

zipline__example

September 29, 2021

0.1 zipline installation

Please follow latest instructions [here](#)

It is recommended to install Zipline in an isolated conda environment. Installing Zipline in conda environments will not interfere your default Python deployment or site-packages, which will prevent any possible conflict with your global libraries.

Use the `environment.yml` in this directory to install `zipline` and dependencies in a separate conda environment.

```
conda env create -f environment.yml
```

0.2 Ingest Data

Get QUANDL API key and follow instructions to download zipline bundles [here](#).

0.3 Imports

```
[1]: import matplotlib.pyplot as plt
import pandas as pd
from zipline.api import order_target, record, symbol
from zipline.examples import buyapple
```

```
[2]: %load_ext zipline
%matplotlib inline
```

0.4 zipline Demo

Zipline is the algorithmic trading library that powers the Quantopian backtesting and live-trading platform. It is also available offline to develop a strategy using a limited number of free data bundles that can be ingested and used to test the performance of trading ideas before porting the result to the online Quantopian platform for paper and live trading.

0.4.1 Data access using zipline

See [zipline docs](#) on the download and management of data bundles used to simulate backtests.

The following commandline instruction lists the available bundles (store per default in `~/zipline`).

```
[3]: !zipline bundles
```

```

csvdir <no ingestions>
quandl 2019-03-06 23:47:31.577436
quandl 2018-06-21 17:47:33.724316
quandl 2018-05-10 14:38:20.063950
quantopian-quandl 2018-06-22 15:46:10.110298

```

The following code illustrates how zipline permits us to access daily stock data for a range of companies. You can run zipline scripts in the Jupyter Notebook using the magic function of the same name.

First, you need to initialize the context with the desired security symbols. We'll also use a counter variable. Then zipline calls `handle_data`, where we use the `data.history()` method to look back a single period and append the data for the last day to a `.csv` file:

```

[4]: %%zipline --start 2010-1-1 --end 2018-1-1 --data-frequency daily
from zipline.api import order_target, record, symbol
import pandas as pd

def initialize(context):
    context.i = 0
    context.assets = [symbol('FB'), symbol('GOOG'), symbol('AMZN')]

def handle_data(context, data):
    df = data.history(context.assets, fields=['price', 'volume'], bar_count=1,
    ↪frequency="1d")
    df = df.to_frame().reset_index()

    if context.i == 0:
        df.columns = ['date', 'asset', 'price', 'volume']
        df.to_csv('stock_data.csv', index=False)
    else:
        df.to_csv('stock_data.csv', index=False, mode='a', header=None)
    context.i += 1

```

```

[2019-04-18 01:09:43.581720] INFO: Loader: Cache at
/home/stefan/.zipline/data/SPY_benchmark.csv does not have data from 2010-01-04
00:00:00+00:00 to 2017-12-29 00:00:00+00:00.

```

```

[2019-04-18 01:09:43.582187] INFO: Loader: Downloading benchmark data for 'SPY'
from 2009-12-31 00:00:00+00:00 to 2017-12-29 00:00:00+00:00

```

```

[2019-04-18 01:09:44.252915] WARNING: Loader: Still don't have expected
benchmark data for 'SPY' from 2009-12-31 00:00:00+00:00 to 2017-12-29
00:00:00+00:00 after redownload!

```

```

/home/stefan/.pyenv/versions/miniconda3-latest/envs/env_zipline/lib/python3.5/si
te-packages/empyrical/stats.py:704: RuntimeWarning: invalid value encountered in
true_divide

```

```

    out=out,
/home/stefan/.pyenv/versions/miniconda3-latest/envs/env_zipline/lib/python3.5/si

```

```
te-packages/empyrical/stats.py:790: RuntimeWarning: invalid value encountered in
true_divide
```

```
    np.divide(average_annual_return, annualized_downside_risk, out=out)
```

```
[2019-04-18 01:11:32.638840] INFO: zipline.finance.metrics.tracker: Simulated
2013 trading days
```

```
first open: 2010-01-04 14:31:00+00:00
```

```
last close: 2017-12-29 21:00:00+00:00
```

```
[4]:
```

	algo_volatility	algorithm_period_return	alpha	\
2010-01-04 21:00:00+00:00	NaN	0.0	NaN	
2010-01-05 21:00:00+00:00	0.0	0.0	NaN	
2010-01-06 21:00:00+00:00	0.0	0.0	NaN	
2010-01-07 21:00:00+00:00	0.0	0.0	NaN	
2010-01-08 21:00:00+00:00	0.0	0.0	NaN	
2010-01-11 21:00:00+00:00	0.0	0.0	NaN	
2010-01-12 21:00:00+00:00	0.0	0.0	NaN	
2010-01-13 21:00:00+00:00	0.0	0.0	NaN	
2010-01-14 21:00:00+00:00	0.0	0.0	NaN	
2010-01-15 21:00:00+00:00	0.0	0.0	NaN	
2010-01-19 21:00:00+00:00	0.0	0.0	NaN	
2010-01-20 21:00:00+00:00	0.0	0.0	NaN	
2010-01-21 21:00:00+00:00	0.0	0.0	NaN	
2010-01-22 21:00:00+00:00	0.0	0.0	NaN	
2010-01-25 21:00:00+00:00	0.0	0.0	NaN	
2010-01-26 21:00:00+00:00	0.0	0.0	NaN	
2010-01-27 21:00:00+00:00	0.0	0.0	NaN	
2010-01-28 21:00:00+00:00	0.0	0.0	NaN	
2010-01-29 21:00:00+00:00	0.0	0.0	NaN	
2010-02-01 21:00:00+00:00	0.0	0.0	NaN	
2010-02-02 21:00:00+00:00	0.0	0.0	NaN	
2010-02-03 21:00:00+00:00	0.0	0.0	NaN	
2010-02-04 21:00:00+00:00	0.0	0.0	NaN	
2010-02-05 21:00:00+00:00	0.0	0.0	NaN	
2010-02-08 21:00:00+00:00	0.0	0.0	NaN	
2010-02-09 21:00:00+00:00	0.0	0.0	NaN	
2010-02-10 21:00:00+00:00	0.0	0.0	NaN	
2010-02-11 21:00:00+00:00	0.0	0.0	NaN	
2010-02-12 21:00:00+00:00	0.0	0.0	NaN	
2010-02-16 21:00:00+00:00	0.0	0.0	NaN	
...	
2017-11-16 21:00:00+00:00	0.0	0.0	0.0	
2017-11-17 21:00:00+00:00	0.0	0.0	0.0	
2017-11-20 21:00:00+00:00	0.0	0.0	0.0	
2017-11-21 21:00:00+00:00	0.0	0.0	0.0	
2017-11-22 21:00:00+00:00	0.0	0.0	0.0	
2017-11-24 18:00:00+00:00	0.0	0.0	0.0	
2017-11-27 21:00:00+00:00	0.0	0.0	0.0	

2017-11-28 21:00:00+00:00	0.0	0.0	0.0
2017-11-29 21:00:00+00:00	0.0	0.0	0.0
2017-11-30 21:00:00+00:00	0.0	0.0	0.0
2017-12-01 21:00:00+00:00	0.0	0.0	0.0
2017-12-04 21:00:00+00:00	0.0	0.0	0.0
2017-12-05 21:00:00+00:00	0.0	0.0	0.0
2017-12-06 21:00:00+00:00	0.0	0.0	0.0
2017-12-07 21:00:00+00:00	0.0	0.0	0.0
2017-12-08 21:00:00+00:00	0.0	0.0	0.0
2017-12-11 21:00:00+00:00	0.0	0.0	0.0
2017-12-12 21:00:00+00:00	0.0	0.0	0.0
2017-12-13 21:00:00+00:00	0.0	0.0	0.0
2017-12-14 21:00:00+00:00	0.0	0.0	0.0
2017-12-15 21:00:00+00:00	0.0	0.0	0.0
2017-12-18 21:00:00+00:00	0.0	0.0	0.0
2017-12-19 21:00:00+00:00	0.0	0.0	0.0
2017-12-20 21:00:00+00:00	0.0	0.0	0.0
2017-12-21 21:00:00+00:00	0.0	0.0	0.0
2017-12-22 21:00:00+00:00	0.0	0.0	0.0
2017-12-26 21:00:00+00:00	0.0	0.0	0.0
2017-12-27 21:00:00+00:00	0.0	0.0	0.0
2017-12-28 21:00:00+00:00	0.0	0.0	0.0
2017-12-29 21:00:00+00:00	0.0	0.0	0.0

	benchmark_period_return	benchmark_volatility \
2010-01-04 21:00:00+00:00	0.003487	NaN
2010-01-05 21:00:00+00:00	0.006987	0.000000
2010-01-06 21:00:00+00:00	0.010498	0.000000
2010-01-07 21:00:00+00:00	0.014022	0.000000
2010-01-08 21:00:00+00:00	0.017559	0.000000
2010-01-11 21:00:00+00:00	0.021107	0.000000
2010-01-12 21:00:00+00:00	0.024668	0.000000
2010-01-13 21:00:00+00:00	0.028241	0.000000
2010-01-14 21:00:00+00:00	0.031827	0.000000
2010-01-15 21:00:00+00:00	0.035425	0.000000
2010-01-19 21:00:00+00:00	0.039036	0.000000
2010-01-20 21:00:00+00:00	0.042660	0.000000
2010-01-21 21:00:00+00:00	0.046296	0.000000
2010-01-22 21:00:00+00:00	0.049945	0.000000
2010-01-25 21:00:00+00:00	0.053606	0.000000
2010-01-26 21:00:00+00:00	0.057280	0.000000
2010-01-27 21:00:00+00:00	0.060967	0.000000
2010-01-28 21:00:00+00:00	0.064667	0.000000
2010-01-29 21:00:00+00:00	0.068380	0.000000
2010-02-01 21:00:00+00:00	0.072106	0.000000
2010-02-02 21:00:00+00:00	0.075845	0.000000
2010-02-03 21:00:00+00:00	0.079596	0.000000

2010-02-04	21:00:00+00:00	0.083361	0.000000
2010-02-05	21:00:00+00:00	0.087139	0.000000
2010-02-08	21:00:00+00:00	0.090931	0.000000
2010-02-09	21:00:00+00:00	0.094735	0.000000
2010-02-10	21:00:00+00:00	0.098553	0.000000
2010-02-11	21:00:00+00:00	0.102384	0.000000
2010-02-12	21:00:00+00:00	0.106228	0.000000
2010-02-16	21:00:00+00:00	0.110086	0.000000
...	
2017-11-16	21:00:00+00:00	61.190689	0.085431
2017-11-17	21:00:00+00:00	61.007937	0.085428
2017-11-20	21:00:00+00:00	61.113759	0.085407
2017-11-21	21:00:00+00:00	61.520152	0.085400
2017-11-22	21:00:00+00:00	61.464842	0.085385
2017-11-24	18:00:00+00:00	61.609129	0.085364
2017-11-27	21:00:00+00:00	61.577862	0.085347
2017-11-28	21:00:00+00:00	62.212695	0.085374
2017-11-29	21:00:00+00:00	62.174230	0.085358
2017-11-30	21:00:00+00:00	62.727310	0.085369
2017-12-01	21:00:00+00:00	62.595045	0.085361
2017-12-04	21:00:00+00:00	62.518090	0.085348
2017-12-05	21:00:00+00:00	62.289650	0.085350
2017-12-06	21:00:00+00:00	62.301672	0.085331
2017-12-07	21:00:00+00:00	62.501269	0.085311
2017-12-08	21:00:00+00:00	62.847553	0.085298
2017-12-11	21:00:00+00:00	63.039928	0.085277
2017-12-12	21:00:00+00:00	63.152948	0.085256
2017-12-13	21:00:00+00:00	63.145725	0.085238
2017-12-14	21:00:00+00:00	62.883619	0.085245
2017-12-15	21:00:00+00:00	63.412333	0.085252
2017-12-18	21:00:00+00:00	63.820780	0.085244
2017-12-19	21:00:00+00:00	63.571858	0.085249
2017-12-20	21:00:00+00:00	63.538019	0.085233
2017-12-21	21:00:00+00:00	63.670952	0.085211
2017-12-22	21:00:00+00:00	63.654032	0.085194
2017-12-26	21:00:00+00:00	63.576682	0.085181
2017-12-27	21:00:00+00:00	63.608097	0.085162
2017-12-28	21:00:00+00:00	63.741030	0.085141
2017-12-29	21:00:00+00:00	63.496932	0.085145

		beta	capital_used	ending_cash	ending_exposure	\
2010-01-04	21:00:00+00:00	NaN	0.0	10000000.0	0.0	
2010-01-05	21:00:00+00:00	NaN	0.0	10000000.0	0.0	
2010-01-06	21:00:00+00:00	NaN	0.0	10000000.0	0.0	
2010-01-07	21:00:00+00:00	NaN	0.0	10000000.0	0.0	
2010-01-08	21:00:00+00:00	NaN	0.0	10000000.0	0.0	
2010-01-11	21:00:00+00:00	NaN	0.0	10000000.0	0.0	

[illegible]

2017-12-19	21:00:00+00:00	0.0	0.0	10000000.0	0.0
2017-12-20	21:00:00+00:00	0.0	0.0	10000000.0	0.0
2017-12-21	21:00:00+00:00	0.0	0.0	10000000.0	0.0
2017-12-22	21:00:00+00:00	0.0	0.0	10000000.0	0.0
2017-12-26	21:00:00+00:00	0.0	0.0	10000000.0	0.0
2017-12-27	21:00:00+00:00	0.0	0.0	10000000.0	0.0
2017-12-28	21:00:00+00:00	0.0	0.0	10000000.0	0.0
2017-12-29	21:00:00+00:00	0.0	0.0	10000000.0	0.0

		ending_value	...	\
2010-01-04	21:00:00+00:00	0.0	...	
2010-01-05	21:00:00+00:00	0.0	...	
2010-01-06	21:00:00+00:00	0.0	...	
2010-01-07	21:00:00+00:00	0.0	...	
2010-01-08	21:00:00+00:00	0.0	...	
2010-01-11	21:00:00+00:00	0.0	...	
2010-01-12	21:00:00+00:00	0.0	...	
2010-01-13	21:00:00+00:00	0.0	...	
2010-01-14	21:00:00+00:00	0.0	...	
2010-01-15	21:00:00+00:00	0.0	...	
2010-01-19	21:00:00+00:00	0.0	...	
2010-01-20	21:00:00+00:00	0.0	...	
2010-01-21	21:00:00+00:00	0.0	...	
2010-01-22	21:00:00+00:00	0.0	...	
2010-01-25	21:00:00+00:00	0.0	...	
2010-01-26	21:00:00+00:00	0.0	...	
2010-01-27	21:00:00+00:00	0.0	...	
2010-01-28	21:00:00+00:00	0.0	...	
2010-01-29	21:00:00+00:00	0.0	...	
2010-02-01	21:00:00+00:00	0.0	...	
2010-02-02	21:00:00+00:00	0.0	...	
2010-02-03	21:00:00+00:00	0.0	...	
2010-02-04	21:00:00+00:00	0.0	...	
2010-02-05	21:00:00+00:00	0.0	...	
2010-02-08	21:00:00+00:00	0.0	...	
2010-02-09	21:00:00+00:00	0.0	...	
2010-02-10	21:00:00+00:00	0.0	...	
2010-02-11	21:00:00+00:00	0.0	...	
2010-02-12	21:00:00+00:00	0.0	...	
2010-02-16	21:00:00+00:00	0.0	...	
...		
2017-11-16	21:00:00+00:00	0.0	...	
2017-11-17	21:00:00+00:00	0.0	...	
2017-11-20	21:00:00+00:00	0.0	...	
2017-11-21	21:00:00+00:00	0.0	...	
2017-11-22	21:00:00+00:00	0.0	...	
2017-11-24	18:00:00+00:00	0.0	...	

2017-11-27	21:00:00+00:00	0.0	...
2017-11-28	21:00:00+00:00	0.0	...
2017-11-29	21:00:00+00:00	0.0	...
2017-11-30	21:00:00+00:00	0.0	...
2017-12-01	21:00:00+00:00	0.0	...
2017-12-04	21:00:00+00:00	0.0	...
2017-12-05	21:00:00+00:00	0.0	...
2017-12-06	21:00:00+00:00	0.0	...
2017-12-07	21:00:00+00:00	0.0	...
2017-12-08	21:00:00+00:00	0.0	...
2017-12-11	21:00:00+00:00	0.0	...
2017-12-12	21:00:00+00:00	0.0	...
2017-12-13	21:00:00+00:00	0.0	...
2017-12-14	21:00:00+00:00	0.0	...
2017-12-15	21:00:00+00:00	0.0	...
2017-12-18	21:00:00+00:00	0.0	...
2017-12-19	21:00:00+00:00	0.0	...
2017-12-20	21:00:00+00:00	0.0	...
2017-12-21	21:00:00+00:00	0.0	...
2017-12-22	21:00:00+00:00	0.0	...
2017-12-26	21:00:00+00:00	0.0	...
2017-12-27	21:00:00+00:00	0.0	...
2017-12-28	21:00:00+00:00	0.0	...
2017-12-29	21:00:00+00:00	0.0	...

	short_exposure	short_value	shorts_count	sortino \	
2010-01-04	21:00:00+00:00	0.0	0.0	0	None
2010-01-05	21:00:00+00:00	0.0	0.0	0	None
2010-01-06	21:00:00+00:00	0.0	0.0	0	None
2010-01-07	21:00:00+00:00	0.0	0.0	0	None
2010-01-08	21:00:00+00:00	0.0	0.0	0	None
2010-01-11	21:00:00+00:00	0.0	0.0	0	None
2010-01-12	21:00:00+00:00	0.0	0.0	0	None
2010-01-13	21:00:00+00:00	0.0	0.0	0	None
2010-01-14	21:00:00+00:00	0.0	0.0	0	None
2010-01-15	21:00:00+00:00	0.0	0.0	0	None
2010-01-19	21:00:00+00:00	0.0	0.0	0	None
2010-01-20	21:00:00+00:00	0.0	0.0	0	None
2010-01-21	21:00:00+00:00	0.0	0.0	0	None
2010-01-22	21:00:00+00:00	0.0	0.0	0	None
2010-01-25	21:00:00+00:00	0.0	0.0	0	None
2010-01-26	21:00:00+00:00	0.0	0.0	0	None
2010-01-27	21:00:00+00:00	0.0	0.0	0	None
2010-01-28	21:00:00+00:00	0.0	0.0	0	None
2010-01-29	21:00:00+00:00	0.0	0.0	0	None
2010-02-01	21:00:00+00:00	0.0	0.0	0	None
2010-02-02	21:00:00+00:00	0.0	0.0	0	None

2010-02-03	21:00:00+00:00	0.0	0.0	0	None
2010-02-04	21:00:00+00:00	0.0	0.0	0	None
2010-02-05	21:00:00+00:00	0.0	0.0	0	None
2010-02-08	21:00:00+00:00	0.0	0.0	0	None
2010-02-09	21:00:00+00:00	0.0	0.0	0	None
2010-02-10	21:00:00+00:00	0.0	0.0	0	None
2010-02-11	21:00:00+00:00	0.0	0.0	0	None
2010-02-12	21:00:00+00:00	0.0	0.0	0	None
2010-02-16	21:00:00+00:00	0.0	0.0	0	None
...		
2017-11-16	21:00:00+00:00	0.0	0.0	0	None
2017-11-17	21:00:00+00:00	0.0	0.0	0	None
2017-11-20	21:00:00+00:00	0.0	0.0	0	None
2017-11-21	21:00:00+00:00	0.0	0.0	0	None
2017-11-22	21:00:00+00:00	0.0	0.0	0	None
2017-11-24	18:00:00+00:00	0.0	0.0	0	None
2017-11-27	21:00:00+00:00	0.0	0.0	0	None
2017-11-28	21:00:00+00:00	0.0	0.0	0	None
2017-11-29	21:00:00+00:00	0.0	0.0	0	None
2017-11-30	21:00:00+00:00	0.0	0.0	0	None
2017-12-01	21:00:00+00:00	0.0	0.0	0	None
2017-12-04	21:00:00+00:00	0.0	0.0	0	None
2017-12-05	21:00:00+00:00	0.0	0.0	0	None
2017-12-06	21:00:00+00:00	0.0	0.0	0	None
2017-12-07	21:00:00+00:00	0.0	0.0	0	None
2017-12-08	21:00:00+00:00	0.0	0.0	0	None
2017-12-11	21:00:00+00:00	0.0	0.0	0	None
2017-12-12	21:00:00+00:00	0.0	0.0	0	None
2017-12-13	21:00:00+00:00	0.0	0.0	0	None
2017-12-14	21:00:00+00:00	0.0	0.0	0	None
2017-12-15	21:00:00+00:00	0.0	0.0	0	None
2017-12-18	21:00:00+00:00	0.0	0.0	0	None
2017-12-19	21:00:00+00:00	0.0	0.0	0	None
2017-12-20	21:00:00+00:00	0.0	0.0	0	None
2017-12-21	21:00:00+00:00	0.0	0.0	0	None
2017-12-22	21:00:00+00:00	0.0	0.0	0	None
2017-12-26	21:00:00+00:00	0.0	0.0	0	None
2017-12-27	21:00:00+00:00	0.0	0.0	0	None
2017-12-28	21:00:00+00:00	0.0	0.0	0	None
2017-12-29	21:00:00+00:00	0.0	0.0	0	None

		starting_cash	starting_exposure	starting_value \
2010-01-04	21:00:00+00:00	10000000.0	0.0	0.0
2010-01-05	21:00:00+00:00	10000000.0	0.0	0.0
2010-01-06	21:00:00+00:00	10000000.0	0.0	0.0
2010-01-07	21:00:00+00:00	10000000.0	0.0	0.0
2010-01-08	21:00:00+00:00	10000000.0	0.0	0.0

10

2017-12-18	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-19	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-20	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-21	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-22	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-26	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-27	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-28	21:00:00+00:00	10000000.0	0.0	0.0
2017-12-29	21:00:00+00:00	10000000.0	0.0	0.0

		trading_days	transactions	treasury_period_return
2010-01-04	21:00:00+00:00	1	[]	0.0
2010-01-05	21:00:00+00:00	2	[]	0.0
2010-01-06	21:00:00+00:00	3	[]	0.0
2010-01-07	21:00:00+00:00	4	[]	0.0
2010-01-08	21:00:00+00:00	5	[]	0.0
2010-01-11	21:00:00+00:00	6	[]	0.0
2010-01-12	21:00:00+00:00	7	[]	0.0
2010-01-13	21:00:00+00:00	8	[]	0.0
2010-01-14	21:00:00+00:00	9	[]	0.0
2010-01-15	21:00:00+00:00	10	[]	0.0
2010-01-19	21:00:00+00:00	11	[]	0.0
2010-01-20	21:00:00+00:00	12	[]	0.0
2010-01-21	21:00:00+00:00	13	[]	0.0
2010-01-22	21:00:00+00:00	14	[]	0.0
2010-01-25	21:00:00+00:00	15	[]	0.0
2010-01-26	21:00:00+00:00	16	[]	0.0
2010-01-27	21:00:00+00:00	17	[]	0.0
2010-01-28	21:00:00+00:00	18	[]	0.0
2010-01-29	21:00:00+00:00	19	[]	0.0
2010-02-01	21:00:00+00:00	20	[]	0.0
2010-02-02	21:00:00+00:00	21	[]	0.0
2010-02-03	21:00:00+00:00	22	[]	0.0
2010-02-04	21:00:00+00:00	23	[]	0.0
2010-02-05	21:00:00+00:00	24	[]	0.0
2010-02-08	21:00:00+00:00	25	[]	0.0
2010-02-09	21:00:00+00:00	26	[]	0.0
2010-02-10	21:00:00+00:00	27	[]	0.0
2010-02-11	21:00:00+00:00	28	[]	0.0
2010-02-12	21:00:00+00:00	29	[]	0.0
2010-02-16	21:00:00+00:00	30	[]	0.0
...	
2017-11-16	21:00:00+00:00	1984	[]	0.0
2017-11-17	21:00:00+00:00	1985	[]	0.0
2017-11-20	21:00:00+00:00	1986	[]	0.0
2017-11-21	21:00:00+00:00	1987	[]	0.0
2017-11-22	21:00:00+00:00	1988	[]	0.0

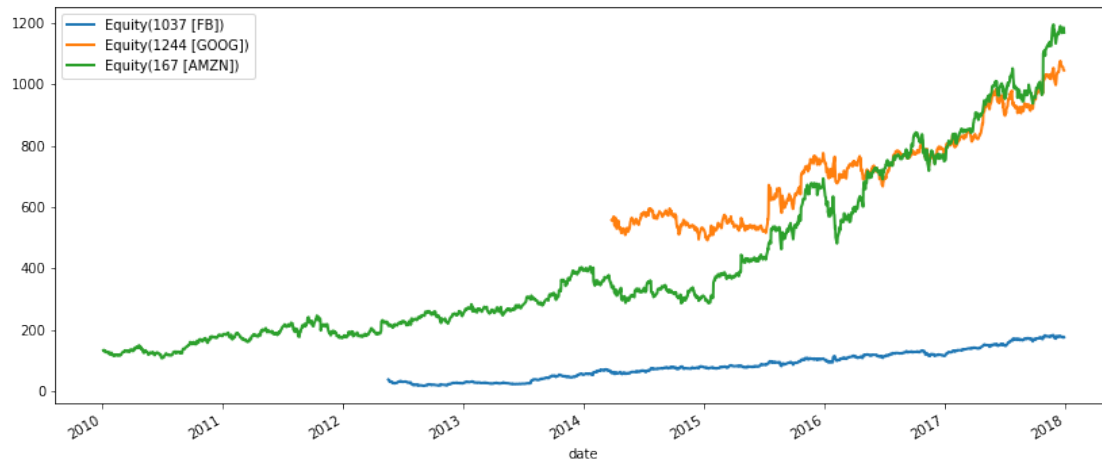
2017-11-24 18:00:00+00:00	1989	[]	0.0
2017-11-27 21:00:00+00:00	1990	[]	0.0
2017-11-28 21:00:00+00:00	1991	[]	0.0
2017-11-29 21:00:00+00:00	1992	[]	0.0
2017-11-30 21:00:00+00:00	1993	[]	0.0
2017-12-01 21:00:00+00:00	1994	[]	0.0
2017-12-04 21:00:00+00:00	1995	[]	0.0
2017-12-05 21:00:00+00:00	1996	[]	0.0
2017-12-06 21:00:00+00:00	1997	[]	0.0
2017-12-07 21:00:00+00:00	1998	[]	0.0
2017-12-08 21:00:00+00:00	1999	[]	0.0
2017-12-11 21:00:00+00:00	2000	[]	0.0
2017-12-12 21:00:00+00:00	2001	[]	0.0
2017-12-13 21:00:00+00:00	2002	[]	0.0
2017-12-14 21:00:00+00:00	2003	[]	0.0
2017-12-15 21:00:00+00:00	2004	[]	0.0
2017-12-18 21:00:00+00:00	2005	[]	0.0
2017-12-19 21:00:00+00:00	2006	[]	0.0
2017-12-20 21:00:00+00:00	2007	[]	0.0
2017-12-21 21:00:00+00:00	2008	[]	0.0
2017-12-22 21:00:00+00:00	2009	[]	0.0
2017-12-26 21:00:00+00:00	2010	[]	0.0
2017-12-27 21:00:00+00:00	2011	[]	0.0
2017-12-28 21:00:00+00:00	2012	[]	0.0
2017-12-29 21:00:00+00:00	2013	[]	0.0

[2013 rows x 37 columns]

We can plot the data as follows:

```
[5]: df = pd.read_csv('stock_data.csv')
df.date = pd.to_datetime(df.date)
df.set_index('date').groupby('asset').price.plot(lw=2, legend=True,
→figsize=(14, 6))
```

```
[5]: asset
Equity(1037 [FB])    AxesSubplot(0.125,0.2;0.775x0.68)
Equity(1244 [GOOG]) AxesSubplot(0.125,0.2;0.775x0.68)
Equity(167 [AMZN])  AxesSubplot(0.125,0.2;0.775x0.68)
Name: price, dtype: object
```



0.4.2 Simple moving average strategy

The following code example illustrates a [Dual Moving Average Cross-Over Strategy](#) to demonstrate zipline in action:

```
[6]: %%zipline --start 2014-1-1 --end 2018-1-1 -o dma.pickle
from zipline.api import order_target, record, symbol
import matplotlib.pyplot as plt

def initialize(context):
    context.i = 0
    context.asset = symbol('AAPL')

def handle_data(context, data):
    # Skip first 300 days to get full windows
    context.i += 1
    if context.i < 300:
        return

    # Compute averages
    # data.history() has to be called with the same params
    # from above and returns a pandas dataframe.
    short_mavg = data.history(context.asset, 'price', bar_count=100,
    ↪frequency="1d").mean()
    long_mavg = data.history(context.asset, 'price', bar_count=300,
    ↪frequency="1d").mean()

    # Trading logic
    if short_mavg > long_mavg:
        # order_target orders as many shares as needed to
```

```

        # achieve the desired number of shares.
        order_target(context.asset, 100)
    elif short_mavg < long_mavg:
        order_target(context.asset, 0)

    # Save values for later inspection
    record(AAPL=data.current(context.asset, 'price'),
           short_mavg=short_mavg,
           long_mavg=long_mavg)

def analyze(context, perf):
    fig = plt.figure()
    ax1 = fig.add_subplot(211)
    perf.portfolio_value.plot(ax=ax1)
    ax1.set_ylabel('portfolio value in $')

    ax2 = fig.add_subplot(212)
    perf['AAPL'].plot(ax=ax2)
    perf[['short_mavg', 'long_mavg']].plot(ax=ax2)

    perf_trans = perf.ix[[t != [] for t in perf.transactions]]
    buys = perf_trans.ix[[t[0]['amount'] > 0 for t in perf_trans.transactions]]
    sells = perf_trans.ix[
        [t[0]['amount'] < 0 for t in perf_trans.transactions]]
    ax2.plot(buys.index, perf.short_mavg.ix[buys.index],
             '^', markersize=10, color='m')
    ax2.plot(sells.index, perf.short_mavg.ix[sells.index],
             'v', markersize=10, color='k')
    ax2.set_ylabel('price in $')
    plt.legend(loc=0)
    plt.show()

```

[2019-04-18 01:16:39.544889] WARNING: Loader: Refusing to download new benchmark data because a download succeeded at 2019-04-18 01:09:44.248942+00:00.

/home/stefan/.pyenv/versions/miniconda3-latest/envs/env_zipline/lib/python3.5/site-packages/empyirical/stats.py:704: RuntimeWarning: invalid value encountered in true_divide

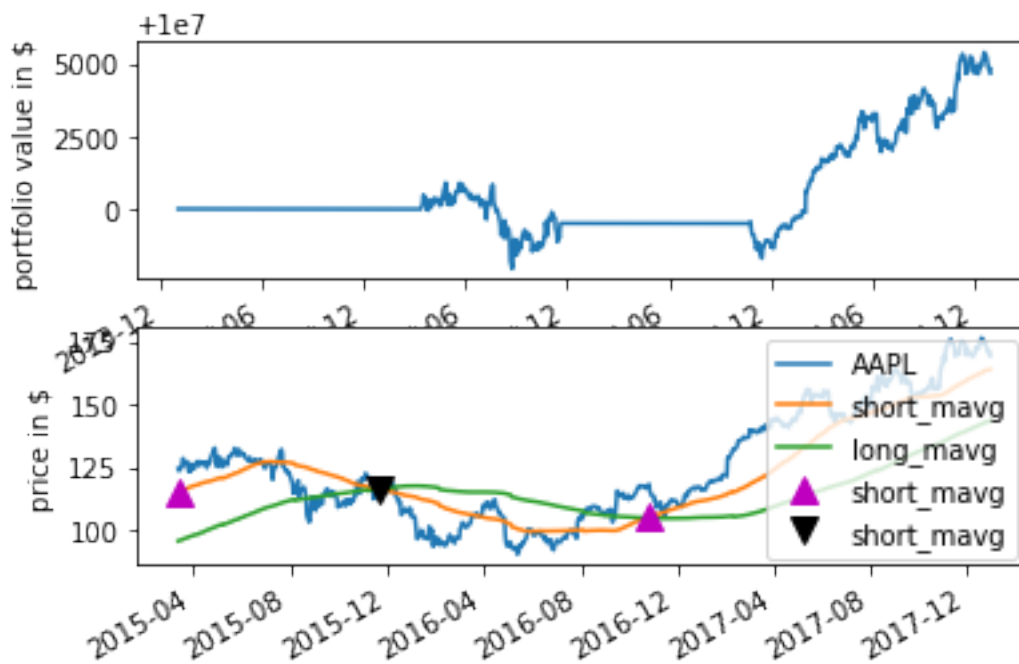
out=out,

/home/stefan/.pyenv/versions/miniconda3-latest/envs/env_zipline/lib/python3.5/site-packages/empyirical/stats.py:790: RuntimeWarning: invalid value encountered in true_divide

np.divide(average_annual_return, annualized_downside_risk, out=out)

[2019-04-18 01:16:42.579180] INFO: zipline.finance.metrics.tracker: Simulated 1007 trading days
first open: 2014-01-02 14:31:00+00:00

last close: 2017-12-29 21:00:00+00:00



[6]:		AAPL	algo_volatility	algorithm_period_return \
2014-01-02	21:00:00+00:00	NaN	NaN	0.000000
2014-01-03	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-06	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-07	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-08	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-09	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-10	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-13	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-14	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-15	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-16	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-17	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-21	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-22	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-23	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-24	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-27	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-28	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-29	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-30	21:00:00+00:00	NaN	0.000000	0.000000
2014-01-31	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-03	21:00:00+00:00	NaN	0.000000	0.000000

2014-02-04	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-05	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-06	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-07	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-10	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-11	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-12	21:00:00+00:00	NaN	0.000000	0.000000
2014-02-13	21:00:00+00:00	NaN	0.000000	0.000000

...	
2017-11-16	21:00:00+00:00	171.100	0.000190	0.000485
2017-11-17	21:00:00+00:00	170.150	0.000190	0.000475
2017-11-20	21:00:00+00:00	169.980	0.000189	0.000473
2017-11-21	21:00:00+00:00	173.140	0.000190	0.000505
2017-11-22	21:00:00+00:00	174.960	0.000190	0.000523
2017-11-24	18:00:00+00:00	174.970	0.000190	0.000523
2017-11-27	21:00:00+00:00	174.090	0.000190	0.000514
2017-11-28	21:00:00+00:00	173.070	0.000190	0.000504
2017-11-29	21:00:00+00:00	169.480	0.000191	0.000468
2017-11-30	21:00:00+00:00	171.850	0.000191	0.000492
2017-12-01	21:00:00+00:00	171.050	0.000191	0.000484
2017-12-04	21:00:00+00:00	169.800	0.000191	0.000472
2017-12-05	21:00:00+00:00	169.640	0.000191	0.000470
2017-12-06	21:00:00+00:00	169.010	0.000191	0.000464
2017-12-07	21:00:00+00:00	169.452	0.000191	0.000468
2017-12-08	21:00:00+00:00	169.370	0.000191	0.000467
2017-12-11	21:00:00+00:00	172.670	0.000191	0.000500
2017-12-12	21:00:00+00:00	171.700	0.000191	0.000491
2017-12-13	21:00:00+00:00	172.270	0.000191	0.000496
2017-12-14	21:00:00+00:00	172.220	0.000191	0.000496
2017-12-15	21:00:00+00:00	173.870	0.000191	0.000512
2017-12-18	21:00:00+00:00	176.420	0.000191	0.000538
2017-12-19	21:00:00+00:00	174.540	0.000192	0.000519
2017-12-20	21:00:00+00:00	174.350	0.000191	0.000517
2017-12-21	21:00:00+00:00	175.010	0.000191	0.000524
2017-12-22	21:00:00+00:00	175.010	0.000191	0.000524
2017-12-26	21:00:00+00:00	170.570	0.000193	0.000479
2017-12-27	21:00:00+00:00	170.600	0.000192	0.000480
2017-12-28	21:00:00+00:00	171.080	0.000192	0.000484
2017-12-29	21:00:00+00:00	169.230	0.000193	0.000466

	alpha	benchmark_period_return \
2014-01-02 21:00:00+00:00	NaN	0.003487
2014-01-03 21:00:00+00:00	NaN	0.006987
2014-01-06 21:00:00+00:00	NaN	0.010498
2014-01-07 21:00:00+00:00	NaN	0.014022
2014-01-08 21:00:00+00:00	NaN	0.017559
2014-01-09 21:00:00+00:00	NaN	0.021107

2014-01-10	21:00:00+00:00	NaN	0.024668
2014-01-13	21:00:00+00:00	NaN	0.028241
2014-01-14	21:00:00+00:00	NaN	0.031827
2014-01-15	21:00:00+00:00	NaN	0.035425
2014-01-16	21:00:00+00:00	NaN	0.039036
2014-01-17	21:00:00+00:00	NaN	0.042660
2014-01-21	21:00:00+00:00	NaN	0.046296
2014-01-22	21:00:00+00:00	NaN	0.049945
2014-01-23	21:00:00+00:00	NaN	0.053606
2014-01-24	21:00:00+00:00	NaN	0.057280
2014-01-27	21:00:00+00:00	NaN	0.060967
2014-01-28	21:00:00+00:00	NaN	0.064667
2014-01-29	21:00:00+00:00	NaN	0.068380
2014-01-30	21:00:00+00:00	NaN	0.072106
2014-01-31	21:00:00+00:00	NaN	0.075845
2014-02-03	21:00:00+00:00	NaN	0.079596
2014-02-04	21:00:00+00:00	NaN	0.083361
2014-02-05	21:00:00+00:00	NaN	0.087139
2014-02-06	21:00:00+00:00	NaN	0.090931
2014-02-07	21:00:00+00:00	NaN	0.094735
2014-02-10	21:00:00+00:00	NaN	0.098553
2014-02-11	21:00:00+00:00	NaN	0.102384
2014-02-12	21:00:00+00:00	NaN	0.106228
2014-02-13	21:00:00+00:00	NaN	0.110086
...	
2017-11-16	21:00:00+00:00	0.000015	0.926928
2017-11-17	21:00:00+00:00	0.000013	0.921266
2017-11-20	21:00:00+00:00	0.000012	0.924545
2017-11-21	21:00:00+00:00	0.000019	0.937136
2017-11-22	21:00:00+00:00	0.000024	0.935423
2017-11-24	18:00:00+00:00	0.000023	0.939893
2017-11-27	21:00:00+00:00	0.000021	0.938924
2017-11-28	21:00:00+00:00	0.000017	0.958594
2017-11-29	21:00:00+00:00	0.000008	0.957402
2017-11-30	21:00:00+00:00	0.000012	0.974539
2017-12-01	21:00:00+00:00	0.000010	0.970441
2017-12-04	21:00:00+00:00	0.000007	0.968057
2017-12-05	21:00:00+00:00	0.000007	0.960979
2017-12-06	21:00:00+00:00	0.000006	0.961351
2017-12-07	21:00:00+00:00	0.000006	0.967535
2017-12-08	21:00:00+00:00	0.000005	0.978265
2017-12-11	21:00:00+00:00	0.000013	0.984225
2017-12-12	21:00:00+00:00	0.000010	0.987727
2017-12-13	21:00:00+00:00	0.000012	0.987503
2017-12-14	21:00:00+00:00	0.000012	0.979382
2017-12-15	21:00:00+00:00	0.000015	0.995764
2017-12-18	21:00:00+00:00	0.000020	1.008419

2017-12-19	21:00:00+00:00	0.000015	1.000707
2017-12-20	21:00:00+00:00	0.000015	0.999658
2017-12-21	21:00:00+00:00	0.000016	1.003777
2017-12-22	21:00:00+00:00	0.000016	1.003253
2017-12-26	21:00:00+00:00	0.000005	1.000856
2017-12-27	21:00:00+00:00	0.000005	1.001830
2017-12-28	21:00:00+00:00	0.000006	1.005948
2017-12-29	21:00:00+00:00	0.000002	0.998385

		benchmark_volatility	beta	capital_used	\
2014-01-02	21:00:00+00:00	NaN	NaN	0.0	
2014-01-03	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-06	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-07	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-08	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-09	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-10	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-13	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-14	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-15	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-16	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-17	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-21	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-22	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-23	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-24	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-27	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-28	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-29	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-30	21:00:00+00:00	0.000000	NaN	0.0	
2014-01-31	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-03	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-04	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-05	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-06	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-07	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-10	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-11	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-12	21:00:00+00:00	0.000000	NaN	0.0	
2014-02-13	21:00:00+00:00	0.000000	NaN	0.0	
...		
2017-11-16	21:00:00+00:00	0.117531	0.000625	0.0	
2017-11-17	21:00:00+00:00	0.117485	0.000625	0.0	
2017-11-20	21:00:00+00:00	0.117426	0.000625	0.0	
2017-11-21	21:00:00+00:00	0.117404	0.000628	0.0	
2017-11-22	21:00:00+00:00	0.117347	0.000628	0.0	
2017-11-24	18:00:00+00:00	0.117290	0.000628	0.0	

2017-11-27 21:00:00+00:00	0.117232	0.000628	0.0
2017-11-28 21:00:00+00:00	0.117269	0.000625	0.0
2017-11-29 21:00:00+00:00	0.117212	0.000626	0.0
2017-11-30 21:00:00+00:00	0.117223	0.000628	0.0
2017-12-01 21:00:00+00:00	0.117172	0.000629	0.0
2017-12-04 21:00:00+00:00	0.117116	0.000629	0.0
2017-12-05 21:00:00+00:00	0.117077	0.000629	0.0
2017-12-06 21:00:00+00:00	0.117019	0.000629	0.0
2017-12-07 21:00:00+00:00	0.116966	0.000629	0.0
2017-12-08 21:00:00+00:00	0.116931	0.000629	0.0
2017-12-11 21:00:00+00:00	0.116878	0.000630	0.0
2017-12-12 21:00:00+00:00	0.116821	0.000630	0.0
2017-12-13 21:00:00+00:00	0.116763	0.000630	0.0
2017-12-14 21:00:00+00:00	0.116729	0.000630	0.0
2017-12-15 21:00:00+00:00	0.116732	0.000631	0.0
2017-12-18 21:00:00+00:00	0.116708	0.000634	0.0
2017-12-19 21:00:00+00:00	0.116672	0.000635	0.0
2017-12-20 21:00:00+00:00	0.116615	0.000635	0.0
2017-12-21 21:00:00+00:00	0.116559	0.000635	0.0
2017-12-22 21:00:00+00:00	0.116502	0.000635	0.0
2017-12-26 21:00:00+00:00	0.116448	0.000637	0.0
2017-12-27 21:00:00+00:00	0.116390	0.000637	0.0
2017-12-28 21:00:00+00:00	0.116334	0.000637	0.0
2017-12-29 21:00:00+00:00	0.116298	0.000638	0.0

	ending_cash	ending_exposure	\
2014-01-02 21:00:00+00:00	1.000000e+07	0.0	
2014-01-03 21:00:00+00:00	1.000000e+07	0.0	
2014-01-06 21:00:00+00:00	1.000000e+07	0.0	
2014-01-07 21:00:00+00:00	1.000000e+07	0.0	
2014-01-08 21:00:00+00:00	1.000000e+07	0.0	
2014-01-09 21:00:00+00:00	1.000000e+07	0.0	
2014-01-10 21:00:00+00:00	1.000000e+07	0.0	
2014-01-13 21:00:00+00:00	1.000000e+07	0.0	
2014-01-14 21:00:00+00:00	1.000000e+07	0.0	
2014-01-15 21:00:00+00:00	1.000000e+07	0.0	
2014-01-16 21:00:00+00:00	1.000000e+07	0.0	
2014-01-17 21:00:00+00:00	1.000000e+07	0.0	
2014-01-21 21:00:00+00:00	1.000000e+07	0.0	
2014-01-22 21:00:00+00:00	1.000000e+07	0.0	
2014-01-23 21:00:00+00:00	1.000000e+07	0.0	
2014-01-24 21:00:00+00:00	1.000000e+07	0.0	
2014-01-27 21:00:00+00:00	1.000000e+07	0.0	
2014-01-28 21:00:00+00:00	1.000000e+07	0.0	
2014-01-29 21:00:00+00:00	1.000000e+07	0.0	
2014-01-30 21:00:00+00:00	1.000000e+07	0.0	
2014-01-31 21:00:00+00:00	1.000000e+07	0.0	

2014-02-03	21:00:00+00:00	1.000000e+07	0.0
2014-02-04	21:00:00+00:00	1.000000e+07	0.0
2014-02-05	21:00:00+00:00	1.000000e+07	0.0
2014-02-06	21:00:00+00:00	1.000000e+07	0.0
2014-02-07	21:00:00+00:00	1.000000e+07	0.0
2014-02-10	21:00:00+00:00	1.000000e+07	0.0
2014-02-11	21:00:00+00:00	1.000000e+07	0.0
2014-02-12	21:00:00+00:00	1.000000e+07	0.0
2014-02-13	21:00:00+00:00	1.000000e+07	0.0

...
2017-11-16	21:00:00+00:00	9.987736e+06	17110.0
2017-11-17	21:00:00+00:00	9.987736e+06	17015.0
2017-11-20	21:00:00+00:00	9.987736e+06	16998.0
2017-11-21	21:00:00+00:00	9.987736e+06	17314.0
2017-11-22	21:00:00+00:00	9.987736e+06	17496.0
2017-11-24	18:00:00+00:00	9.987736e+06	17497.0
2017-11-27	21:00:00+00:00	9.987736e+06	17409.0
2017-11-28	21:00:00+00:00	9.987736e+06	17307.0
2017-11-29	21:00:00+00:00	9.987736e+06	16948.0
2017-11-30	21:00:00+00:00	9.987736e+06	17185.0
2017-12-01	21:00:00+00:00	9.987736e+06	17105.0
2017-12-04	21:00:00+00:00	9.987736e+06	16980.0
2017-12-05	21:00:00+00:00	9.987736e+06	16964.0
2017-12-06	21:00:00+00:00	9.987736e+06	16901.0
2017-12-07	21:00:00+00:00	9.987736e+06	16945.2
2017-12-08	21:00:00+00:00	9.987736e+06	16937.0
2017-12-11	21:00:00+00:00	9.987736e+06	17267.0
2017-12-12	21:00:00+00:00	9.987736e+06	17170.0
2017-12-13	21:00:00+00:00	9.987736e+06	17227.0
2017-12-14	21:00:00+00:00	9.987736e+06	17222.0
2017-12-15	21:00:00+00:00	9.987736e+06	17387.0
2017-12-18	21:00:00+00:00	9.987736e+06	17642.0
2017-12-19	21:00:00+00:00	9.987736e+06	17454.0
2017-12-20	21:00:00+00:00	9.987736e+06	17435.0
2017-12-21	21:00:00+00:00	9.987736e+06	17501.0
2017-12-22	21:00:00+00:00	9.987736e+06	17501.0
2017-12-26	21:00:00+00:00	9.987736e+06	17057.0
2017-12-27	21:00:00+00:00	9.987736e+06	17060.0
2017-12-28	21:00:00+00:00	9.987736e+06	17108.0
2017-12-29	21:00:00+00:00	9.987736e+06	16923.0

	...	short_mavg	short_value	\
2014-01-02	21:00:00+00:00	...	NaN	0.0
2014-01-03	21:00:00+00:00	...	NaN	0.0
2014-01-06	21:00:00+00:00	...	NaN	0.0
2014-01-07	21:00:00+00:00	...	NaN	0.0
2014-01-08	21:00:00+00:00	...	NaN	0.0

2014-01-09 21:00:00+00:00	...	NaN	0.0
2014-01-10 21:00:00+00:00	...	NaN	0.0
2014-01-13 21:00:00+00:00	...	NaN	0.0
2014-01-14 21:00:00+00:00	...	NaN	0.0
2014-01-15 21:00:00+00:00	...	NaN	0.0
2014-01-16 21:00:00+00:00	...	NaN	0.0
2014-01-17 21:00:00+00:00	...	NaN	0.0
2014-01-21 21:00:00+00:00	...	NaN	0.0
2014-01-22 21:00:00+00:00	...	NaN	0.0
2014-01-23 21:00:00+00:00	...	NaN	0.0
2014-01-24 21:00:00+00:00	...	NaN	0.0
2014-01-27 21:00:00+00:00	...	NaN	0.0
2014-01-28 21:00:00+00:00	...	NaN	0.0
2014-01-29 21:00:00+00:00	...	NaN	0.0
2014-01-30 21:00:00+00:00	...	NaN	0.0
2014-01-31 21:00:00+00:00	...	NaN	0.0
2014-02-03 21:00:00+00:00	...	NaN	0.0
2014-02-04 21:00:00+00:00	...	NaN	0.0
2014-02-05 21:00:00+00:00	...	NaN	0.0
2014-02-06 21:00:00+00:00	...	NaN	0.0
2014-02-07 21:00:00+00:00	...	NaN	0.0
2014-02-10 21:00:00+00:00	...	NaN	0.0
2014-02-11 21:00:00+00:00	...	NaN	0.0
2014-02-12 21:00:00+00:00	...	NaN	0.0
2014-02-13 21:00:00+00:00	...	NaN	0.0
...
2017-11-16 21:00:00+00:00	...	157.284780	0.0
2017-11-17 21:00:00+00:00	...	157.533680	0.0
2017-11-20 21:00:00+00:00	...	157.802300	0.0
2017-11-21 21:00:00+00:00	...	158.099130	0.0
2017-11-22 21:00:00+00:00	...	158.419340	0.0
2017-11-24 18:00:00+00:00	...	158.733780	0.0
2017-11-27 21:00:00+00:00	...	159.052960	0.0
2017-11-28 21:00:00+00:00	...	159.347500	0.0
2017-11-29 21:00:00+00:00	...	159.597370	0.0
2017-11-30 21:00:00+00:00	...	159.866260	0.0
2017-12-01 21:00:00+00:00	...	160.125060	0.0
2017-12-04 21:00:00+00:00	...	160.351140	0.0
2017-12-05 21:00:00+00:00	...	160.562970	0.0
2017-12-06 21:00:00+00:00	...	160.763320	0.0
2017-12-07 21:00:00+00:00	...	160.962910	0.0
2017-12-08 21:00:00+00:00	...	161.152320	0.0
2017-12-11 21:00:00+00:00	...	161.381500	0.0
2017-12-12 21:00:00+00:00	...	161.601680	0.0
2017-12-13 21:00:00+00:00	...	161.809430	0.0
2017-12-14 21:00:00+00:00	...	162.010200	0.0
2017-12-15 21:00:00+00:00	...	162.220300	0.0

2017-12-18 21:00:00+00:00	...	162.484790	0.0
2017-12-19 21:00:00+00:00	...	162.741040	0.0
2017-12-20 21:00:00+00:00	...	163.001860	0.0
2017-12-21 21:00:00+00:00	...	163.257330	0.0
2017-12-22 21:00:00+00:00	...	163.442180	0.0
2017-12-26 21:00:00+00:00	...	163.598270	0.0
2017-12-27 21:00:00+00:00	...	163.746493	0.0
2017-12-28 21:00:00+00:00	...	163.899510	0.0
2017-12-29 21:00:00+00:00	...	163.997270	0.0

	shorts_count	sortino	starting_cash \
2014-01-02 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-03 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-06 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-07 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-08 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-09 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-10 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-13 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-14 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-15 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-16 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-17 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-21 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-22 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-23 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-24 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-27 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-28 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-29 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-30 21:00:00+00:00	0	NaN	1.000000e+07
2014-01-31 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-03 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-04 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-05 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-06 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-07 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-10 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-11 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-12 21:00:00+00:00	0	NaN	1.000000e+07
2014-02-13 21:00:00+00:00	0	NaN	1.000000e+07
...
2017-11-16 21:00:00+00:00	0	0.965631	9.987736e+06
2017-11-17 21:00:00+00:00	0	0.945566	9.987736e+06
2017-11-20 21:00:00+00:00	0	0.941682	9.987736e+06
2017-11-21 21:00:00+00:00	0	1.004008	9.987736e+06
2017-11-22 21:00:00+00:00	0	1.039651	9.987736e+06

2017-11-24 18:00:00+00:00	0	1.039320	9.987736e+06
2017-11-27 21:00:00+00:00	0	1.020722	9.987736e+06
2017-11-28 21:00:00+00:00	0	0.999187	9.987736e+06
2017-11-29 21:00:00+00:00	0	0.918577	9.987736e+06
2017-11-30 21:00:00+00:00	0	0.964551	9.987736e+06
2017-12-01 21:00:00+00:00	0	0.947940	9.987736e+06
2017-12-04 21:00:00+00:00	0	0.921922	9.987736e+06
2017-12-05 21:00:00+00:00	0	0.918314	9.987736e+06
2017-12-06 21:00:00+00:00	0	0.905282	9.987736e+06
2017-12-07 21:00:00+00:00	0	0.913448	9.987736e+06
2017-12-08 21:00:00+00:00	0	0.911384	9.987736e+06
2017-12-11 21:00:00+00:00	0	0.975233	9.987736e+06
2017-12-12 21:00:00+00:00	0	0.955178	9.987736e+06
2017-12-13 21:00:00+00:00	0	0.965786	9.987736e+06
2017-12-14 21:00:00+00:00	0	0.964328	9.987736e+06
2017-12-15 21:00:00+00:00	0	0.995910	9.987736e+06
2017-12-18 21:00:00+00:00	0	1.044942	9.987736e+06
2017-12-19 21:00:00+00:00	0	1.005269	9.987736e+06
2017-12-20 21:00:00+00:00	0	1.001063	9.987736e+06
2017-12-21 21:00:00+00:00	0	1.013329	9.987736e+06
2017-12-22 21:00:00+00:00	0	1.012824	9.987736e+06
2017-12-26 21:00:00+00:00	0	0.913229	9.987736e+06
2017-12-27 21:00:00+00:00	0	0.913345	9.987736e+06
2017-12-28 21:00:00+00:00	0	0.922025	9.987736e+06
2017-12-29 21:00:00+00:00	0	0.884198	9.987736e+06

	starting_exposure	starting_value	trading_days \
2014-01-02 21:00:00+00:00	0.0	0.0	1
2014-01-03 21:00:00+00:00	0.0	0.0	2
2014-01-06 21:00:00+00:00	0.0	0.0	3
2014-01-07 21:00:00+00:00	0.0	0.0	4
2014-01-08 21:00:00+00:00	0.0	0.0	5
2014-01-09 21:00:00+00:00	0.0	0.0	6
2014-01-10 21:00:00+00:00	0.0	0.0	7
2014-01-13 21:00:00+00:00	0.0	0.0	8
2014-01-14 21:00:00+00:00	0.0	0.0	9
2014-01-15 21:00:00+00:00	0.0	0.0	10
2014-01-16 21:00:00+00:00	0.0	0.0	11
2014-01-17 21:00:00+00:00	0.0	0.0	12
2014-01-21 21:00:00+00:00	0.0	0.0	13
2014-01-22 21:00:00+00:00	0.0	0.0	14
2014-01-23 21:00:00+00:00	0.0	0.0	15
2014-01-24 21:00:00+00:00	0.0	0.0	16
2014-01-27 21:00:00+00:00	0.0	0.0	17
2014-01-28 21:00:00+00:00	0.0	0.0	18
2014-01-29 21:00:00+00:00	0.0	0.0	19
2014-01-30 21:00:00+00:00	0.0	0.0	20

2014-01-31	21:00:00+00:00	0.0	0.0	21
2014-02-03	21:00:00+00:00	0.0	0.0	22
2014-02-04	21:00:00+00:00	0.0	0.0	23
2014-02-05	21:00:00+00:00	0.0	0.0	24
2014-02-06	21:00:00+00:00	0.0	0.0	25
2014-02-07	21:00:00+00:00	0.0	0.0	26
2014-02-10	21:00:00+00:00	0.0	0.0	27
2014-02-11	21:00:00+00:00	0.0	0.0	28
2014-02-12	21:00:00+00:00	0.0	0.0	29
2014-02-13	21:00:00+00:00	0.0	0.0	30

...	
2017-11-16	21:00:00+00:00	16908.0	16908.0	978
2017-11-17	21:00:00+00:00	17110.0	17110.0	979
2017-11-20	21:00:00+00:00	17015.0	17015.0	980
2017-11-21	21:00:00+00:00	16998.0	16998.0	981
2017-11-22	21:00:00+00:00	17314.0	17314.0	982
2017-11-24	18:00:00+00:00	17496.0	17496.0	983
2017-11-27	21:00:00+00:00	17497.0	17497.0	984
2017-11-28	21:00:00+00:00	17409.0	17409.0	985
2017-11-29	21:00:00+00:00	17307.0	17307.0	986
2017-11-30	21:00:00+00:00	16948.0	16948.0	987
2017-12-01	21:00:00+00:00	17185.0	17185.0	988
2017-12-04	21:00:00+00:00	17105.0	17105.0	989
2017-12-05	21:00:00+00:00	16980.0	16980.0	990
2017-12-06	21:00:00+00:00	16964.0	16964.0	991
2017-12-07	21:00:00+00:00	16901.0	16901.0	992
2017-12-08	21:00:00+00:00	16945.2	16945.2	993
2017-12-11	21:00:00+00:00	16937.0	16937.0	994
2017-12-12	21:00:00+00:00	17267.0	17267.0	995
2017-12-13	21:00:00+00:00	17170.0	17170.0	996
2017-12-14	21:00:00+00:00	17227.0	17227.0	997
2017-12-15	21:00:00+00:00	17222.0	17222.0	998
2017-12-18	21:00:00+00:00	17387.0	17387.0	999
2017-12-19	21:00:00+00:00	17642.0	17642.0	1000
2017-12-20	21:00:00+00:00	17454.0	17454.0	1001
2017-12-21	21:00:00+00:00	17435.0	17435.0	1002
2017-12-22	21:00:00+00:00	17501.0	17501.0	1003
2017-12-26	21:00:00+00:00	17501.0	17501.0	1004
2017-12-27	21:00:00+00:00	17057.0	17057.0	1005
2017-12-28	21:00:00+00:00	17060.0	17060.0	1006
2017-12-29	21:00:00+00:00	17108.0	17108.0	1007

	transactions	treasury_period_return
2014-01-02	21:00:00+00:00	[] 0.0
2014-01-03	21:00:00+00:00	[] 0.0
2014-01-06	21:00:00+00:00	[] 0.0
2014-01-07	21:00:00+00:00	[] 0.0

2014-01-08	21:00:00+00:00	☐	0.0
2014-01-09	21:00:00+00:00	☐	0.0
2014-01-10	21:00:00+00:00	☐	0.0
2014-01-13	21:00:00+00:00	☐	0.0
2014-01-14	21:00:00+00:00	☐	0.0
2014-01-15	21:00:00+00:00	☐	0.0
2014-01-16	21:00:00+00:00	☐	0.0
2014-01-17	21:00:00+00:00	☐	0.0
2014-01-21	21:00:00+00:00	☐	0.0
2014-01-22	21:00:00+00:00	☐	0.0
2014-01-23	21:00:00+00:00	☐	0.0
2014-01-24	21:00:00+00:00	☐	0.0
2014-01-27	21:00:00+00:00	☐	0.0
2014-01-28	21:00:00+00:00	☐	0.0
2014-01-29	21:00:00+00:00	☐	0.0
2014-01-30	21:00:00+00:00	☐	0.0
2014-01-31	21:00:00+00:00	☐	0.0
2014-02-03	21:00:00+00:00	☐	0.0
2014-02-04	21:00:00+00:00	☐	0.0
2014-02-05	21:00:00+00:00	☐	0.0
2014-02-06	21:00:00+00:00	☐	0.0
2014-02-07	21:00:00+00:00	☐	0.0
2014-02-10	21:00:00+00:00	☐	0.0
2014-02-11	21:00:00+00:00	☐	0.0
2014-02-12	21:00:00+00:00	☐	0.0
2014-02-13	21:00:00+00:00	☐	0.0
...		...	
2017-11-16	21:00:00+00:00	☐	0.0
2017-11-17	21:00:00+00:00	☐	0.0
2017-11-20	21:00:00+00:00	☐	0.0
2017-11-21	21:00:00+00:00	☐	0.0
2017-11-22	21:00:00+00:00	☐	0.0
2017-11-24	18:00:00+00:00	☐	0.0
2017-11-27	21:00:00+00:00	☐	0.0
2017-11-28	21:00:00+00:00	☐	0.0
2017-11-29	21:00:00+00:00	☐	0.0
2017-11-30	21:00:00+00:00	☐	0.0
2017-12-01	21:00:00+00:00	☐	0.0
2017-12-04	21:00:00+00:00	☐	0.0
2017-12-05	21:00:00+00:00	☐	0.0
2017-12-06	21:00:00+00:00	☐	0.0
2017-12-07	21:00:00+00:00	☐	0.0
2017-12-08	21:00:00+00:00	☐	0.0
2017-12-11	21:00:00+00:00	☐	0.0
2017-12-12	21:00:00+00:00	☐	0.0
2017-12-13	21:00:00+00:00	☐	0.0
2017-12-14	21:00:00+00:00	☐	0.0

2017-12-15 21:00:00+00:00	[]	0.0
2017-12-18 21:00:00+00:00	[]	0.0
2017-12-19 21:00:00+00:00	[]	0.0
2017-12-20 21:00:00+00:00	[]	0.0
2017-12-21 21:00:00+00:00	[]	0.0
2017-12-22 21:00:00+00:00	[]	0.0
2017-12-26 21:00:00+00:00	[]	0.0
2017-12-27 21:00:00+00:00	[]	0.0
2017-12-28 21:00:00+00:00	[]	0.0
2017-12-29 21:00:00+00:00	[]	0.0

[1007 rows x 40 columns]

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