C:\Users\Robai\Desktop\CsProjects\StockTraderV3\Deep-Reinforcement-Learning-for-Automated-Stock-Trading-Ensemble-Strategy-ICAIF-2020>python run\_DRL.py

datadate tic adjcp open high low volume macd rsi cci adx turbulence

0 20090102 AAPL 12.964286 12.268571 13.005714 12.165714 26641980.0 0.0 100.0 66.666667 100.0 0.0

1 20090102 AXP 19.330000 18.570000 19.520000 18.400000 10955620.0 0.0 100.0 66.666667 100.0 0.0

2 20090102 BA 45.250000 42.800000 45.560000 42.780000 7010171.0 0.0 100.0 66.666667 100.0 0.0

3 20090102 CAT 46.910000 44.910000 46.980000 44.710000 7116726.0 0.0 0.0 66.666667 100.0 0.0

4 20090102 CSCO 16.960000 16.410000 17.000000 16.250000 40977480.0 0.0 100.0 66.666667 100.0 0.0

1053360

[20151002 20151005 20151006 ... 20200702 20200706 20200707]

============Start Ensemble Strategy============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20151002

======A2C Training========

Training time (A2C): 2.0102113087972007 minutes

======A2C Validation from: 20151002 to 20160104

A2C Sharpe Ratio: -0.028729550678645216

======PPO Training========

Training time (PPO): 7.24202633301417 minutes

======PPO Validation from: 20151002 to 20160104

PPO Sharpe Ratio: -0.005389146775433365

======DDPG Training========

Training time (DDPG): 1.2334364175796508 minutes

======DDPG Validation from: 20151002 to 20160104

======Trading from: 20160104 to 20160405

previous\_total\_asset:1000000

end\_total\_asset:1058835.4941962215

total\_reward:58835.494196221465

total\_cost: 1464.0755616076683

total trades: 1249

Sharpe: 0.18286140166121384

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20160104

======A2C Training========

Training time (A2C): 2.467221148808797 minutes

======A2C Validation from: 20160104 to 20160405

A2C Sharpe Ratio: 0.09009195009292005

======PPO Training========

Training time (PPO): 7.790709761778514 minutes

======PPO Validation from: 20160104 to 20160405

PPO Sharpe Ratio: 0.22112933381553274

======DDPG Training========

Training time (DDPG): 1.390673045317332 minutes

======DDPG Validation from: 20160104 to 20160405

======Trading from: 20160405 to 20160705

previous\_total\_asset:1058835.4941962215

end\_total\_asset:1067521.3722468459

total\_reward:8685.878050624393

total\_cost: 4520.202738206032

total trades: 1495

Sharpe: 0.037652997891755656

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20160405

======A2C Training========

Training time (A2C): 2.0334933002789817 minutes

======A2C Validation from: 20160405 to 20160705

A2C Sharpe Ratio: 0.06395146867957373

======PPO Training========

Training time (PPO): 7.311526052157084 minutes

======PPO Validation from: 20160405 to 20160705

PPO Sharpe Ratio: 0.03981300724306997

======DDPG Training========

Training time (DDPG): 1.2892975409825642 minutes

======DDPG Validation from: 20160405 to 20160705

======Trading from: 20160705 to 20161003

previous\_total\_asset:1067521.3722468459

end\_total\_asset:1092451.2820891899

total\_reward:24929.909842344

total\_cost: 2724.7284891900463

total trades: 1329

Sharpe: 0.1175670389491662

============================================

turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20160705

======A2C Training========

Training time (A2C): 2.1070903460184733 minutes

======A2C Validation from: 20160705 to 20161003

A2C Sharpe Ratio: 0.1446817375260123

======PPO Training========

Training time (PPO): 7.426472906271616 minutes

======PPO Validation from: 20160705 to 20161003

PPO Sharpe Ratio: -0.08079419692885331

======DDPG Training========

Training time (DDPG): 1.3526938160260518 minutes

======DDPG Validation from: 20160705 to 20161003

======Trading from: 20161003 to 20170103

previous\_total\_asset:1092451.2820891899

end\_total\_asset:1172110.1904086727

total\_reward:79658.90831948281

total\_cost: 1528.4187319321372

total trades: 1001

Sharpe: 0.42116930435394206

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20161003

======A2C Training========

Training time (A2C): 2.2791646122932434 minutes

======A2C Validation from: 20161003 to 20170103

A2C Sharpe Ratio: 0.4972116472632053

======PPO Training========

Training time (PPO): 7.965102700392405 minutes

======PPO Validation from: 20161003 to 20170103

PPO Sharpe Ratio: 0.34391203103200707

======DDPG Training========

Training time (DDPG): 1.3343050479888916 minutes

======DDPG Validation from: 20161003 to 20170103

======Trading from: 20170103 to 20170404

previous\_total\_asset:1172110.1904086727

end\_total\_asset:1209492.251442472

total\_reward:37382.06103379931

total\_cost: 1482.702086245127

total trades: 1110

Sharpe: 0.20119166006934858

============================================

turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20170103

======A2C Training========

Training time (A2C): 1.818022855122884 minutes

======A2C Validation from: 20170103 to 20170404

A2C Sharpe Ratio: 0.3970208813165948

======PPO Training========

Training time (PPO): 7.143004858493805 minutes

======PPO Validation from: 20170103 to 20170404

PPO Sharpe Ratio: 0.35035398067949813

======DDPG Training========

Training time (DDPG): 1.3974647959073385 minutes

======DDPG Validation from: 20170103 to 20170404

======Trading from: 20170404 to 20170705

previous\_total\_asset:1209492.251442472

end\_total\_asset:1238570.6518548816

total\_reward:29078.400412409566

total\_cost: 6570.460240219821

total trades: 1208

Sharpe: 0.19843194174227693

============================================

turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20170404

======A2C Training========

Training time (A2C): 2.3912898818651835 minutes

======A2C Validation from: 20170404 to 20170705

A2C Sharpe Ratio: 0.29876568121656333

======PPO Training========

Training time (PPO): 7.6514373024304705 minutes

======PPO Validation from: 20170404 to 20170705

PPO Sharpe Ratio: 0.22553914336895345

======DDPG Training========

Training time (DDPG): 1.0882069746653238 minutes

======DDPG Validation from: 20170404 to 20170705

======Trading from: 20170705 to 20171003

previous\_total\_asset:1238570.6518548816

end\_total\_asset:1245747.999185052

total\_reward:7177.347330170451

total\_cost: 8019.911742614664

total trades: 1473

Sharpe: 0.051544615815011435

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20170705

======A2C Training========

Training time (A2C): 1.7696361978848776 minutes

======A2C Validation from: 20170705 to 20171003

A2C Sharpe Ratio: 0.5053552607233832

======PPO Training========

Training time (PPO): 7.239803604284922 minutes

======PPO Validation from: 20170705 to 20171003

PPO Sharpe Ratio: 0.2473113443707483

======DDPG Training========

Training time (DDPG): 134.5302638053894 minutes

======DDPG Validation from: 20170705 to 20171003

======Trading from: 20171003 to 20180103

previous\_total\_asset:1245747.999185052

end\_total\_asset:1395952.497980893

total\_reward:150204.4987958409

total\_cost: 7703.759084056999

total trades: 1450

Sharpe: 0.8476082560373751

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20171003

======A2C Training========

Training time (A2C): 3.0643120845158895 minutes

======A2C Validation from: 20171003 to 20180103

A2C Sharpe Ratio: 0.437296473795776

======PPO Training========

Training time (PPO): 9.979060264428457 minutes

======PPO Validation from: 20171003 to 20180103

PPO Sharpe Ratio: 0.13692269546819513

======DDPG Training========

Training time (DDPG): 1.322961111863454 minutes

======DDPG Validation from: 20171003 to 20180103

======Trading from: 20180103 to 20180405

previous\_total\_asset:1395952.497980893

end\_total\_asset:1411036.8039613536

total\_reward:15084.305980460718

total\_cost: 1845.7833738624643

total trades: 256

Sharpe: 0.06363340474688796

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20180103

======A2C Training========

Training time (A2C): 2.2677886207898457 minutes

======A2C Validation from: 20180103 to 20180405

A2C Sharpe Ratio: 0.0017547175507107262

======PPO Training========

Training time (PPO): 7.611203161875407 minutes

======PPO Validation from: 20180103 to 20180405

PPO Sharpe Ratio: -0.04406967233324395

======DDPG Training========

Training time (DDPG): 1.2462720314661662 minutes

======DDPG Validation from: 20180103 to 20180405

======Trading from: 20180405 to 20180705

previous\_total\_asset:1411036.8039613536

end\_total\_asset:1394988.6997355109

total\_reward:-16048.104225842748

total\_cost: 4610.06997012742

total trades: 951

Sharpe: -0.05236967349132693

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20180405

======A2C Training========

Training time (A2C): 2.5097499092419944 minutes

======A2C Validation from: 20180405 to 20180705

A2C Sharpe Ratio: -0.23947472932447283

======PPO Training========

Training time (PPO): 8.876463854312897 minutes

======PPO Validation from: 20180405 to 20180705

PPO Sharpe Ratio: -0.1875752819778485

======DDPG Training========

Training time (DDPG): 1.5319084962209066 minutes

======DDPG Validation from: 20180405 to 20180705

======Trading from: 20180705 to 20181003

previous\_total\_asset:1394988.6997355109

end\_total\_asset:1404569.6295485701

total\_reward:9580.92981305928

total\_cost: 5678.230363440367

total trades: 783

Sharpe: 0.08787489256570284

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20180705

======A2C Training========

Training time (A2C): 2.5193111379941304 minutes

======A2C Validation from: 20180705 to 20181003

A2C Sharpe Ratio: 0.15191145245341933

======PPO Training========

Training time (PPO): 8.71497275431951 minutes

======PPO Validation from: 20180705 to 20181003

PPO Sharpe Ratio: 0.1556097311165768

======DDPG Training========

Training time (DDPG): 1.3898229002952576 minutes

======DDPG Validation from: 20180705 to 20181003

======Trading from: 20181003 to 20190104

previous\_total\_asset:1404569.6295485701

end\_total\_asset:1422553.8030005542

total\_reward:17984.17345198407

total\_cost: 988.4590455102582

total trades: 179

Sharpe: 0.365494325785537

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20181003

======A2C Training========

Training time (A2C): 2.6693105896313987 minutes

======A2C Validation from: 20181003 to 20190104

A2C Sharpe Ratio: -0.3880372344045416

======PPO Training========

Training time (PPO): 9.193815835316975 minutes

======PPO Validation from: 20181003 to 20190104

PPO Sharpe Ratio: -0.3531495624767656

======DDPG Training========

Training time (DDPG): 1.3729496518770854 minutes

======DDPG Validation from: 20181003 to 20190104

======Trading from: 20190104 to 20190405

previous\_total\_asset:1422553.8030005542

end\_total\_asset:1483360.4626701134

total\_reward:60806.659669559216

total\_cost: 8618.50701540794

total trades: 1500

Sharpe: 0.2492049173343681

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20190104

======A2C Training========

Training time (A2C): 2.7543103019396464 minutes

======A2C Validation from: 20190104 to 20190405

A2C Sharpe Ratio: 0.10205910491659001

======PPO Training========

Training time (PPO): 8.99228138923645 minutes

======PPO Validation from: 20190104 to 20190405

PPO Sharpe Ratio: 0.1582163713135373

======DDPG Training========

Training time (DDPG): 1.4230705936749777 minutes

======DDPG Validation from: 20190104 to 20190405

======Trading from: 20190405 to 20190708

previous\_total\_asset:1483360.4626701134

end\_total\_asset:1486084.7000166504

total\_reward:2724.2373465369456

total\_cost: 1047.5917119500657

total trades: 155

Sharpe: 0.21954251250192866

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20190405

======A2C Training========

Training time (A2C): 2.7668197631835936 minutes

======A2C Validation from: 20190405 to 20190708

A2C Sharpe Ratio: 0.11695679655346651

======PPO Training========

Training time (PPO): 11.444523056348165 minutes

======PPO Validation from: 20190405 to 20190708

PPO Sharpe Ratio: 0.2270924596851665

======DDPG Training========

Training time (DDPG): 2.80308172305425 minutes

======DDPG Validation from: 20190405 to 20190708

======Trading from: 20190708 to 20191004

previous\_total\_asset:1486084.7000166504

end\_total\_asset:1484196.2729407027

total\_reward:-1888.4270759476349

total\_cost: 1839.7753472888066

total trades: 330

Sharpe: -0.06316560884529329

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20190708

======A2C Training========

Training time (A2C): 3.7324901978174845 minutes

======A2C Validation from: 20190708 to 20191004

A2C Sharpe Ratio: 0.09017455945847162

======PPO Training========

Training time (PPO): 10.935458866755168 minutes

======PPO Validation from: 20190708 to 20191004

PPO Sharpe Ratio: -0.14724931981036016

======DDPG Training========

Training time (DDPG): 1.9371007879575093 minutes

======DDPG Validation from: 20190708 to 20191004

======Trading from: 20191004 to 20200106

previous\_total\_asset:1484196.2729407027

end\_total\_asset:1482955.2618032391

total\_reward:-1241.011137463618

total\_cost: 277.35193485852244

total trades: 46

Sharpe: -0.3393992285672833

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20191004

======A2C Training========

Training time (A2C): 4.023934344450633 minutes

======A2C Validation from: 20191004 to 20200106

A2C Sharpe Ratio: -0.19449820818817615

======PPO Training========

Training time (PPO): 11.06712996562322 minutes

======PPO Validation from: 20191004 to 20200106

PPO Sharpe Ratio: -0.3504228141636595

======DDPG Training========

Training time (DDPG): 1.8208934505780539 minutes

======DDPG Validation from: 20191004 to 20200106

======Trading from: 20200106 to 20200406

previous\_total\_asset:1482955.2618032391

end\_total\_asset:1472773.9077518638

total\_reward:-10181.354051375296

total\_cost: 847.8044996999168

total trades: 150

Sharpe: -0.38413223288290477

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20200106

======A2C Training========

Training time (A2C): 3.5502064704895018 minutes

======A2C Validation from: 20200106 to 20200406

A2C Sharpe Ratio: -0.44348867501795786

======PPO Training========

Training time (PPO): 10.96697035630544 minutes

======PPO Validation from: 20200106 to 20200406

PPO Sharpe Ratio: -0.44021163078036785

======DDPG Training========

Training time (DDPG): 1.3809613029162089 minutes

======DDPG Validation from: 20200106 to 20200406

======Trading from: 20200406 to 20200707

previous\_total\_asset:1472773.9077518638

end\_total\_asset:1476635.9032912592

total\_reward:3861.9955393953715

total\_cost: 525.7463236042283

total trades: 107

Sharpe: 0.2669069177218868

Ensemble Strategy took: 367.3660026629766 minutes

2x size training.

datadate tic adjcp open high low volume macd rsi cci adx turbulence

0 20090102 AAPL 12.964286 12.268571 13.005714 12.165714 26641980.0 0.0 100.0 66.666667 100.0 0.0

1 20090102 AXP 19.330000 18.570000 19.520000 18.400000 10955620.0 0.0 100.0 66.666667 100.0 0.0

2 20090102 BA 45.250000 42.800000 45.560000 42.780000 7010171.0 0.0 100.0 66.666667 100.0 0.0

3 20090102 CAT 46.910000 44.910000 46.980000 44.710000 7116726.0 0.0 0.0 66.666667 100.0 0.0

4 20090102 CSCO 16.960000 16.410000 17.000000 16.250000 40977480.0 0.0 100.0 66.666667 100.0 0.0

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[20151002 20151005 20151006 ... 20200702 20200706 20200707]

============Start Ensemble Strategy============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20151002

======A2C Training========

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\tf\_util.py:191: The name tf.ConfigProto is deprecated. Please use tf.compat.v1.ConfigProto instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\tf\_util.py:200: The name tf.Session is deprecated. Please use tf.compat.v1.Session instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\policies.py:116: The name tf.variable\_scope is deprecated. Please use tf.compat.v1.variable\_scope instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\input.py:25: The name tf.placeholder is deprecated. Please use tf.compat.v1.placeholder instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\policies.py:561: flatten (from tensorflow.python.layers.core) is deprecated and will be removed in a future version.

Instructions for updating:

Use keras.layers.flatten instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\tensorflow\_core\python\layers\core.py:332: Layer.apply (from tensorflow.python.keras.engine.base\_layer) is deprecated and will be removed in a future version.

Instructions for updating:

Please use `layer.\_\_call\_\_` method instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\tf\_layers.py:123: The name tf.get\_variable is deprecated. Please use tf.compat.v1.get\_variable instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\distributions.py:418: The name tf.random\_normal is deprecated. Please use tf.random.normal instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\a2c\a2c.py:160: The name tf.summary.scalar is deprecated. Please use tf.compat.v1.summary.scalar instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\tf\_util.py:449: The name tf.get\_collection is deprecated. Please use tf.compat.v1.get\_collection instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\tf\_util.py:449: The name tf.GraphKeys is deprecated. Please use tf.compat.v1.GraphKeys instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\tensorflow\_core\python\ops\clip\_ops.py:301: where (from tensorflow.python.ops.array\_ops) is deprecated and will be removed in a future version.

Instructions for updating:

Use tf.where in 2.0, which has the same broadcast rule as np.where

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\a2c\a2c.py:184: The name tf.train.RMSPropOptimizer is deprecated. Please use tf.compat.v1.train.RMSPropOptimizer instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\tensorflow\_core\python\training\rmsprop.py:119: calling Ones.\_\_init\_\_ (from tensorflow.python.ops.init\_ops) with dtype is deprecated and will be removed in a future version.

Instructions for updating:

Call initializer instance with the dtype argument instead of passing it to the constructor

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\a2c\a2c.py:194: The name tf.global\_variables\_initializer is deprecated. Please use tf.compat.v1.global\_variables\_initializer instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\a2c\a2c.py:196: The name tf.summary.merge\_all is deprecated. Please use tf.compat.v1.summary.merge\_all instead.

Training time (A2C): 4.241889508565267 minutes

======A2C Validation from: 20151002 to 20160104

A2C Sharpe Ratio: 0.0018791219740180616

======PPO Training========

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\ppo2\ppo2.py:198: The name tf.trainable\_variables is deprecated. Please use tf.compat.v1.trainable\_variables instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\ppo2\ppo2.py:206: The name tf.train.AdamOptimizer is deprecated. Please use tf.compat.v1.train.AdamOptimizer instead.

Training time (PPO): 12.289878873030345 minutes

======PPO Validation from: 20151002 to 20160104

PPO Sharpe Ratio: 0.018872629609666812

======DDPG Training========

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\ddpg\policies.py:136: dense (from tensorflow.python.layers.core) is deprecated and will be removed in a future version.

Instructions for updating:

Use keras.layers.Dense instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\ddpg\ddpg.py:94: The name tf.assign is deprecated. Please use tf.compat.v1.assign instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\ddpg\ddpg.py:444: The name tf.global\_variables is deprecated. Please use tf.compat.v1.global\_variables instead.

WARNING:tensorflow:From C:\Users\Robai\AppData\Local\Programs\Python\Python37\lib\site-packages\stable\_baselines\common\tf\_util.py:432: The name tf.get\_default\_session is deprecated. Please use tf.compat.v1.get\_default\_session instead.

Training time (DDPG): 3.023267968495687 minutes

======DDPG Validation from: 20151002 to 20160104

======Trading from: 20160104 to 20160405

Used Model: <stable\_baselines.ppo2.ppo2.PPO2 object at 0x00000280DEC16C88>

previous\_total\_asset:1000000

end\_total\_asset:1058324.2475788284

total\_reward:58324.24757882836

total\_cost: 4479.544965108042

total trades: 1418

Sharpe: 0.19365522155482848

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20160104

======A2C Training========

Training time (A2C): 5.252041387557983 minutes

======A2C Validation from: 20160104 to 20160405

A2C Sharpe Ratio: 0.10756928027777536

======PPO Training========

Training time (PPO): 13.927495702107747 minutes

======PPO Validation from: 20160104 to 20160405

PPO Sharpe Ratio: 0.13727690448839247

======DDPG Training========

Training time (DDPG): 2.680848209063212 minutes

======DDPG Validation from: 20160104 to 20160405

======Trading from: 20160405 to 20160705

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E114D0F0>

previous\_total\_asset:1058324.2475788284

end\_total\_asset:1031687.9960480599

total\_reward:-26636.251530768466

total\_cost: 2662.4541983605704

total trades: 1061

Sharpe: -0.10158800283193384

============Trading Done============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20160405

======A2C Training========

Training time (A2C): 4.454532273610433 minutes

======A2C Validation from: 20160405 to 20160705

A2C Sharpe Ratio: 0.027756326464391537

======PPO Training========

Training time (PPO): 269.3494309226672 minutes

======PPO Validation from: 20160405 to 20160705

PPO Sharpe Ratio: 0.04264301967144672

======DDPG Training========

Training time (DDPG): 2.095758879184723 minutes

======DDPG Validation from: 20160405 to 20160705

======Trading from: 20160705 to 20161003

Used Model: <stable\_baselines.ppo2.ppo2.PPO2 object at 0x00000280E0672358>

previous\_total\_asset:1031687.9960480599

end\_total\_asset:1005139.9449048821

total\_reward:-26548.051143177785

total\_cost: 2936.28545670832

total trades: 1212

Sharpe: -0.14263155984908632

============Trading Done============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20160705

======A2C Training========

Training time (A2C): 3.8554674903551738 minutes

======A2C Validation from: 20160705 to 20161003

A2C Sharpe Ratio: 0.00811531616158648

======PPO Training========

Training time (PPO): 14.036088681221008 minutes

======PPO Validation from: 20160705 to 20161003

PPO Sharpe Ratio: -0.04613884530608329

======DDPG Training========

Training time (DDPG): 2.093840988477071 minutes

======DDPG Validation from: 20160705 to 20161003

======Trading from: 20161003 to 20170103

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E06727B8>

previous\_total\_asset:1005139.9449048821

end\_total\_asset:1066587.5355241552

total\_reward:61447.590619273135

total\_cost: 2231.26807568044

total trades: 1025

Sharpe: 0.335359268994408

============Trading Done============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20161003

======A2C Training========

Training time (A2C): 3.4429759979248047 minutes

======A2C Validation from: 20161003 to 20170103

A2C Sharpe Ratio: 0.5045559895665087

======PPO Training========

Training time (PPO): 588.0686046679815 minutes

======PPO Validation from: 20161003 to 20170103

PPO Sharpe Ratio: 0.7439713149971233

======DDPG Training========

Training time (DDPG): 2.816955014069875 minutes

======DDPG Validation from: 20161003 to 20170103

======Trading from: 20170103 to 20170404

Used Model: <stable\_baselines.ppo2.ppo2.PPO2 object at 0x00000280DEA880F0>

previous\_total\_asset:1066587.5355241552

end\_total\_asset:1113154.2367817

total\_reward:46566.7012575448

total\_cost: 2026.654027338854

total trades: 1246

Sharpe: 0.2822165048849183

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20170103

======A2C Training========

Training time (A2C): 3.8241626620292664 minutes

======A2C Validation from: 20170103 to 20170404

A2C Sharpe Ratio: 0.36574440290817734

======PPO Training========

Training time (PPO): 11.889087820053101 minutes

======PPO Validation from: 20170103 to 20170404

PPO Sharpe Ratio: 0.10294758075366567

======DDPG Training========

Training time (DDPG): 2.5420763651529947 minutes

======DDPG Validation from: 20170103 to 20170404

======Trading from: 20170404 to 20170705

Used Model: <stable\_baselines.a2c.a2c.A2C object at 0x00000280DEC17B70>

previous\_total\_asset:1113154.2367817

end\_total\_asset:1126857.085416119

total\_reward:13702.848634419031

total\_cost: 6543.824016722244

total trades: 1325

Sharpe: 0.11619475776754962

============Trading Done============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20170404

======A2C Training========

Training time (A2C): 275.23247936566673 minutes

======A2C Validation from: 20170404 to 20170705

A2C Sharpe Ratio: 0.3016539790232501

======PPO Training========

Training time (PPO): 51.975706203778586 minutes

======PPO Validation from: 20170404 to 20170705

PPO Sharpe Ratio: 0.26929875496660294

======DDPG Training========

Training time (DDPG): 4.4377192179361975 minutes

======DDPG Validation from: 20170404 to 20170705

======Trading from: 20170705 to 20171003

Used Model: <stable\_baselines.a2c.a2c.A2C object at 0x00000280DAD2ED68>

previous\_total\_asset:1126857.085416119

end\_total\_asset:1153198.529393387

total\_reward:26341.443977267947

total\_cost: 5259.483432936046

total trades: 1273

Sharpe: 0.17782162268107948

============Trading Done============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20170705

======A2C Training========

Training time (A2C): 4.179836126168569 minutes

======A2C Validation from: 20170705 to 20171003

A2C Sharpe Ratio: 0.3523777116969021

======PPO Training========

Training time (PPO): 20.525210646788278 minutes

======PPO Validation from: 20170705 to 20171003

PPO Sharpe Ratio: 0.05945289839749294

======DDPG Training========

Training time (DDPG): 2.0430906772613526 minutes

======DDPG Validation from: 20170705 to 20171003

======Trading from: 20171003 to 20180103

Used Model: <stable\_baselines.a2c.a2c.A2C object at 0x00000280DFFC3390>

previous\_total\_asset:1153198.529393387

end\_total\_asset:1256008.8778378954

total\_reward:102810.34844450839

total\_cost: 2883.6095718944475

total trades: 1223

Sharpe: 0.5841592559290713

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20171003

======A2C Training========

Training time (A2C): 4.128828891118368 minutes

======A2C Validation from: 20171003 to 20180103

A2C Sharpe Ratio: 0.5807862706310988

======PPO Training========

Training time (PPO): 14.568480936686198 minutes

======PPO Validation from: 20171003 to 20180103

PPO Sharpe Ratio: 0.5069313623088604

======DDPG Training========

Training time (DDPG): 101.92764655351638 minutes

======DDPG Validation from: 20171003 to 20180103

======Trading from: 20180103 to 20180405

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E05A6D68>

previous\_total\_asset:1256008.8778378954

end\_total\_asset:1268462.1730304048

total\_reward:12453.295192509424

total\_cost: 1851.512724409564

total trades: 316

Sharpe: 0.05554172263668142

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20180103

======A2C Training========

Training time (A2C): 4.241117974122365 minutes

======A2C Validation from: 20180103 to 20180405

A2C Sharpe Ratio: -0.07054523169501489

======PPO Training========

Training time (PPO): 19.956373957792916 minutes

======PPO Validation from: 20180103 to 20180405

PPO Sharpe Ratio: -0.02629866036272663

======DDPG Training========

Training time (DDPG): 2.3579128344853717 minutes

======DDPG Validation from: 20180103 to 20180405

======Trading from: 20180405 to 20180705

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E13C8A90>

previous\_total\_asset:1268462.1730304048

end\_total\_asset:1281608.7535714773

total\_reward:13146.580541072413

total\_cost: 3573.6603888400723

total trades: 743

Sharpe: 0.05643812446353037

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20180405

======A2C Training========

Training time (A2C): 4.198152152697245 minutes

======A2C Validation from: 20180405 to 20180705

A2C Sharpe Ratio: -0.07391974473788113

======PPO Training========

Training time (PPO): 17.277157807350157 minutes

======PPO Validation from: 20180405 to 20180705

PPO Sharpe Ratio: -0.0246936467704131

======DDPG Training========

Training time (DDPG): 2.3962707996368406 minutes

======DDPG Validation from: 20180405 to 20180705

======Trading from: 20180705 to 20181003

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E0EA4BE0>

previous\_total\_asset:1281608.7535714773

end\_total\_asset:1287005.9831274257

total\_reward:5397.229555948405

total\_cost: 4897.812161648304

total trades: 675

Sharpe: 0.048679422304436726

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20180705

======A2C Training========

Training time (A2C): 128.8178724169731 minutes

======A2C Validation from: 20180705 to 20181003

A2C Sharpe Ratio: 0.1540037669328831

======PPO Training========

Training time (PPO): 16.330600229899087 minutes

======PPO Validation from: 20180705 to 20181003

PPO Sharpe Ratio: 0.016498911006567737

======DDPG Training========

Training time (DDPG): 2.915939466158549 minutes

======DDPG Validation from: 20180705 to 20181003

======Trading from: 20181003 to 20190104

Used Model: <stable\_baselines.a2c.a2c.A2C object at 0x00000280E2BD17F0>

previous\_total\_asset:1287005.9831274257

end\_total\_asset:1307436.1531803263

total\_reward:20430.170052900678

total\_cost: 1311.9998123865025

total trades: 221

Sharpe: 0.30191413893202174

============Trading Done============

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turbulence\_threshold: 171.0940715631016

======Model training from: 20090000 to 20181003

======A2C Training========

Training time (A2C): 5.132003668944041 minutes

======A2C Validation from: 20181003 to 20190104

A2C Sharpe Ratio: -0.4299396200093949

======PPO Training========

Training time (PPO): 15.786135216554007 minutes

======PPO Validation from: 20181003 to 20190104

PPO Sharpe Ratio: -0.4425164330533583

======DDPG Training========

Training time (DDPG): 2.62947815656662 minutes

======DDPG Validation from: 20181003 to 20190104

======Trading from: 20190104 to 20190405

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E1332BE0>

previous\_total\_asset:1307436.1531803263

end\_total\_asset:1492434.807276447

total\_reward:184998.65409612074

total\_cost: 2713.28831933539

total trades: 903

Sharpe: 0.6277592912896913

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20190104

======A2C Training========

Training time (A2C): 4.483110626538594 minutes

======A2C Validation from: 20190104 to 20190405

A2C Sharpe Ratio: 0.011987689631623505

======PPO Training========

Training time (PPO): 16.822114408016205 minutes

======PPO Validation from: 20190104 to 20190405

PPO Sharpe Ratio: 0.16222738974665732

======DDPG Training========

Training time (DDPG): 2.7013214747111003 minutes

======DDPG Validation from: 20190104 to 20190405

======Trading from: 20190405 to 20190708

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E06729B0>

previous\_total\_asset:1492434.807276447

end\_total\_asset:1502355.1323581734

total\_reward:9920.325081726303

total\_cost: 1266.8122008313942

total trades: 118

Sharpe: 0.41977077865434287

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20190405

======A2C Training========

Training time (A2C): 4.73365763425827 minutes

======A2C Validation from: 20190405 to 20190708

A2C Sharpe Ratio: 0.3155519823984443

======PPO Training========

Training time (PPO): 16.848149271806083 minutes

======PPO Validation from: 20190405 to 20190708

PPO Sharpe Ratio: 0.12458420481611787

======DDPG Training========

Training time (DDPG): 2.733988293011983 minutes

======DDPG Validation from: 20190405 to 20190708

======Trading from: 20190708 to 20191004

Used Model: <stable\_baselines.ddpg.ddpg.DDPG object at 0x00000280E0E47048>

previous\_total\_asset:1502355.1323581734

end\_total\_asset:1514710.4323148471

total\_reward:12355.299956673756

total\_cost: 2590.8993908340303

total trades: 294

Sharpe: 0.1990808099887889

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20190708

======A2C Training========

Training time (A2C): 5.411157592137655 minutes

======A2C Validation from: 20190708 to 20191004

A2C Sharpe Ratio: 0.056239291998709494

======PPO Training========

Training time (PPO): 23.466489394505818 minutes

======PPO Validation from: 20190708 to 20191004

PPO Sharpe Ratio: -0.03648169389862785

======DDPG Training========

Training time (DDPG): 2.861213437716166 minutes

======DDPG Validation from: 20190708 to 20191004

======Trading from: 20191004 to 20200106

Used Model: <stable\_baselines.a2c.a2c.A2C object at 0x00000280E0E3F278>

previous\_total\_asset:1514710.4323148471

end\_total\_asset:1513937.3013522653

total\_reward:-773.1309625818394

total\_cost: 236.06856615916251

total trades: 60

Sharpe: -0.25689733640886253

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20191004

======A2C Training========

Training time (A2C): 6.0523487011591595 minutes

======A2C Validation from: 20191004 to 20200106

A2C Sharpe Ratio: -0.4090820966616558

======PPO Training========

Training time (PPO): 21.039086254437766 minutes

======PPO Validation from: 20191004 to 20200106

PPO Sharpe Ratio: -0.20379661678489588

======DDPG Training========

Training time (DDPG): 2.467397165298462 minutes

======DDPG Validation from: 20191004 to 20200106

======Trading from: 20200106 to 20200406

Used Model: <stable\_baselines.ppo2.ppo2.PPO2 object at 0x00000280E52998D0>

previous\_total\_asset:1513937.3013522653

end\_total\_asset:1495017.4253168772

total\_reward:-18919.876035388093

total\_cost: 915.0949453184747

total trades: 155

Sharpe: -0.4405156902390821

============Trading Done============

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turbulence\_threshold: 96.08032158358223

======Model training from: 20090000 to 20200106

======A2C Training========

Training time (A2C): 5.6471747318903605 minutes

======A2C Validation from: 20200106 to 20200406

A2C Sharpe Ratio: -0.4167064403028425

======PPO Training========

Training time (PPO): 18.98853879372279 minutes

======PPO Validation from: 20200106 to 20200406

PPO Sharpe Ratio: -0.38540722156199664

======DDPG Training========

Training time (DDPG): 62.16313922007878 minutes

======DDPG Validation from: 20200106 to 20200406

======Trading from: 20200406 to 20200707

Used Model: <stable\_baselines.ppo2.ppo2.PPO2 object at 0x00000280E5700278>

previous\_total\_asset:1495017.4253168772

end\_total\_asset:1497853.3277096967

total\_reward:2835.902392819524

total\_cost: 671.7497637894298

total trades: 119

Sharpe: 0.14004470258713267

============Trading Done============

Ensemble Strategy took: 3126.100938463211 minutes