

# Project Title

An example of convex optimization using CVXPPY for portfolio optimization

## Reference

<https://www.kdnuggets.com/2019/06/optimization-python-money-risk.html>

### Written by

\* \*\*UBDA \*\* - Mar 4, 2020

\* \*\*UBDA \*\* - Aug 23, 2021 Updated

## Sources

All the program(s), control file and data are available at  
/ubda/apps/examples/python/OptimizationExample.

### Python program(s)

/ubda/apps/examples/python/OptimizationExample/opt1.py

### PBS (control file)

/ubda/apps/examples/python/OptimizationExample/python.pbs

### Data

Download the [github.com/tirthajyoti/Optimization-Python/tree/master/Data/monthly\\_prices.csv](https://github.com/tirthajyoti/Optimization-Python/tree/master/Data/monthly_prices.csv)

Create a directory for program and data:

```
cd $HOME
```

```
mkdir OptimizationExample
```

```
cd OptimizationExample
```

Put the data file here

```
## Executing the program
```

```
cd $HOME
```

```
cd OptimizationExample
```

```
cp -pr /ubda/apps/examples/python/OptimizationExample/* .
```

```
qsub python.pbs
```

```
### Environment setting
```

The python.pbs is include the proper environment settings, including:

```
module load anaconda3-5.2.0
```

```
source activate demo_py37
```

```
** packages in environment **
```

Name	Version	Build	Channel
_libgcc_mutex	0.1	main	
_tflow_select	2.3.0	mk1	anaconda
absl-py	0.8.0	py37_0	anaconda
astor	0.8.0	py37_0	anaconda
backcall	0.1.0	py37_0	anaconda
blas	1.0	mk1	anaconda
bzip2	1.0.8	h7b6447c_0	anaconda
c-ares	1.15.0	h7b6447c_1001	anaconda
ca-certificates	2019.10.16	0	anaconda
cairo	1.14.12	h8948797_3	anaconda
certifi	2019.9.11	py37_0	anaconda
cloudpickle	1.2.2	py_0	anaconda
cvxopt	1.2.0	py37hfa32c7d_0	anaconda
cvxpy	1.0.25	py37he1b5a44_1	conda-forge
cvxpy-base	1.0.25	py37he1b5a44_1	conda-forge
cycler	0.10.0	py_2	conda-forge
cytoolz	0.10.0	py37h7b6447c_0	anaconda

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dask-core	2.6.0	py_0	anaconda
dbus	1.13.6	h746ee38_0	
decorator	4.4.0	py37_1	anaconda
dill	0.3.1.1	py37_0	conda-forge
ecos	2.0.7.post1	py37hc1659b7_0	conda-forge
expat	2.2.6	he6710b0_0	
fastcache	1.1.0	py37h516909a_0	conda-forge
ffmpeg	4.0	hcdf2ecd_0	anaconda
fontconfig	2.13.0	h9420a91_0	anaconda
freelut	3.0.0	hf484d3e_5	anaconda
freetype	2.9.1	h8a8886c_1	anaconda
future	0.18.1	py37_0	conda-forge
gast	0.2.2	py37_0	anaconda
glib	2.56.2	hd408876_0	anaconda
glpk	4.65	h3ceedfd_2	anaconda
gmp	6.1.2	hb3b607b_0	anaconda
google-pasta	0.1.7	py_0	anaconda
graphite2	1.3.13	h23475e2_0	anaconda
grpcio	1.16.1	py37hf8bcb03_1	anaconda
gsl	2.4	h14c3975_4	anaconda
gst-plugins-base	1.14.0	hb8d80ab_1	
gstreamer	1.14.0	hb453b48_1	
h5py	2.8.0	py37h989c5e5_3	anaconda
harfbuzz	1.8.8	hffaf4a1_0	anaconda
hdf5	1.10.2	hba1933b_1	anaconda
icu	58.2	h211956c_0	anaconda
imageio	2.6.1	py37_0	anaconda
intel-openmp	2019.5	281	anaconda
ipython	7.8.0	py37h39e3cac_0	anaconda
ipython_genutils	0.2.0	py37_0	anaconda
jasper	2.0.14	h07fcd6_1	anaconda
jedi	0.15.1	py37_0	anaconda
joblib	0.13.2	py37_0	anaconda
jpeg	9b	habf39ab_1	anaconda

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keras-applications	1.0.8	py_0	anaconda
keras-preprocessing	1.1.0	py_1	anaconda
kiwisolver	1.1.0	py37hc9558a2_0	conda-forge
libblas	3.8.0	14_mkl	conda-forge
libedit	3.1.20181209	hc058e9b_0	
libffi	3.2.1	hd88cf55_4	
libgcc-ng	9.1.0	hdf63c60_0	
libgfortran-ng	7.3.0	hdf63c60_0	anaconda
libglu	9.0.0	hf484d3e_1	anaconda
liblapack	3.8.0	14_mkl	conda-forge
libopencv	3.4.2	hb342d67_1	anaconda
libopus	1.3	h7b6447c_0	anaconda
libpng	1.6.37	hbc83047_0	anaconda
libprotobuf	3.9.2	hd408876_0	anaconda
libstdcxx-ng	9.1.0	hdf63c60_0	
libtiff	4.0.10	h2733197_2	anaconda
libuuid	1.0.3	h1bed415_2	anaconda
libvpx	1.7.0	h439df22_0	anaconda
libxcb	1.13	h1bed415_1	anaconda
libxml2	2.9.9	hea5a465_1	anaconda
mahotas	1.4.8	py37hb3f55d8_0	conda-forge
markdown	3.1.1	py37_0	anaconda
matplotlib	3.1.1	py37h5429711_0	
metis	5.1.0	hf484d3e_4	anaconda
mkl	2019.5	281	anaconda
mkl-service	2.3.0	py37he904b0f_0	anaconda
mkl_fft	1.0.14	py37ha843d7b_0	anaconda
mkl_random	1.1.0	py37hd6b4f25_0	anaconda
multiprocess	0.70.9	py37h516909a_0	conda-forge
ncurses	6.1	he6710b0_1	
networkx	2.4	py_0	anaconda
nltk	3.4.5	py37_0	anaconda
numpy	1.17.2	py37haad9e8e_0	anaconda
numpy-base	1.17.2	py37hde5b4d6_0	anaconda

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olefile	0.46	py37_0	anaconda
opencv	3.4.2	py37h6fd60c2_1	anaconda
openssl	1.1.1	h7b6447c_0	anaconda
opt_einsum	3.1.0	py_0	anaconda
osqp	0.6.1	py37hb3f55d8_1	conda-forge
pandas	0.25.2	py37he6710b0_0	anaconda
parso	0.5.1	py_0	anaconda
patsy	0.5.1	py37_0	anaconda
pcre	8.43	he6710b0_0	anaconda
pexpect	4.7.0	py37_0	anaconda
pickleshare	0.7.5	py37_0	anaconda
pillow	6.2.0	py37h34e0f95_0	anaconda
pip	19.3.1	py37_0	
pixman	0.38.0	h7b6447c_0	anaconda
prompt_toolkit	2.0.10	py_0	anaconda
protobuf	3.9.2	py37he6710b0_0	anaconda
ptyprocess	0.6.0	py37_0	anaconda
py-opencv	3.4.2	py37hb342d67_1	anaconda
py4j	0.10.7	py37_0	anaconda
pydotplus	2.0.2	py37_1	anaconda
pygments	2.4.2	py_0	anaconda
pyparsing	2.4.2	py_0	conda-forge
pyqt	5.9.2	py37hcca6a23_4	conda-forge
pyspark	2.4.4	py_0	anaconda
python	3.7.4	h265db76_1	
python-dateutil	2.8.0	py_0	conda-forge
pytz	2019.3	py_0	conda-forge
pywavelets	1.1.1	py37h7b6447c_0	anaconda
qt	5.9.7	h5867ecd_1	
readline	7.0	h7b6447c_5	
scikit-image	0.15.0	py37he6710b0_0	anaconda
scikit-learn	0.21.3	py37hd81dba3_0	anaconda
scipy	1.3.1	py37h7c811a0_0	anaconda
scs	2.1.1.2	py37h4ff444d_3	conda-forge

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seaborn	0.9.0	py37_0	anaconda
setuptools	41.4.0	py37_0	
sip	4.19.8	py37hf484d3e_0	
six	1.12.0	py37_0	anaconda
sqlite	3.30.0	h7b6447c_0	
statsmodels	0.10.1	py37hdd07704_0	anaconda
stop-words	2018.7.23	pypi_0	pypi
suitesparse	5.2.0	h9e4a6bb_0	anaconda
tbb	2019.8	hfd86e86_0	anaconda
tensorboard	2.0.0	pyhb230dea_0	anaconda
tensorflow	2.0.0	mk1_py37h66b46cc_0	anaconda
tensorflow-base	2.0.0	mk1_py37h9204916_0	anaconda
tensorflow-estimator	2.0.0	pyh2649769_0	anaconda
termcolor	1.1.0	py37_1	anaconda
tk	8.6.8	hbc83047_0	
toolz	0.10.0	py_0	anaconda
tornado	6.0.3	py37h516909a_0	conda-forge
traitlets	4.3.3	py37_0	anaconda
wcwidth	0.1.7	py37_0	anaconda
webencodings	0.5.1	py37_1	anaconda
werkzeug	0.16.0	py_0	anaconda
wheel	0.33.6	py37_0	
wrapt	1.11.2	py37h7b6447c_0	anaconda
xz	5.2.4	h14c3975_4	
zlib	1.2.11	h7b6447c_3	
zstd	1.3.7	h0b5b093_0	anaconda