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1 C:\Users\Alex\Anaconda3\python.exe "C:/Users/Zihang
  Guan/Desktop/Deep-Reinforcement-Learning-for-
  Automated-Stock-Trading-Ensemble-Strategy-ICAIF-2020-
  master/run_DRL.py"
2 2022-03-30 23:57:52.720304: W tensorflow/
  stream_executor/platform/default/dso_loader.cc:59]
  Could not load dynamic library 'cudart64_101.dll';
  dlerror: cudart64_101.dll not found
3 2022-03-30 23:57:52.722393: I tensorflow/
  stream_executor/cuda/cudart_stub.cc:29] Ignore above
  cudart dlerror if you do not have a GPU set up on
  your machine.
4 C:\Users\Alex\Anaconda3\lib\site-packages\
  stable_baselines\__init__.py:33: UserWarning: stable-
  baselines is in maintenance mode, please use [Stable-
  Baselines3 (SB3)](https://github.com/DLR-RM/stable-
  baselines3) for an up-to-date version. You can find a
  [migration guide](https://stable-baselines3.
  readthedocs.io/en/master/guide/migration.html) in SB3
  documentation.
5 warnings.warn(
6   datadate    tic      adjcp      open    ...    rsi
      cci      adx  turbulence
7 0  20090102  AAPL  12.964286  12.268571  ...  100.0
  66.666667  100.0      0.0
8 1  20090102   AXP  19.330000  18.570000  ...  100.0
  66.666667  100.0      0.0
9 2  20090102   BA   45.250000  42.800000  ...  100.0
  66.666667  100.0      0.0
10 3  20090102  CAT  46.910000  44.910000  ...    0.0
   66.666667  100.0      0.0
11 4  20090102  CSC0  16.960000  16.410000  ...  100.0
   66.666667  100.0      0.0
12
13 [5 rows x 12 columns]
14 1053360
15 [20151002 20151005 20151006 ... 20200702 20200706
   20200707]
16 =====Start Ensemble Strategy=====
17 =====
18 turbulence_threshold: 171.0940715631016

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19 =====A2C Original Training=====
20 2022-03-30 23:58:01.868678: I tensorflow/core/
platform/cpu_feature_guard.cc:142] This TensorFlow
binary is optimized with oneAPI Deep Neural Network
Library (oneDNN)to use the following CPU instructions
in performance-critical operations: AVX2
21 To enable them in other operations, rebuild
TensorFlow with the appropriate compiler flags.
22 2022-03-30 23:58:01.930395: I tensorflow/compiler/xla
/service/service.cc:168] XLA service 0x227b1abf670
initialized for platform Host (this does not
guarantee that XLA will be used). Devices:
23 2022-03-30 23:58:01.932004: I tensorflow/compiler/xla
/service/service.cc:176] StreamExecutor device (0
): Host, Default Version
24 2022-03-30 23:58:01.937394: W tensorflow/
stream_executor/platform/default/dso_loader.cc:59]
Could not load dynamic library 'nvcuda.dll'; dlerror
: nvcuda.dll not found
25 2022-03-30 23:58:01.939628: W tensorflow/
stream_executor/cuda/cuda_driver.cc:312] failed call
to cuInit: UNKNOWN ERROR (303)
26 2022-03-30 23:58:01.941039: I tensorflow/
stream_executor/cuda/cuda_diagnostics.cc:169]
retrieving CUDA diagnostic information for host:
LAPTOP-FJQ3PEHG
27 2022-03-30 23:58:01.943747: I tensorflow/
stream_executor/cuda/cuda_diagnostics.cc:176]
hostname: LAPTOP-FJQ3PEHG
28 WARNING:tensorflow:From C:\Users\Alex\Anaconda3\lib\
site-packages\stable_baselines\common\policies.py:565
: flatten (from tensorflow.python.keras.
legacy_tf_layers.core) is deprecated and will be
removed in a future version.
29 Instructions for updating:
30 Use keras.layers.Flatten instead.
31 WARNING:tensorflow:From C:\Users\Alex\Anaconda3\lib\
site-packages\tensorflow\python\keras\
legacy_tf_layers\core.py:332: Layer.apply (from
tensorflow.python.keras.engine.base_layer_v1) is
deprecated and will be removed in a future version.
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32 Instructions for updating:
33 Please use `layer.__call__` method instead.
34 WARNING:tensorflow:From C:\Users\Alex\Anaconda3\lib\
site-packages\tensorflow\python\training\rmsprop.py:
123: calling Ones.__init__ (from tensorflow.python.
ops.init_ops) with dtype is deprecated and will be
removed in a future version.
35 Instructions for updating:
36 Call initializer instance with the dtype argument
instead of passing it to the constructor
37 Training time (A2C): 3.47820561726888 minutes
38 =====A2C Original Validation from: 20151002 to
20160104
39 A2C Original Sharpe Ratio: 0.10486901638810256
40 =====Trading from: 20160104 to 20160405
41 Used Model: <stable_baselines.a2c_original.
a2c_original.A2C_Original object at
0x00000227B2FBB370>
42 previous_total_asset:1000000
43 end_total_asset:1083784.1188326625
44 total_reward:83784.11883266247
45 total_cost: 2340.053628396993
46 total trades: 1106
47 Sharpe: 0.2971721948313013
48 =====Trading Done=====
49 =====
50 turbulence_threshold: 96.08032158358223
51 =====A2C Original Training=====
52 Training time (A2C): 4.820422915617625 minutes
53 =====A2C Original Validation from: 20160104 to
20160405
54 A2C Original Sharpe Ratio: 0.03470057898357038
55 =====Trading from: 20160405 to 20160705
56 Used Model: <stable_baselines.a2c_original.
a2c_original.A2C_Original object at
0x00000227B2FBB070>
57 previous_total_asset:1083784.1188326625
58 end_total_asset:1089740.1570277386
59 total_reward:5956.038195076166
60 total_cost: 4008.95070528571
61 total trades: 1363

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62 Sharpe: 0.0296095962751775
63 =====Trading Done=====
64 =====
65 turbulence_threshold: 171.0940715631016
66 =====A2C Original Training=====
67 Training time (A2C): 4.179627486069998 minutes
68 =====A2C Original Validation from: 20160405 to
  20160705
69 A2C Original Sharpe Ratio: -0.04122110299639336
70 =====Trading from: 20160705 to 20161003
71 Used Model: <stable_baselines.a2c_original.
  a2c_original.A2C_Original object at
  0x00000227BE406490>
72 previous_total_asset:1089740.1570277386
73 end_total_asset:1112620.6522678926
74 total_reward:22880.495240153978
75 total_cost: 2575.9240668098155
76 total trades: 1192
77 Sharpe: 0.10970682025283512
78 =====Trading Done=====
79 =====
80 turbulence_threshold: 171.0940715631016
81 =====A2C Original Training=====
82 Training time (A2C): 3.045102580388387 minutes
83 =====A2C Original Validation from: 20160705 to
  20161003
84 A2C Original Sharpe Ratio: -0.12831986329253245
85 =====Trading from: 20161003 to 20170103
86 Used Model: <stable_baselines.a2c_original.
  a2c_original.A2C_Original object at
  0x00000227BAEFD370>
87 previous_total_asset:1112620.6522678926
88 end_total_asset:1168211.1002142979
89 total_reward:55590.44794640527
90 total_cost: 3800.3634224608904
91 total trades: 1473
92 Sharpe: 0.2732720527413373
93 =====Trading Done=====
94 =====
95 turbulence_threshold: 171.0940715631016
96 =====A2C Original Training=====
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97 Training time (A2C): 3.1969196597735086 minutes
98 =====A2C Original Validation from: 20161003 to
    20170103
99 A2C Original Sharpe Ratio: 0.17206551341880783
100 =====Trading from: 20170103 to 20170404
101 Used Model: <stable_baselines.a2c_original.
    a2c_original.A2C_Original object at
    0x000000227BE0B7D60>
102 previous_total_asset:1168211.1002142979
103 end_total_asset:1204726.7722094664
104 total_reward:36515.67199516855
105 total_cost: 3978.6607176934854
106 total trades: 1303
107 Sharpe: 0.20369686267550194
108 =====Trading Done=====
109 =====
110 turbulence_threshold: 96.08032158358223
111 =====A2C Original Training=====
112 Training time (A2C): 3.037540376186371 minutes
113 =====A2C Original Validation from: 20170103 to
    20170404
114 A2C Original Sharpe Ratio: 0.2967164756445461
115 =====Trading from: 20170404 to 20170705
116 Used Model: <stable_baselines.a2c_original.
    a2c_original.A2C_Original object at
    0x000000227BAC7CB50>
117 previous_total_asset:1204726.7722094664
118 end_total_asset:1207867.2223461736
119 total_reward:3140.4501367071643
120 total_cost: 5553.054804877654
121 total trades: 1217
122 Sharpe: 0.03161153502800065
123 =====Trading Done=====
124 =====
125 turbulence_threshold: 171.0940715631016
126 =====A2C Original Training=====
127 Training time (A2C): 3.0856110374132792 minutes
128 =====A2C Original Validation from: 20170404 to
    20170705
129 A2C Original Sharpe Ratio: 0.21477800070599973
130 =====Trading from: 20170705 to 20171003
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131 Used Model: <stable_baselines.a2c_original.  
    a2c_original.A2C_Original object at  
    0x00000227BE6EBC70>  
132 previous_total_asset:1207867.2223461736  
133 end_total_asset:1252859.124569259  
134 total_reward:44991.902223085286  
135 total_cost: 7324.254337835468  
136 total trades: 1585  
137 Sharpe: 0.23634585338389805  
138 =====Trading Done=====  
139 =====  
140 turbulence_threshold: 171.0940715631016  
141 =====A2C Original Training=====  
142 Training time (A2C): 3.0989841779073077 minutes  
143 =====A2C Original Validation from: 20170705 to  
    20171003  
144 A2C Original Sharpe Ratio: 0.162386512940306  
145 =====Trading from: 20171003 to 20180103  
146 Used Model: <stable_baselines.a2c_original.  
    a2c_original.A2C_Original object at  
    0x00000227BA3EC970>  
147 previous_total_asset:1252859.124569259  
148 end_total_asset:1392037.5489455175  
149 total_reward:139178.42437625863  
150 total_cost: 4796.570881620777  
151 total trades: 1432  
152 Sharpe: 0.6432308184821326  
153 =====Trading Done=====  
154 =====  
155 turbulence_threshold: 96.08032158358223  
156 =====A2C Original Training=====  
157 Training time (A2C): 3.6152915954589844 minutes  
158 =====A2C Original Validation from: 20171003 to  
    20180103  
159 A2C Original Sharpe Ratio: 0.27517391198519353  
160 =====Trading from: 20180103 to 20180405  
161 Used Model: <stable_baselines.a2c_original.  
    a2c_original.A2C_Original object at  
    0x00000227BAD0B940>  
162 previous_total_asset:1392037.5489455175  
163 end_total_asset:1414301.2683537793
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164 total_reward:22263.719408261823
165 total_cost: 2178.2621838761506
166 total trades: 342
167 Sharpe: 0.11788138172535342
168 =====Trading Done=====
169 =====
170 turbulence_threshold: 96.08032158358223
171 =====A2C Original Training=====
172 Training time (A2C): 3.82090292374293 minutes
173 =====A2C Original Validation from: 20180103 to
    20180405
174 A2C Original Sharpe Ratio: -0.0025619625152406367
175 =====Trading from: 20180405 to 20180705
176 Used Model: <stable_baselines.a2c_original.
    a2c_original.A2C_Original object at
    0x00000227BE579280>
177 previous_total_asset:1414301.2683537793
178 end_total_asset:1375341.3758183285
179 total_reward:-38959.89253545087
180 total_cost: 7084.262173787874
181 total trades: 1126
182 Sharpe: -0.15107862938527944
183 =====Trading Done=====
184 =====
185 turbulence_threshold: 96.08032158358223
186 =====A2C Original Training=====
187 Training time (A2C): 4.296559969584147 minutes
188 =====A2C Original Validation from: 20180405 to
    20180705
189 A2C Original Sharpe Ratio: -0.007140349661959166
190 =====Trading from: 20180705 to 20181003
191 Used Model: <stable_baselines.a2c_original.
    a2c_original.A2C_Original object at
    0x00000227BE0D6820>
192 previous_total_asset:1375341.3758183285
193 end_total_asset:1384498.004439091
194 total_reward:9156.62862076261
195 total_cost: 6747.593000354392
196 total trades: 1004
197 Sharpe: 0.08211625463232615
198 =====Trading Done=====
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199 =====
200 turbulence_threshold: 96.08032158358223
201 =====A2C Original Training=====
202 Training time (A2C): 3.6340682029724123 minutes
203 =====A2C Original Validation from: 20180705 to
    20181003
204 A2C Original Sharpe Ratio: 0.17571974695582823
205 =====Trading from: 20181003 to 20190104
206 Used Model: <stable_baselines.a2c_original.
    a2c_original.A2C_Original object at
    0x000000227B740EFD0>
207 previous_total_asset:1384498.004439091
208 end_total_asset:1390949.4880508734
209 total_reward:6451.483611782314
210 total_cost: 980.4000178902761
211 total trades: 171
212 Sharpe: 0.12611127564243263
213 =====Trading Done=====
214 =====
215 turbulence_threshold: 171.0940715631016
216 =====A2C Original Training=====
217 Training time (A2C): 3.362243648370107 minutes
218 =====A2C Original Validation from: 20181003 to
    20190104
219 A2C Original Sharpe Ratio: -0.43075096330849905
220 =====Trading from: 20190104 to 20190405
221 Used Model: <stable_baselines.a2c_original.
    a2c_original.A2C_Original object at
    0x000000227B9AC3370>
222 previous_total_asset:1390949.4880508734
223 end_total_asset:1508671.039661402
224 total_reward:117721.55161052872
225 total_cost: 4576.40059716739
226 total trades: 1293
227 Sharpe: 0.3148591213346405
228 =====Trading Done=====
229 =====
230 turbulence_threshold: 96.08032158358223
231 =====A2C Original Training=====
232 Training time (A2C): 3.3650631427764894 minutes
233 =====A2C Original Validation from: 20190104 to
```



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233 20190405
234 A2C Original Sharpe Ratio: 0.00528118461458618
235 =====Trading from: 20190405 to 20190708
236 Used Model: <stable_baselines.a2c_original.
      a2c_original.A2C_Original object at
      0x00000227B9B45F10>
237 previous_total_asset:1508671.039661402
238 end_total_asset:1512849.7632340076
239 total_reward:4178.723572605522
240 total_cost: 1128.338655684733
241 total trades: 165
242 Sharpe: 0.2161006873727663
243 =====Trading Done=====
244 =====
245 turbulence_threshold: 96.08032158358223
246 =====A2C Original Training=====
247 Training time (A2C): 4.058049937089284 minutes
248 =====A2C Original Validation from: 20190405 to
      20190708
249 A2C Original Sharpe Ratio: 0.2121922421468063
250 =====Trading from: 20190708 to 20191004
251 Used Model: <stable_baselines.a2c_original.
      a2c_original.A2C_Original object at
      0x00000227B87DF970>
252 previous_total_asset:1512849.7632340076
253 end_total_asset:1508897.5203491917
254 total_reward:-3952.2428848159034
255 total_cost: 1809.7208820365954
256 total trades: 331
257 Sharpe: -0.0968656339789275
258 =====Trading Done=====
259 =====
260 turbulence_threshold: 96.08032158358223
261 =====A2C Original Training=====
262 Training time (A2C): 4.076199642817179 minutes
263 =====A2C Original Validation from: 20190708 to
      20191004
264 A2C Original Sharpe Ratio: -0.07410935622425568
265 =====Trading from: 20191004 to 20200106
266 Used Model: <stable_baselines.a2c_original.
      a2c_original.A2C_Original object at
```

```
266 0x00000227BC63B040>
267 previous_total_asset:1508897.5203491917
268 end_total_asset:1507910.4891542755
269 total_reward:-987.0311949162278
270 total_cost: 322.09190265988354
271 total trades: 64
272 Sharpe: -0.32265389373281816
273 =====Trading Done=====
274 =====
275 turbulence_threshold: 96.08032158358223
276 =====A2C Original Training=====
277 Training time (A2C): 3.800358013312022 minutes
278 =====A2C Original Validation from: 20191004 to
20200106
279 A2C Original Sharpe Ratio: -0.05678310604505592
280 =====Trading from: 20200106 to 20200406
281 Used Model: <stable_baselines.a2c_original.
a2c_original.A2C_Original object at
0x00000227BAF23910>
282 previous_total_asset:1507910.4891542755
283 end_total_asset:1489288.8773325656
284 total_reward:-18621.6118217099
285 total_cost: 1005.8680389140463
286 total trades: 195
287 Sharpe: -0.4027560105447122
288 =====Trading Done=====
289 =====
290 turbulence_threshold: 96.08032158358223
291 =====A2C Original Training=====
292 Training time (A2C): 4.260867345333099 minutes
293 =====A2C Original Validation from: 20200106 to
20200406
294 A2C Original Sharpe Ratio: -0.45304706096794
295 =====Trading from: 20200406 to 20200707
296 Used Model: <stable_baselines.a2c_original.
a2c_original.A2C_Original object at
0x00000227B9BA9D90>
297 previous_total_asset:1489288.8773325656
298 end_total_asset:1493519.1286990622
299 total_reward:4230.251366496552
300 total_cost: 594.0109991887998
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301 total trades: 128
302 Sharpe: 0.2297965476386896
303 =====Trading Done=====
304 A2C Original Strategy took: 66.69074712991714
    minutes
305
306 Process finished with exit code 0
307
```