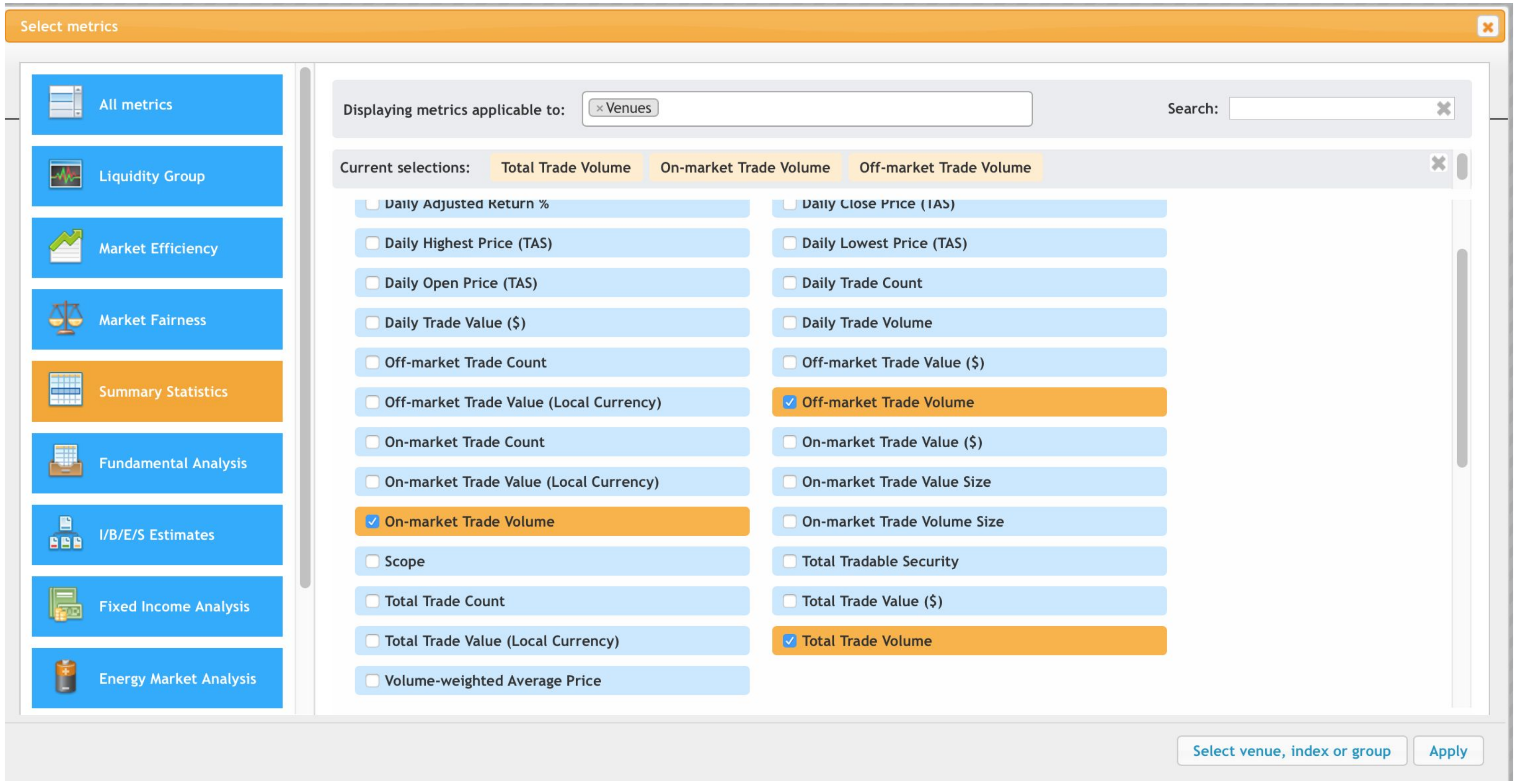
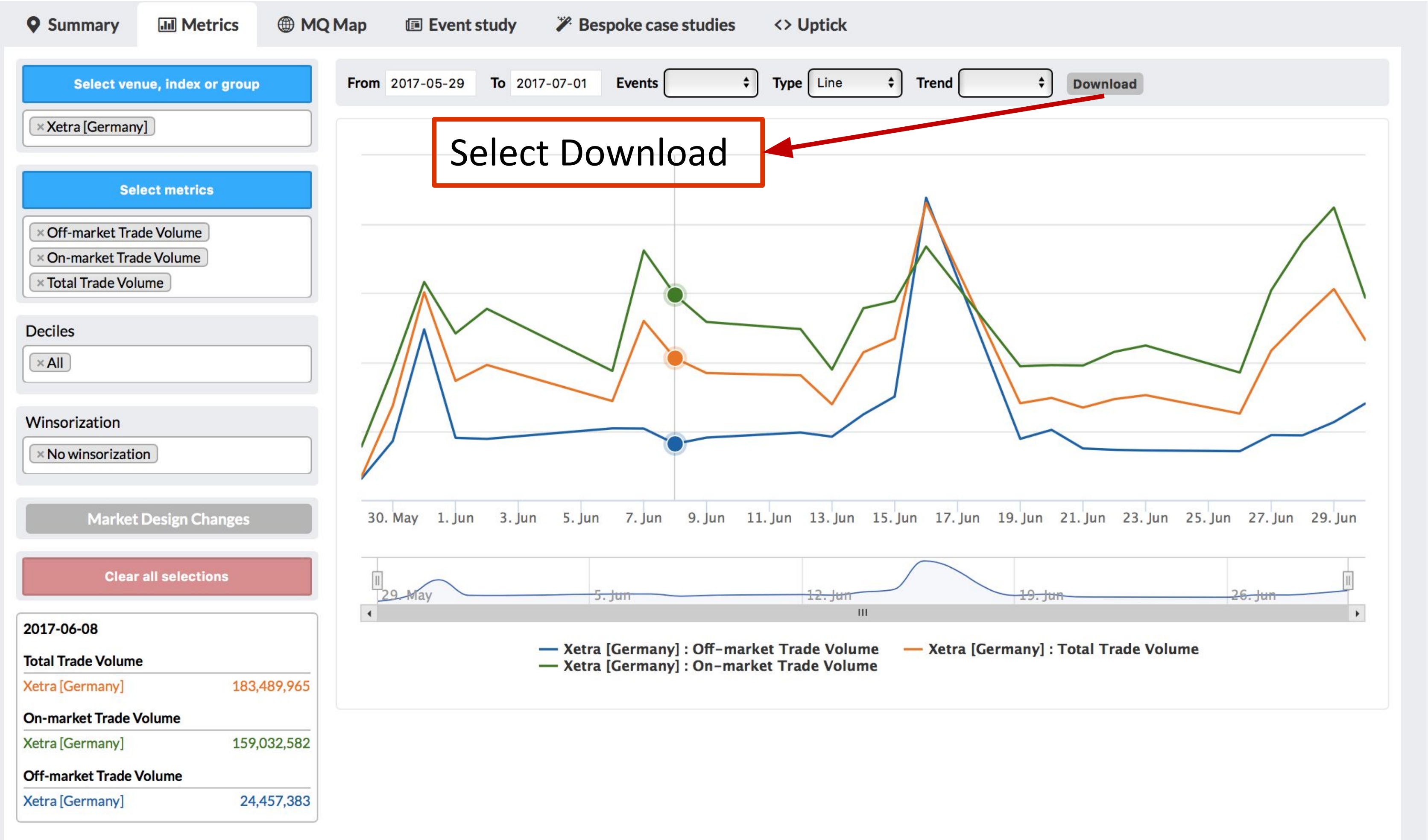
About the MQD (-QA): Select your metric/s

- Select the metrics you need for QA
- In case you QA volume and value data, select on/off/total Trade Volume
  - You do not know yet what the data you collected from the external sources refers to.

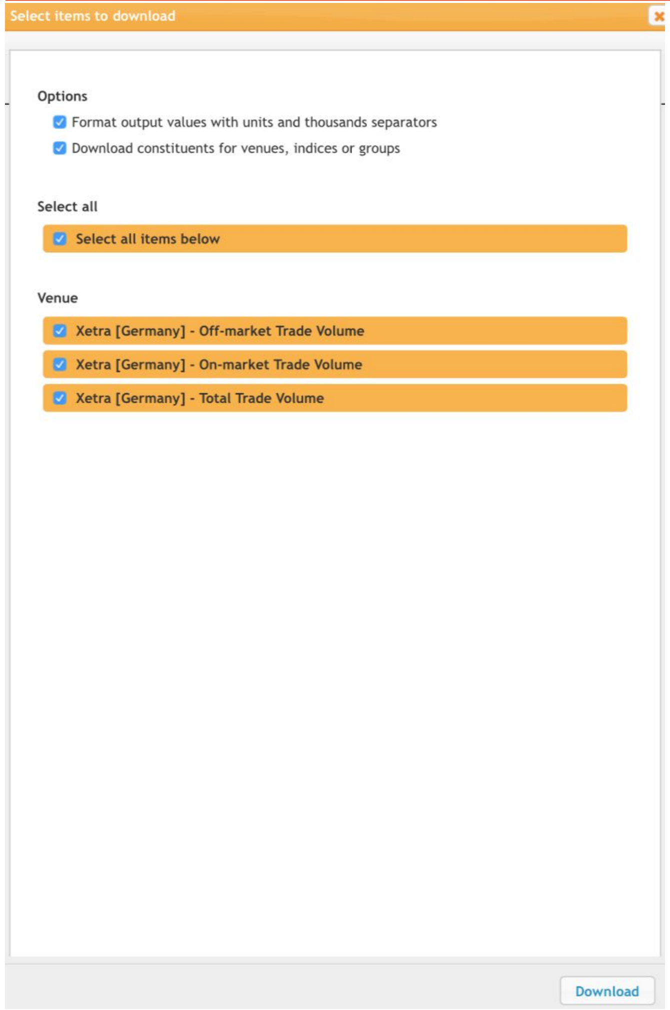


About the MQD (-QA): Select your metric/s

- Select the time horizon needed
- Study the metric



About the MQD (-QA): Select your metric/s



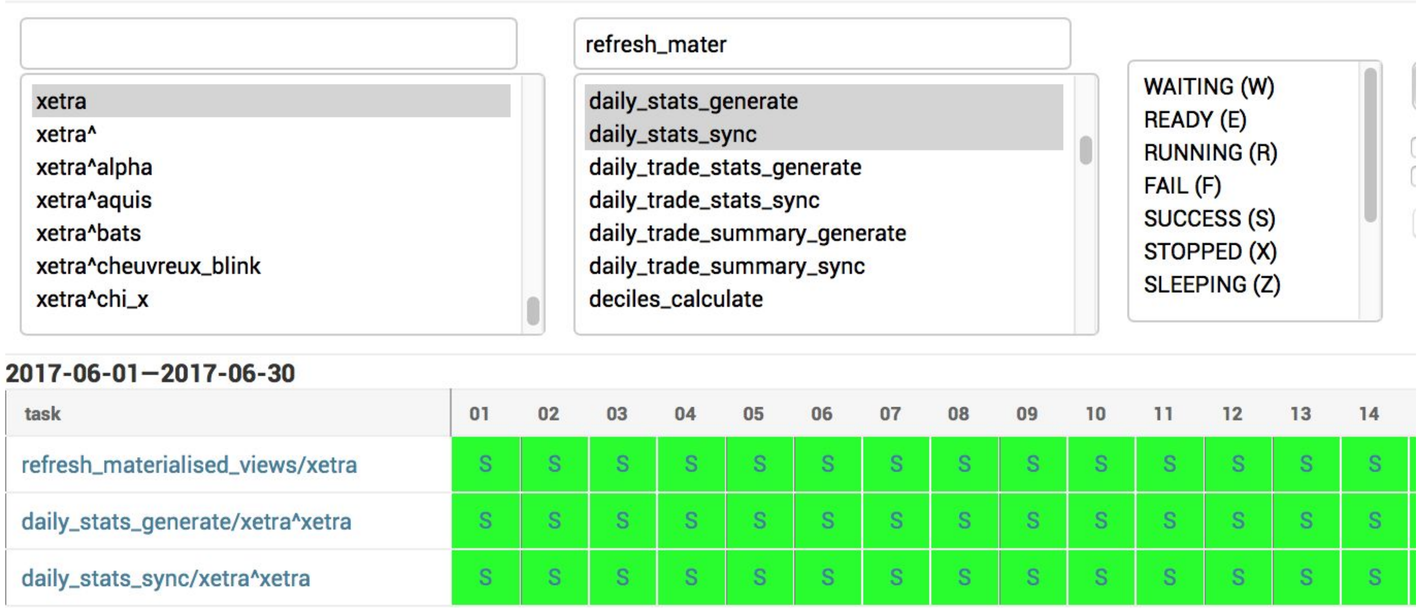
- Download all constituents.
- You will receive the aggregate market results and the single instrument results for each day and metric.

Market settings QA on a security level

You do not see your data on the MQD-QA?

Did run refresh_materialised_views?

The job pushes the results from the local storage to the MQD-QA. If it is not run, old results won't be overwritten, first-time results won't be visualized



Market settings QA on a security level

You do not see your data on the MQD-QA?

Refresh_materialised_views successfully ran but you do not see data

- Open the metric_sync job to access the background information
- Select the **View Details** of the last successful status in the Job status history/ eg the job you ran and expect to have data

The Standard output reports the **No. of objects** (rows) generated.

Job status history and job submissions:

Timestamp	Prev Status	New Status	Details
2018-03-16 18:23:10	running	success	OK job result
2018-03-16 18:23:10	Submission	success	**Exit status:** 0 **Time elapsed:** 0:05:15 (314.755304 seconds) **Submitted:** 2018-03-16

Runner job ID: 8f30f7f34b42593c20b87402cac95a04ebe913ad7e67c13f9ad319516d7dc50b

Cluster: DOCKERSWARM (cdt-prod)

Command: /home/sge_ve/bin/metrics_sync_aws --metric=daily_stats --uptick_market=xetra^xetra --date_from=2017-06-06 --date_to=2017-06-06 --

Job submission ID: 39976363

WFJOBS Version: 20180316164938

Memory usage: 77.3 MB (requested: 450.0 MB)

CPU usage: 0:00:07 (7.111875235 seconds) (requested: 0.10)

Compute node: 172.31.105.113

Standard output:

```
Using test databases mqdashboard_nonmetrics mqdashboard_metrics on
Cleaning up DailyStats with filters { date__gte': '2017-06-06', 'date__lte': '2017-06-06', 'listing__listing_market__uptick_name__in': ['x
Importing data from file: /tmp/metrics_sync_daily_stats_xetra_xetra_2017-06-06_2017-06-06/metric-daily_stats-xetra-xetra-2017-06-06.csv.gz
No. of objects generated: 2496
```

Standard error:

```
/usr/lib/python3.6/re.py:212: FutureWarning: split() requires a non-empty pattern match.
  return _compile(pattern, flags).split(string, maxsplit)
2018-03-16 18:18:01,832 - INFO     - [MetricsSyncAWS] Extracted 1 daily_stats files from S3 for xetra between 2017-06-06 and 2017-06-06.
/usr/local/lib/python3.6/dist-packages/psycopg2/__init__.py:144: UserWarning: The psycopg2 wheel package will be renamed from release 2.8;
  """)
INFO 2018-03-16 18:18:05,625 base 9 140153117820736 Raven is not configured (logging is disabled). Please see the documentation for more i
INFO 2018-03-16 18:18:05,687 driver 9 140153117820736 Generating grammar tables from /usr/lib/python3.6/lib2to3/Grammar.txt
INFO 2018-03-16 18:18:05,740 driver 9 140153117820736 Generating grammar tables from /usr/lib/python3.6/lib2to3/PatternGrammar.txt
WARNING: 203 rows contained a filtered listing and were not written to the database.
WARNING: Filtered listings: ['xetra:AU000000ATC9', 'xetra:CA02139L1031', 'xetra:CA0738951049', 'xetra:CA37636L1076', 'xetra:CA74270U3091',
```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Market settings QA on a security level

You do not see your data on the MQD-QA?

Refresh_materialised_views successfully ran but you do not see data

- Dailystats_sync has no data

Access S3, where the data computed during the metric_generate is stored.

- Dailystats_sync has generated data

Rerun from that job. If still no data is generated access S3.

Job status history and job submissions:

Timestamp	Prev Status	New Status	Details
2018-03-16 18:23:10	running	success	OK job result
2018-03-16 18:23:10	Submission	success	**Exit status:** 0 **Time elapsed:** 0:05:15 (314.755304 seconds) **Submitted:** 2018-03-16

Runner job ID: 8f30f7f34b42593c20b87402cac95a04ebe913ad7e67c13f9ad319516d7dc50b

Cluster: DOCKERSWARM (cdt-prod)

Command: /home/sge_ve/bin/metrics_sync_aws --metric=daily_stats --uptick_market=xetra^xetra --date_from=2017-06-06 --date_to=2017-06-06 --

Job submission ID: 39976363

WFJOBS Version: 20180316164938

Memory usage: 77.3 MB (requested: 450.0 MB)

CPU usage: 0:00:07 (7.111875235 seconds) (requested: 0.10)

Compute node: 172.31.105.113

Standard output:

```
Using test databases mqdashboard_nonmetrics mqdashboard_metrics on
Cleaning up DailyStats with filters {'date__gte': '2017-06-06', 'date__lte': '2017-06-06', 'listing__listing_market__uptick_name__in': ['x
Importing data from file: /tmp/metrics_sync_daily_stats_xetra_xetra_2017-06-06_2017-06-06/metric-daily_stats-xetra-xetra-2017-06-06.csv.gz
No. of objects generated: 2496
```

Standard error:

```
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```
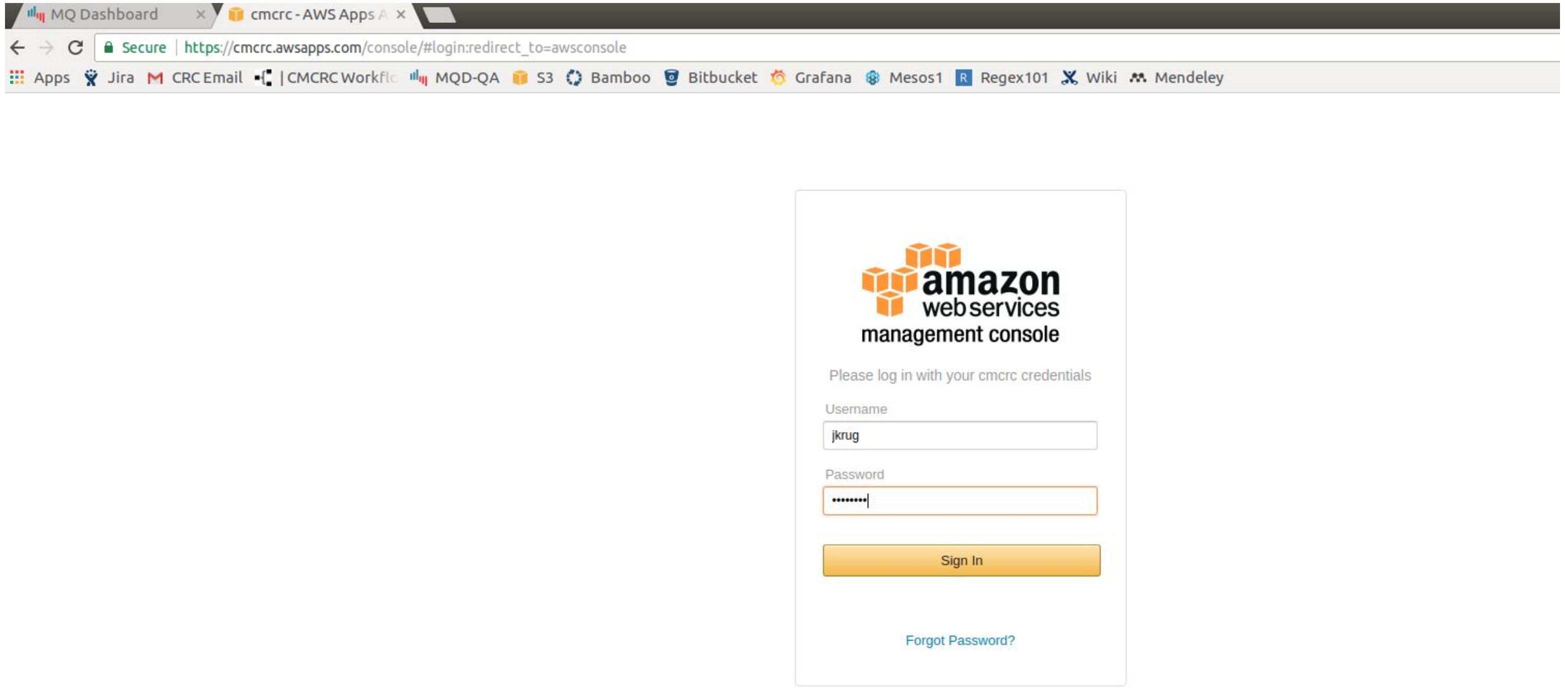

Digression: Working in S3



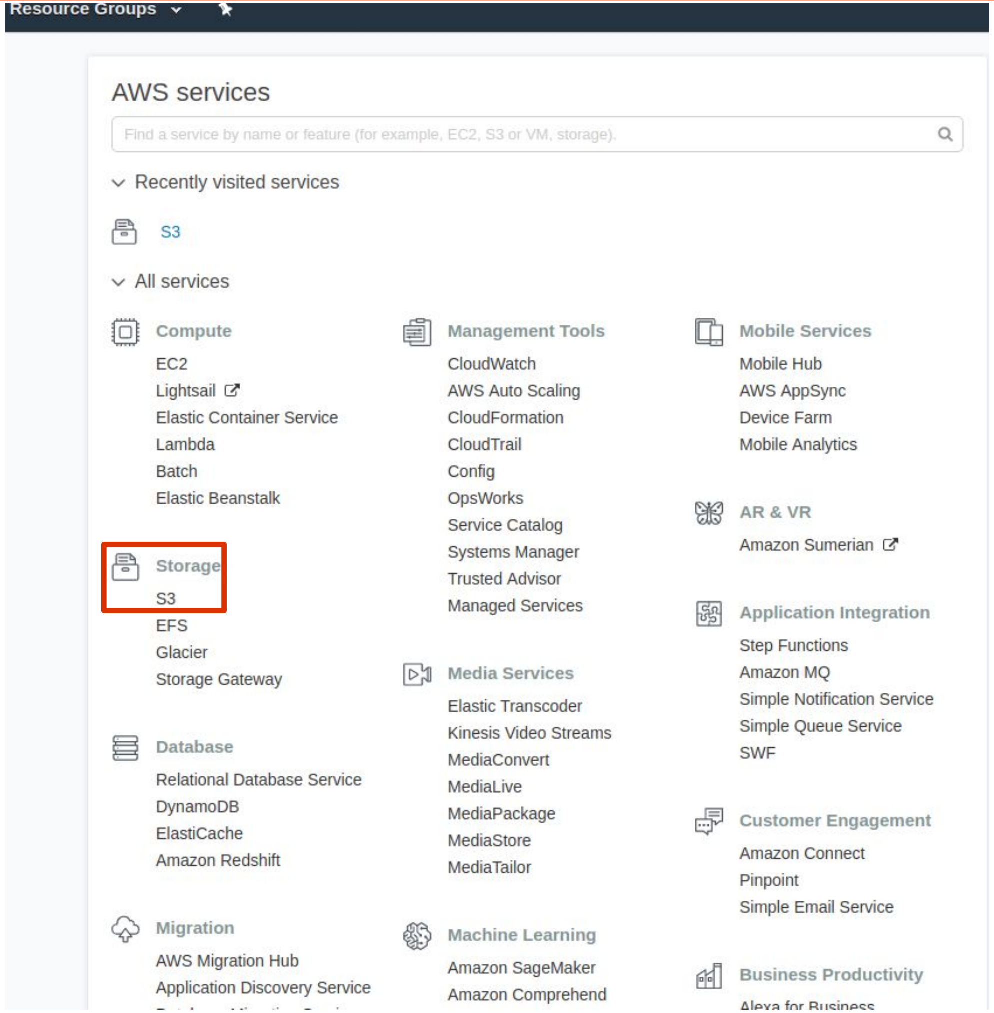
Digression: Working in S3

Amazon S3 is a cloud storage platform allowing also to run big data analytics.

We use S3 throughout the complete ETL process;

- The downloaded raw data is stored in S3 (Stage I).
- The data is converted (Stage II) to blueshift format and also stored in S3.
- Generation of metrics (Stage III), which are stored in csv format in S3.

You can view the data in S3, for verification and debugging.



Digression: Working in S3

+ Create bucket | Delete bucket | Empty bucket

66 Buckets 4 Public 2 Regi

cmcrc-global-bootstrap	Not public *	US East (N. Virginia)	Nov 1, 2017 9:36:26 PM GM
cmcrc-jira-images	Not public *	US East (N. Virginia)	Oct 9, 2017 11:28:26 AM G
cmcrc-moodle	Not public *	US East (N. Virginia)	Mar 22, 2017 5:28:05 PM G
cmcrc-morningstar	Not public *	US East (N. Virginia)	Jun 20, 2016 11:35:27 AM
cmcrc-mstar	Not public *	US East (N. Virginia)	Jul 9, 2015 2:47:19 PM GM
cmcrc-nasdaq-fob	Not public *	US East (N. Virginia)	Apr 21, 2016 8:50:47 AM G
cmcrc-newmorningstardata	Not public *	US East (N. Virginia)	Jun 30, 2017 10:54:52 AM
cmcrc-old-pypi-packages	Not public *	US East (N. Virginia)	Jan 12, 2017 10:43:17 AM
cmcrc-profile	Not public *	US East (N. Virginia)	May 19, 2016 9:39:06 AM G
cmcrc-profiler-input	Not public *	US East (N. Virginia)	Mar 9, 2017 3:03:34 PM GM
cmcrc-public	Public	US East (N. Virginia)	Feb 26, 2016 11:37:26 AM
cmcrc-recovery-artifacts	Not public *	US East (N. Virginia)	Aug 11, 2017 9:02:49 AM G
cmcrc-redis	Not public *	US East (N. Virginia)	May 5, 2016 2:12:42 PM GI
cmcrc-ssenthilvel-bucket00	Not public *	US East (N. Virginia)	Nov 25, 2015 11:51:25 AM
cmcrc-video-editing-sofia-dont-delete	Not public *	US East (N. Virginia)	Mar 20, 2017 3:32:27 PM G
cmcrc-virtualmachines	Public	US East (N. Virginia)	Jan 19, 2017 4:41:20 PM G
cmcrc-workflow	Not public *	US East (N. Virginia)	Apr 13, 2015 3:42:08 PM G
cmcrc-zookeeper	Not public *	US East (N. Virginia)	Mar 29, 2016 11:28:17 AM
compnews	Not public *	US East (N. Virginia)	Mar 29, 2017 12:03:56 PM

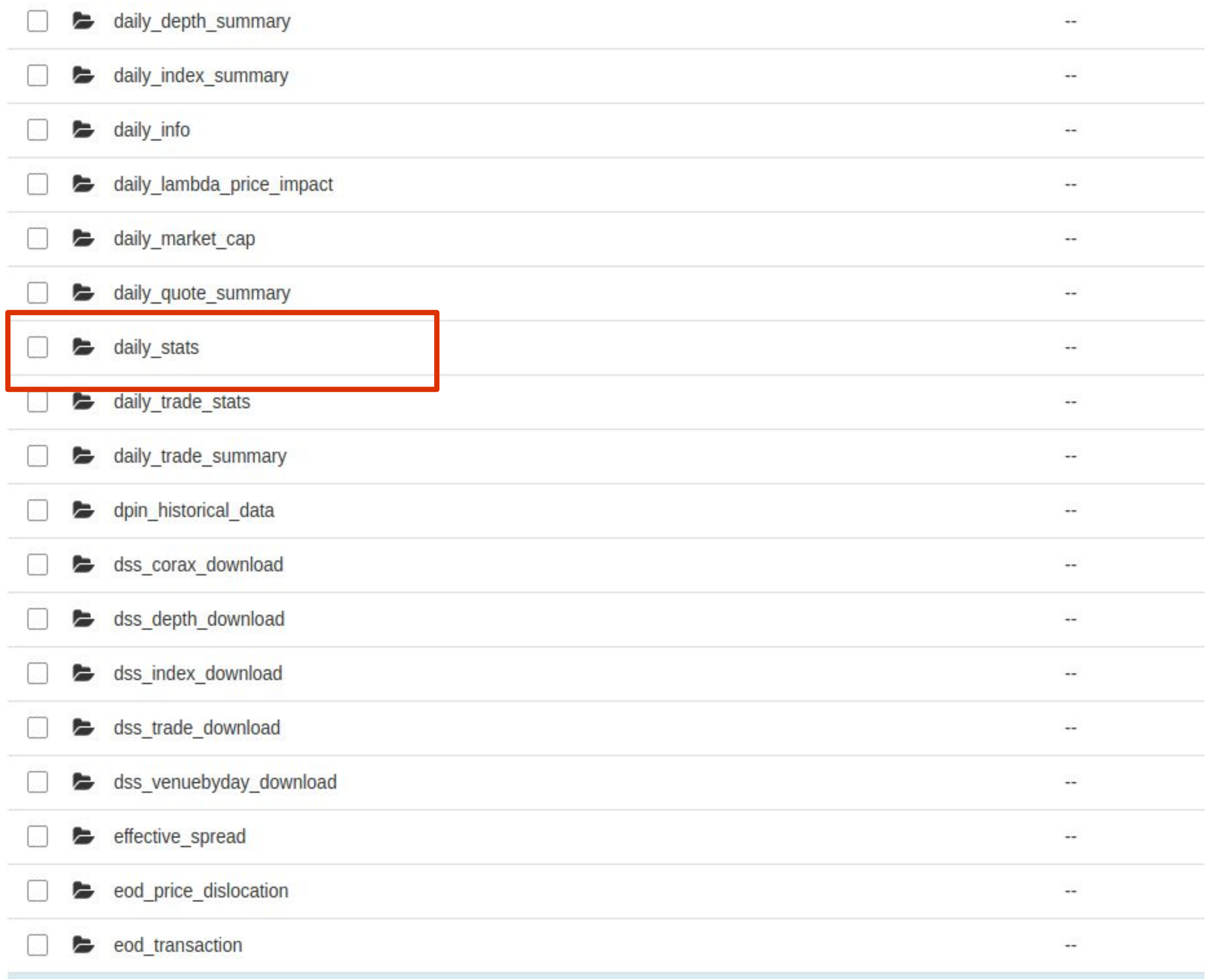
CMCRC
ASSURING MARKET QUALITY

Digression: Working in S3

Data is stored separately by task type.

For the initial data QA you most likely need summary statistic like metrics. These are in daily_stats.

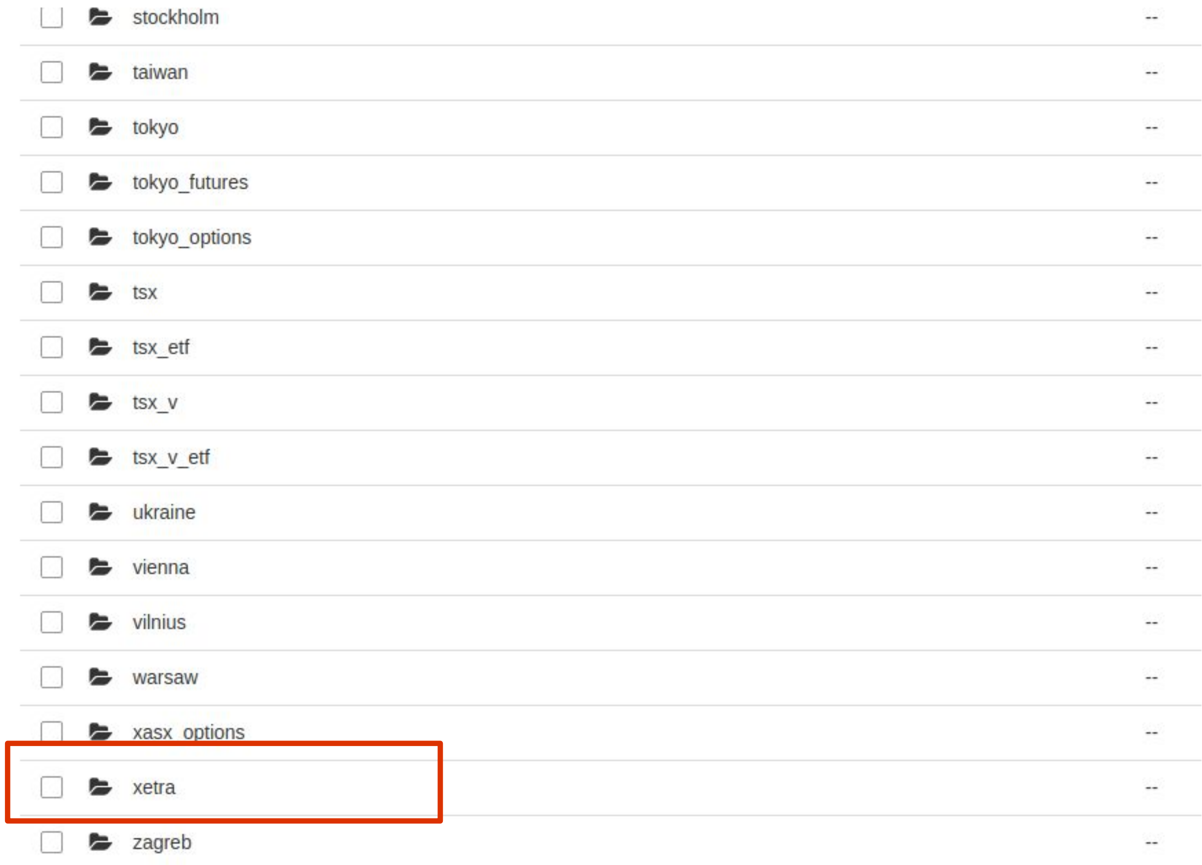
If you need information under which ‘metric group’ specific metrics are stored, please look those up in the repository metrics in pycharm.



Digression: Working in S3

Data is then stored under the task name.

First, select the listing market ..



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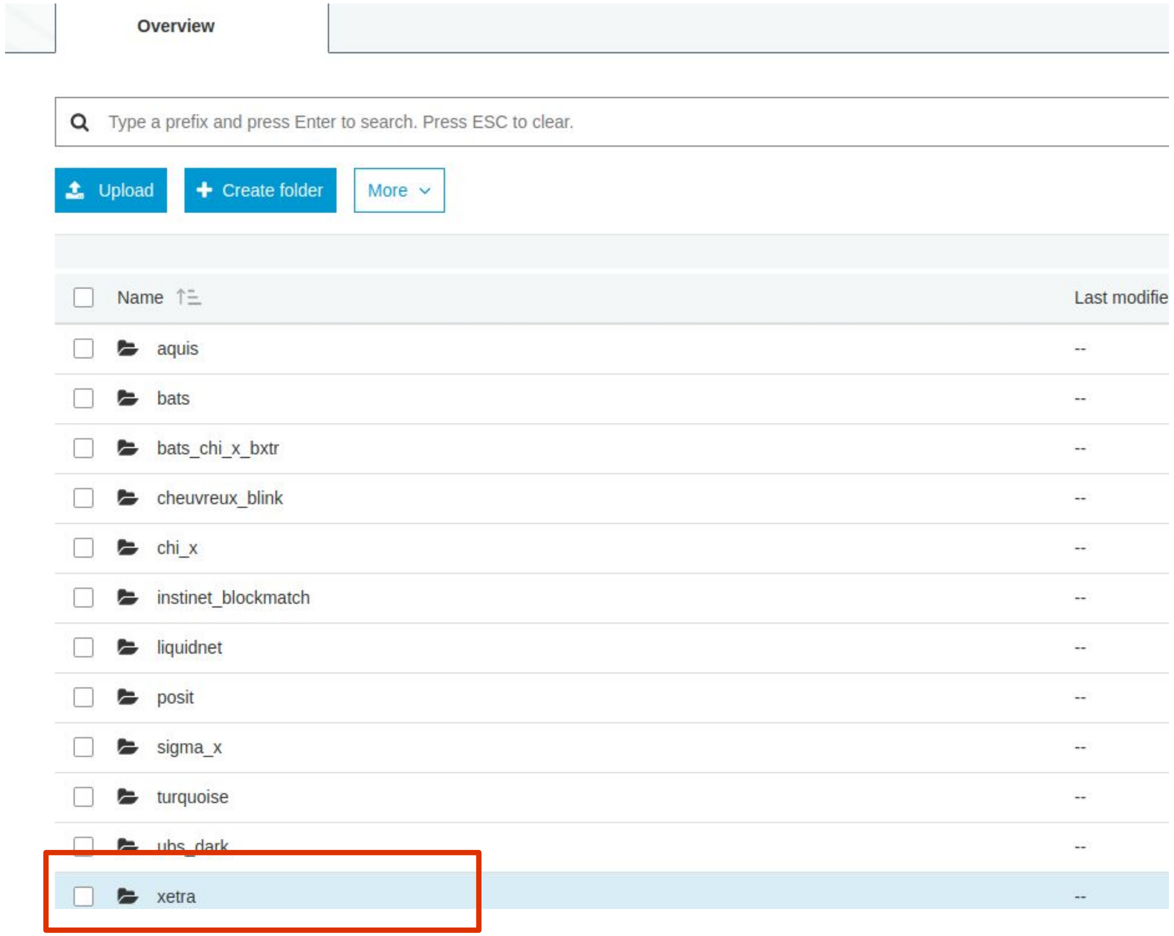
Digression: Working in S3

Data is then stored under the task name.

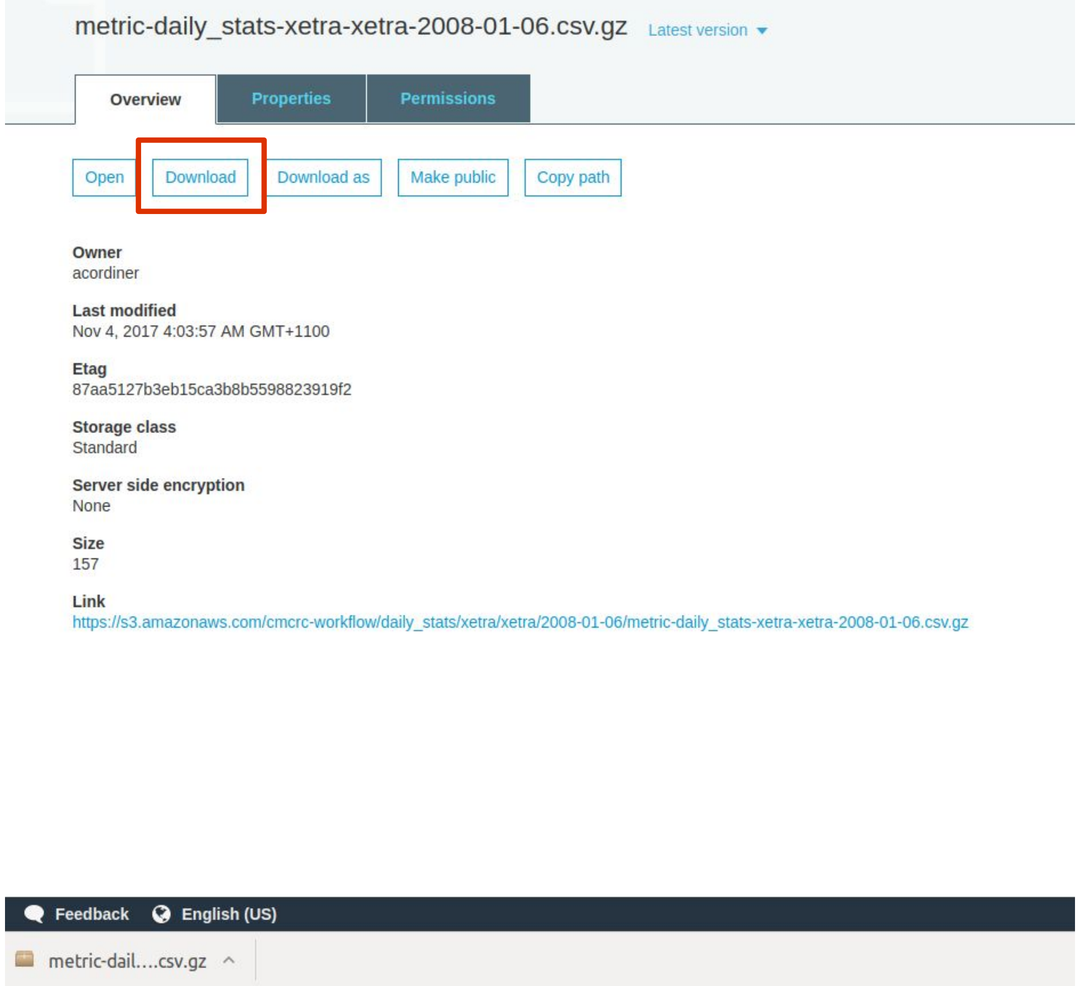
Then, select the trading market ..

Followed by the date.



Digression: Working in S3

You can download any data file per trading day.



Digression: Working in S3

The csv file presents all metric results for that day per security.

We use 'tradable' to be able to distinguish and match securities across venues.

- You will need to match by ISIN, hence you are likely required to produce a security list from the external source providing both the ric and ISIN.

Tradable Listingmarket:ISIN:Currency

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	date	prev_close_price	volume	daily_return_perc	off_value	trade_count	value	trading_market	tradable	close_price	off_volume	listing_market	off_trade_count
2	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0V8D46:EUR		0	xetra	0
3	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1A4BZ0:EUR		0	xetra	0
4	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0V8E29:EUR		0	xetra	0
5	2017-06-06	EUR 68.43	975	-1.0960105217	EUR 0	12	EUR 65489.78	xetra	xetra:LU0378436447:EUR	EUR 67.68	0	xetra	0
6	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0QY8Z7:EUR		0	xetra	0
7	2017-06-06	EUR 1.921	0		EUR 0	0	EUR 0	xetra	xetra:US75971T1034:EUR		0	xetra	0
8	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXBR2:EUR		0	xetra	0
9	2017-06-06	EUR 102.92	50	0.3692188107	EUR 0	1	EUR 5165.0	xetra	xetra:LU0392495536:EUR	EUR 103.3	0	xetra	0
10	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXYQ6:EUR		0	xetra	0
11	2017-06-06	EUR 37.125	5457	-0.8754208754	EUR 0	30	EUR 199856.435	xetra	xetra:US02209S1033:EUR	EUR 36.8	0	xetra	0
12	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000ETC0498:EUR		0	xetra	0
13	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXV21:EUR		0	xetra	0
14	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0V8JJ4:EUR		0	xetra	0
15	2017-06-06	EUR 57.21	16127	-0.4981646565	EUR 0	5	EUR 917328.725	xetra	xetra:FR0010654913:EUR	EUR 56.925	0	xetra	0
16	2017-06-06	EUR 19	11257	5.2368421053	EUR 99.975	72	EUR 223898.460	xetra	xetra:DE000A0HL8N9:EUR	EUR 19.995	5	xetra	1
17	2017-06-06	EUR 43.29	445	-1.3051513052	EUR 2947.68	7	EUR 18715.505	xetra	xetra:DE0005859698:EUR	EUR 42.725	69	xetra	1
18	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:US80105N1054:EUR		0	xetra	0
19	2017-06-06	EUR 0.044	1453969	-9.0909090909	EUR 0	43	EUR 55869.864	xetra	xetra:CH0020609688:EUR	EUR 0.04	0	xetra	0
20	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:IT0004623333:EUR		0	xetra	0
21	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1A4EV3:EUR		0	xetra	0
22	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0V8J81:EUR		0	xetra	0
23	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXFD3:EUR		0	xetra	0
24	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0MEKY4:EUR		0	xetra	0
25	2017-06-06	EUR 39.55	26885	0.0252844501	EUR 0	8	EUR 1066943.51	xetra	xetra:LU0292103651:EUR	EUR 39.56	0	xetra	0
26	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:LU0533033824:EUR		0	xetra	0
27	2017-06-06	EUR 11.1	1030	1.6666666667	EUR 0	2	EUR 11603.550	xetra	xetra:GB00B08SNH34:EU	EUR 11.285	0	xetra	0
28	2017-06-06	EUR 51.95	11855	-1.0779595765	EUR 0	17	EUR 608271.420	xetra	xetra:DE000A0H08H3:EUR	EUR 51.39	0	xetra	0
29	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0SYTA0:EUR		0	xetra	0
30	2017-06-06	EUR 0.871	47833	2.2962112514	EUR 0	8	EUR 42924.277	xetra	xetra:LU0659579220:EUR	EUR 0.891	0	xetra	0
31	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1X2YK1:EUR		0	xetra	0
32	2017-06-06	EUR 31.911	24247	0.0908777538	EUR 0	52	EUR 771300.60	xetra	xetra:DE000A0H08M3:EU	EUR 31.94	0	xetra	0
33	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0SYNN6:EUR		0	xetra	0
34	2017-06-06	EUR 9.321	9897	-1.5019847656	EUR 7918.00	13	EUR 91365.770	xetra	xetra:DE0005493654:EUR	EUR 9.181	856	xetra	1
35	2017-06-06	EUR 65.9	821	-0.3641881639	EUR 0	12	EUR 53392.95	xetra	xetra:GB00B24CGK77:EU	EUR 65.66	0	xetra	0
36	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXYW4:EUR		0	xetra	0
37	2017-06-06	EUR 276.89	17902	-0.6175737658	EUR 0	34	EUR 4918026.98	xetra	xetra:FR0010655738:EUR	EUR 275.18	0	xetra	0
38	2017-06-06	EUR 11.7	1377	-1.5384615385	EUR 0	32	EUR 16122.75	xetra	xetra:DE000A0V9YT0:EUR	EUR 11.52	0	xetra	0
39	2017-06-06	EUR 66.71	3531486	1.4690451207	EUR 51083982.8	11013	EUR 238712374.47	xetra	xetra:DE000BASF111:EUR	EUR 67.69	754564	xetra	1
40	2017-06-06	EUR 22.25	220535	-1.9101123596	EUR 908374.495	820	EUR 4840572.[illegible]	xetra	xetra:DE000A1ML7J1:EUR	EUR 21.825	41659	xetra	1
41	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A12UP94:EUR		0	xetra	0
42	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXAG7:EUR		0	xetra	0
43	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0SYNA3:EUR		0	xetra	0
44	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000ETC0563:EUR		0	xetra	0
45	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0S3FP5:EUR		0	xetra	0
46	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0S3HM8:EUR		0	xetra	0
47	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXCL3:EUR		0	xetra	0
48	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1C22K7:EUR		0	xetra	0
49	2017-06-06		305		EUR 0	2	EUR 2989.975	xetra	xetra:DE0005533400:EUR	EUR 9.851	0	xetra	0
50	2017-06-06	EUR 1.87	656983	1.6577540107	EUR 102555.495	544	EUR 1249536.820	xetra	xetra:DE0005137004:EUR	EUR 1.901	54005	xetra	1
51	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0V8EW8:EUR		0	xetra	0
52	2017-06-06	EUR 16.84	67768	-2.1674584323	EUR 94932.95	312	EUR 1127670.420	xetra	xetra:DE000A0S8488:EUR	EUR 16.475	5771	xetra	1
53	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A0V8JL0:EUR		0	xetra	0
54	2017-06-06	EUR 39.8	949	0.1231155779	EUR 0	6	EUR 37902.870	xetra	xetra:LU0378435399:EUR	EUR 39.849	0	xetra	0
55	2017-06-06	EUR 15.891	11224	-0.4467937826	EUR 0	22	EUR 177503.646	xetra	xetra:LU0412624271:EUR	EUR 15.82	0	xetra	0
56	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXX94:EUR		0	xetra	0
57	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:DE000A1EXWZ1:EUR		0	xetra	0
58	2017-06-06		0		EUR 0	0	EUR 0	xetra	xetra:LU1048313891:EUR		0	xetra	0
59	2017-06-06	EUR 203.64	560	-0.3142801021	EUR 348313.68	4	EUR 113647.650	xetra	xetra:LU0290358224:EUR	EUR 203	1716	xetra	1

Market settings QA on a security level

You do not see your data on the MQD-QA?

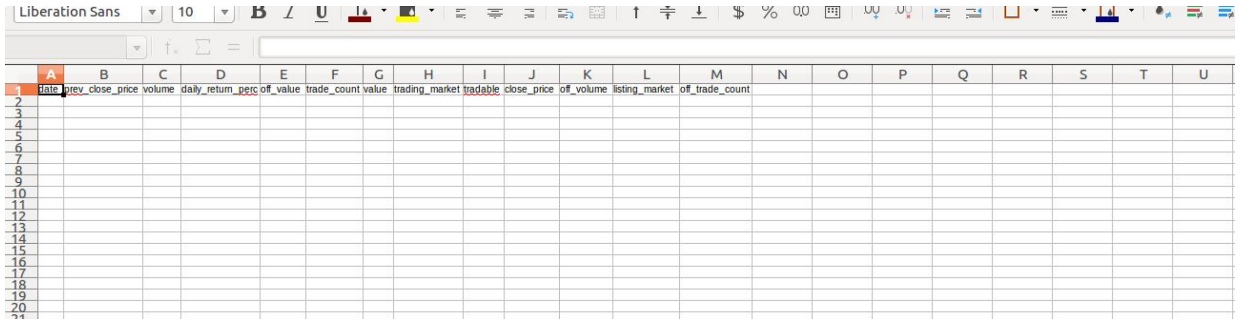
In S3, access the metric-market-date for your issue.

Open the file.

- The file has data, which seems correct.
  - Rerun the the subsequent jobs, eg metric_sync and refreshed_materialized_views
    - Does not resolve the issue?
      - Rerun from metric_gen, if still not visible from convert_taq. If unresolved create Jira.
- The file has data which seems incorrect or is missing
  - Check backwards to the dependency the metric_generate jobs the S3 data files
    - Here: dailystats_summary_generate
  - If the metric has produced data, then either the subsequent metric has an issue or the transmission is false. Restart therefore like above mentioned.

How can that happen?

- Issues in transmission.
- Irregularities while running a job (false success).
- False metric configuration for new metrics.



Market settings QA on a security level

- Include the downloaded data from the MQD in the table. Evaluate what volume (on/off/total) the reported volume on the exchange homepage is referring to.
    - Here it is the Total Trade volume
- Compare these metrics.
- If the match is between 99-101%, your market set up seems to be correct.
    - If you have any doubts, consult a Business team member and investigate the raw data.

M16 fx

	A	B	C	D	E	F	G	H	I	J	K	L
1			EXCHANGE						MQD			Comparison (MQD/EXCHANGE)
2			Source http://en.boerse-frankfurt.de/stock/pricehistory/Siemens-share/ETR/1.6.2017_18.6.2017#Price%20History									
3												
4	Date	Security	Open	Close	High	Low	Turnover	Volume	On market T	Off market 1	Total Trading	Volume
5	8/6/17	SIEGn.DE	126.9	127.95	128.15	126.8	139,133,760	1,090,408	872,326	218,082	1,090,408	100.00000%
6	7/6/17	SIEGn.DE	127.3	126.9	128.15	126.65	184,673,395	1,452,502	1,191,052	261,450	1,452,502	100.00000%
7	6/6/17	SIEGn.DE	128.5	127.5	129.1	127.5	207,695,394	1,621,091	1,313,081	308,007	1,621,088	99.99981%
8	2/6/17	SIEGn.DE	127.5	129.5	129.8	127.5	217,873,794	1,687,396	1,349,917	337,479	1,687,396	100.00000%
9	1/6/17	SIEGn.DE	127.05	126.85	127.65	125.9	172,945,263	1,364,129	1,173,151	190,978	1,364,129	100.00000%
10												
11												
12												

Market settings QA on a security level

What to do when you find miss matches?

- It is likely due to one of 2 issues
  - Error/s in the market set-up.
  - Less likely but possible: Data irregularities.
- Issues do not need to be visible or happening every day or for every security.
  - Example: Misclassified qualifiers do not need to appear every day or be used by every security.
  - Example: Data issues/missing data might not be obvious everyday.

A	B	C	D	E	F	G	H	I	J	K	L
		EXCHANGE						MQD			Comparison (MQD/EXCHANGE)
		Source http://en.boerse-frankfurt.de/stock/pricehistory/Siemens-share/ETR/1.6.2017_18.6.2017#Price%20History									
ate	Security	Open	Close	High	Low	Turnover	Volume	On market T	Off market T	Total Trading	Volume
8/6/17	SIEGn.DE	126.9	127.95	128.15	126.8	139,133,760	1,090,408	872,326	218,082	1,090,408	100.00000%
7/6/17	SIEGn.DE	127.3	126.9	128.15	126.65	184,673,395	1,452,502	1,166,124	255,978	1,422,102	97.90706%
6/6/17	SIEGn.DE	128.5	127.5	129.1	127.5	207,695,394	1,621,091	1,313,081	308,007	1,621,088	99.99981%
2/6/17	SIEGn.DE	127.5	129.5	129.8	127.5	217,873,794	1,687,396	1,029,917	257,479	1,287,396	76.29484%
1/6/17	SIEGn.DE	127.05	126.85	127.65	125.9	172,945,263	1,364,129	1,173,151	190,978	1,364,129	100.00000%

Market settings QA on a security level

What to do when you find miss matches?

- In any case, you will need to look into the raw data.
  - It is often easier to observe and understand issues for small cap securities.
  - Download the raw data (quotes/ trades) for the relevant security from TRTH.
  - If you find discrepancies, try to recreate the data of the exchange website with the TRTH data.
    - You need to understand what is causing the discrepancy.
  - Prepare a QA at a security level.
- If you find that the market settings are incorrect:
  - Misclassified qualifiers, on/off trading.
  - Trading hours are not adjusted for delays.
  - Adapt those and reconvert test period. QA the data.
- If you think it is an issue in the TRTH data, contact a Business-Team member.

Always document your QA, conclusions and issues in the relevant Jira!

Market settings QA on a security level

- If you completed your analysis on a security level for min 8 securities on at least 2 trading days each and the matching is satisfying you can proceed with the QA on a market level.
  - The more securities you test, the higher the chance you uncover data issues at an early stage.
  - For small markets and good data availability you can check even all securities.

A	B	C	D	E	F	G	H	I	J	K	L
		EXCHANGE						MQD			Comparison (MQD/EXCHANGE)
		Source http://en.boerse-frankfurt.de/stock/pricehistory/Siemens-share/ETR/1.6.2017_18.6.2017#Price%20History									
ate	Security	Open	Close	High	Low	Turnover	Volume	On market T	Off market T	Total Trading	Volume
8/6/17	SIEGn.DE	126.9	127.95	128.15	126.8	139,133,760	1,090,408	872,326	218,082	1,090,408	100.00000%
7/6/17	SIEGn.DE	127.3	126.9	128.15	126.65	184,673,395	1,452,502	1,166,124	255,978	1,422,102	97.90706%
6/6/17	SIEGn.DE	128.5	127.5	129.1	127.5	207,695,394	1,621,091	1,313,081	308,007	1,621,088	99.99981%
2/6/17	SIEGn.DE	127.5	129.5	129.8	127.5	217,873,794	1,687,396	1,029,917	257,479	1,287,396	76.29484%
1/6/17	SIEGn.DE	127.05	126.85	127.65	125.9	172,945,263	1,364,129	1,173,151	190,978	1,364,129	100.00000%

Market settings QA on a security level

Example for ‘special’ data:

- Here we found, that TRTH produced way more volume than reported by the exchange.
- Our system to that time filled down missing values as it is done for quotes data.
- For Istanbul, every minute the traded volume is stated which is filled with out a price.
- Our system filled down the previous price if there was one.

This was no issue: The conversion rules needed to be adapted!

VERTU.IS	20180316	09:55:31.303723	Trade	2.54	500	2.5400				
VERTU.IS	20180316	09:55:31.303723	Trade	2.54	1010	2.5400				
VERTU.IS	20180316	09:55:31.303723	Trade	2.54	2000	2.5400				
VERTU.IS	20180316	10:00:07.150229	Trade	2.54	500	2.5400				
VERTU.IS	20180316	10:00:07.159980	Trade		500	2.5400				
VERTU.IS	20180316	10:00:07.310364	Quote				2.54	3490		
VERTU.IS	20180316	10:00:09.130409	Quote				2.54	11290		
VERTU.IS	20180316	10:00:09.710452	Trade	2.55	350	2.5400				
VERTU.IS	20180316	10:00:12.960431	Trade		350	2.5400				
VERTU.IS	20180316	10:00:14.159638	Quote						2.55	11175
VERTU.IS	20180316	10:00:15.470035	Quote				2.54	15290		
VERTU.IS	20180316	10:00:16.992229	Quote				2.54	16290		
VERTU.IS	20180316	10:00:17.282299	Trade	2.55	400	2.5410				
VERTU.IS	20180316	10:00:17.362245	Quote						2.55	10775
VERTU.IS	20180316	10:00:17.392421	Trade		400	2.5410				
VERTU.IS	20180316	10:00:18.341781	Trade	2.54	1490	2.5410				
VERTU.IS	20180316	10:00:18.341781	Trade	2.54	1510	2.5400				
VERTU.IS	20180316	10:00:18.452306	Quote				2.54	13290		
VERTU.IS	20180316	10:00:18.472678	Trade		3000	2.5400				
VERTU.IS	20180316	10:00:26.802101	Trade	2.55	1750	2.5410				
VERTU.IS	20180316	10:00:26.802101	Trade	2.55	750	2.5420				
VERTU.IS	20180316	10:00:26.802101	Trade		2500	2.5420				
VERTU.IS	20180316	10:00:26.852054	Quote						2.55	8275
VERTU.IS	20180316	10:00:28.001525	Trade	2.55	1750	2.5420				
VERTU.IS	20180316	10:00:28.001525	Trade	2.55	25	2.5430				
VERTU.IS	20180316	10:00:28.001525	Trade	2.55	3225	2.5440				
VERTU.IS	20180316	10:00:28.001525	Quote						2.55	3275
VERTU.IS	20180316	10:00:28.031654	Trade		5000	2.5440				
VERTU.IS	20180316	10:00:28.031666	Trade	2.55	775	2.5440				
VERTU.IS	20180316	10:00:28.031666	Trade	2.55	1925	2.5440				
VERTU.IS	20180316	10:00:28.031666	Trade		2700	2.5440				
VERTU.IS	20180316	10:00:28.031666	Quote						2.55	575

Market settings QA on a market level

- A correct setting on security level does not mean that the result is correct on a market level.
- If you find information on a market level use them!
  - Often the underlying securities are not clear.

How can we assure the results are accurate on a market level?

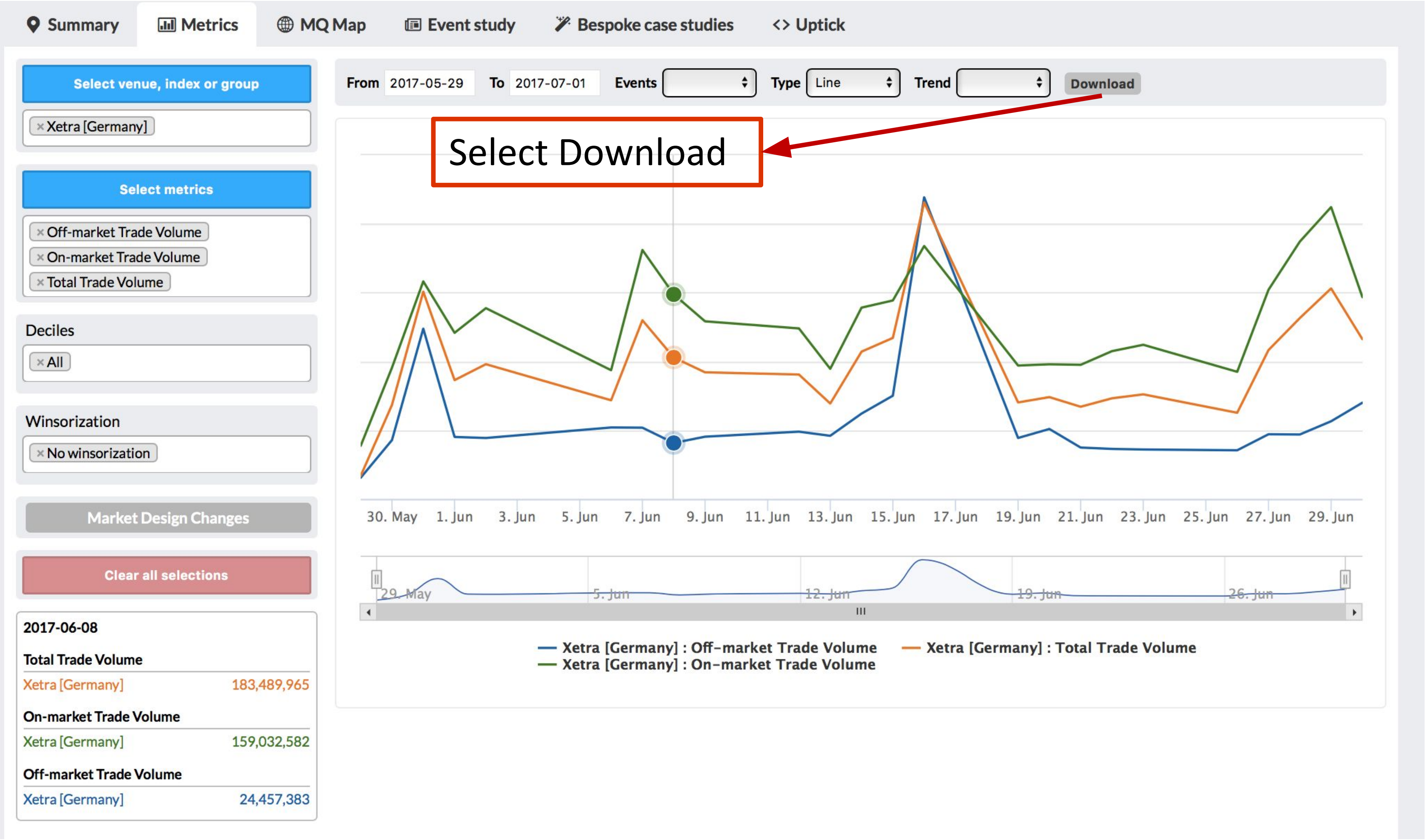
- Trust your QA on a security level.
  - The more comprehensive the QA was the more confident you can take the next step.

- Assure (again, if you have done it as the very first step of setting up a market) that your security list matches the official instrument list.
  - Compare the security list at a sync level with the official instrument list.

Market settings QA on a market level

Download 1 day dailystats data.

- Again we are working within your initial test period for which you should have an instrument list
- This time we are not interested in the data itself
- Extract from the tradable the ISIN
- These are the securities which passed the filter/s



Market settings QA on a market level

We check in two directions:

1. **Is the every security extracted from the MQD in the official security list?**

- Vlookup the security(ISIN or Ric) in the official securities list.
  - Its recommended to create an Ric list for the ISIN list.
  - If the official instruments list is given in form of rics you must find the according ISIN upfront.
- If the security is not in the official security list:
- Does the security fit the ‘usual’ pattern you identified in the official securities list ?
  - Yes:
    - Does it I have the expected type?
    - Did it just started to get traded recently?
      - The official list might not be updated.
  - No:
    - Likely to falsely in the list. The regex needs to be adjusted (convert or sync step)
- The trading venues are rather small:
  - For learning and review purposes please explain every security not in the official security list.

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Market settings QA on a market level

We check in two directions:

2. Is every instrument of official security list in the final metric results?

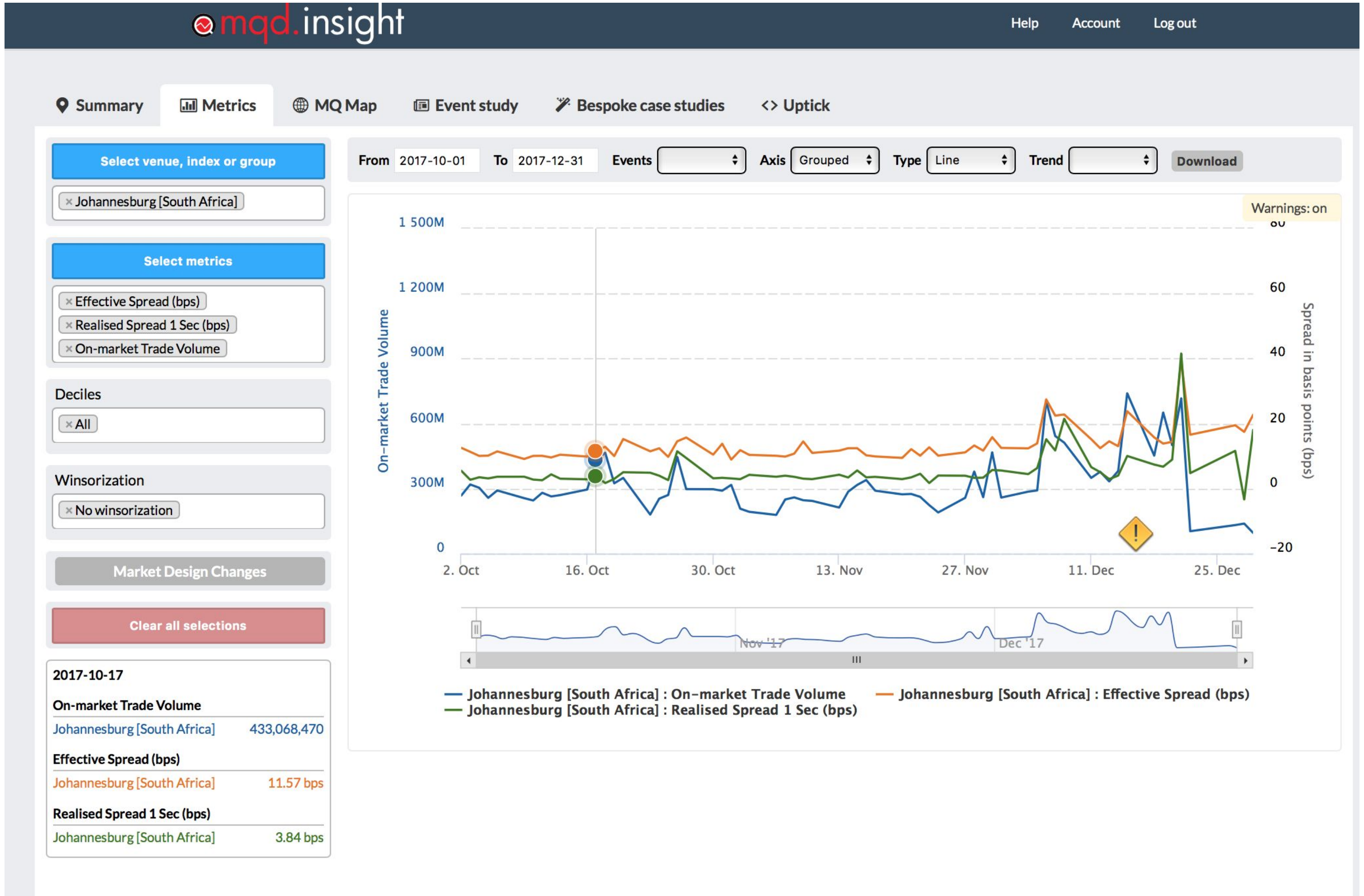
- Vlookup the security(ISIN or Ric) of the official securities list in the list you got from the MQD.
    - If the official securities list list is given in form of rics you must find the according ISIN upfront.
- If the security is not in the final MQD list:
    - The filter configuration is likely false.
    - If not, does TRTH provide that security?
- Discuss with your supervisor if you cannot explain discrepancies or f find appropriate regex

	A	B	C	D	E	F	G	H	I	J
1	Official Securities		In MQD	Comment		Official Securities		In official list	Comment	
2	Ric_offical_A	ISIN_offical_A	YES			Ric_offical_1	ISIN_offical_1	YES		
3	Ric_offical_B	ISIN_offical_B	YES			Ric_offical_2	ISIN_offical_2	YES		
4	Ric_offical_C	ISIN_offical_C	YES			Ric_offical_3	ISIN_offical_3	YES		
5	Ric_offical_D	ISIN_offical_D	YES			Ric_offical_4	ISIN_offical_4	YES		
6	Ric_offical_E	ISIN_offical_E	YES			Ric_offical_5	ISIN_offical_5	YES		
7	Ric_offical_F	ISIN_offical_F	YES			Ric_offical_6	ISIN_offical_6	YES		
8	Ric_offical_G	ISIN_offical_G	YES			Ric_offical_7	ISIN_offical_7	YES		
9	Ric_offical_H	ISIN_offical_H	YES			Ric_offical_8	ISIN_offical_8	YES		
10	Ric_offical_I	ISIN_offical_I	**NO**	**Stopped trading on DDMMYY**		Ric_offical_9	ISIN_offical_9	**NO**	**Missclassified type, warrant, exclude**	
11	Ric_offical_J	ISIN_offical_J	YES			Ric_offical_10	ISIN_offical_10	YES		
12	Ric_offical_K	ISIN_offical_K	YES			Ric_offical_11	ISIN_offical_11	YES		
13	Ric_offical_L	ISIN_offical_L	YES			Ric_offical_12	ISIN_offical_12	YES		
14	Ric_offical_M	ISIN_offical_M	YES			Ric_offical_13	ISIN_offical_13	**NO**	**Started trading on DDMMYY**	
15	…	…				Ric_offical_14	ISIN_offical_14	YES		
16						Ric_offical_15	ISIN_offical_15	YES		
17						…	…			
18										

Only run extended periods if the QA is Correct on a security and market level!

Session 5

Quality assurance after market set up



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16 March 2018