alamSYS: Development of Stock Market Price Forecasting System Using Dynamic Mode Decomposition, Long Short-Term Memory with Arnaud Legoux Moving Average Convergence-Divergence Integration

A Special Problem
Presented to
the Faculty of the Division of Physical Sciences and Mathematics
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Miag-ao, Iloilo

In Partial Fulfillment
of the Requirements for the Degree of
Bachelor of Science in Computer Science by

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Abstract

Abstract here

Keywords: Keyword 1, keyword 2, keyword 3, keyword 4, etc.

Contents

List of Figures

List of Tables

Appendix A

Source Code Repository

Follow this link to access the code repository for this special problem: `https://github.com/GravitonXD/OLARTE_SP`. It should be noted that this repository also contains all of the miscellaneous files, such as the.tex files used to create this paper, test codes, and so on. The following are the primary directories for this project:

(a) alamSYS - contains the source code for alamSYS as well as the docker and docker-compose files.

(b) DeepLearningModel - contains all of the Python notebooks used in the development of this special problem for training, testing, and cross-validation of the models, trading algorithm, and other calculations.

(c) alamAPP - This directory contains the source code for the mobile-based test application.

Future developers who want to expand the functionality or dig deeper into this special problem can use the following repository links:

(a) alamSYS - `https://github.com/GravitonXD/alamSYS`

(b) DMD-LSTM - `https://github.com/GravitonXD/alamSYS_DMD-LSTM`

(c) alamAPP - `https://github.com/GravitonXD/alamAPP`

Appendix B

Raw Data Figures

B.1   Exploratory Stocks Data Graphs

The figures below depict combined line graphs of the opening, high, low, and closing prices of each stock in the alamSYS. These figures also demonstrate why closing prices were chosen as the primary training feature of the models developed for this particular problem. Aside from being the most important price target in most trading and investing strategies, closing prices do not differ significantly from the other price metrics.

Figure B.1: Opening, High, Low, and Closing Prices on AC

Figure B.2: Opening, High, Low, and Closing Prices for ALI
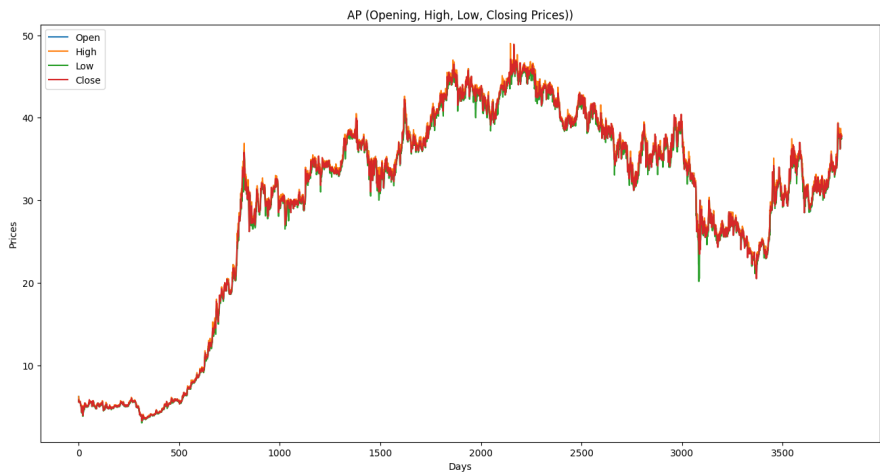
Figure B.3: Opening, High, Low, and Closing Prices for AP

3

Figure B.4: Opening, High, Low, and Closing Prices for BDO
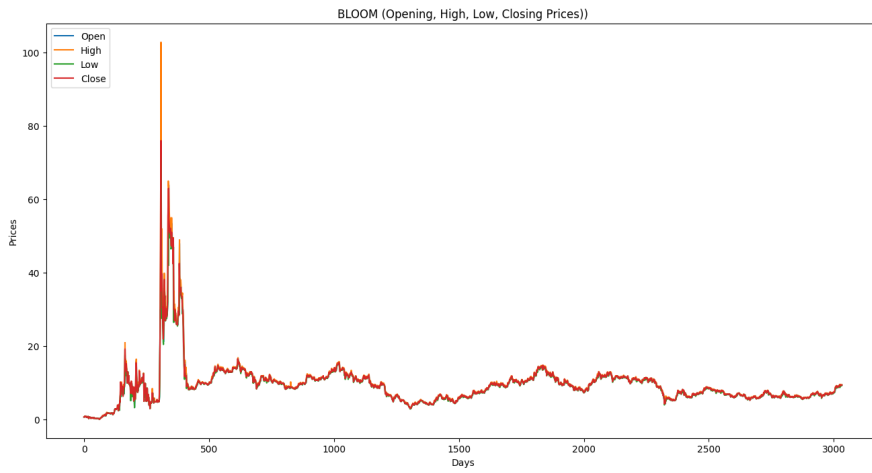
Figure B.5: Opening, High, Low, and Closing Prices for BLOOM
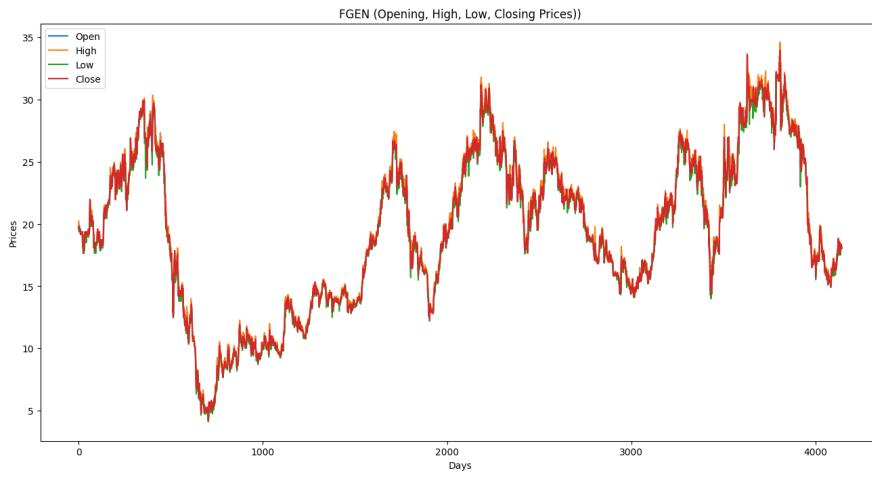
Figure B.6: Opening, High, Low, and Closing Prices for FGEN
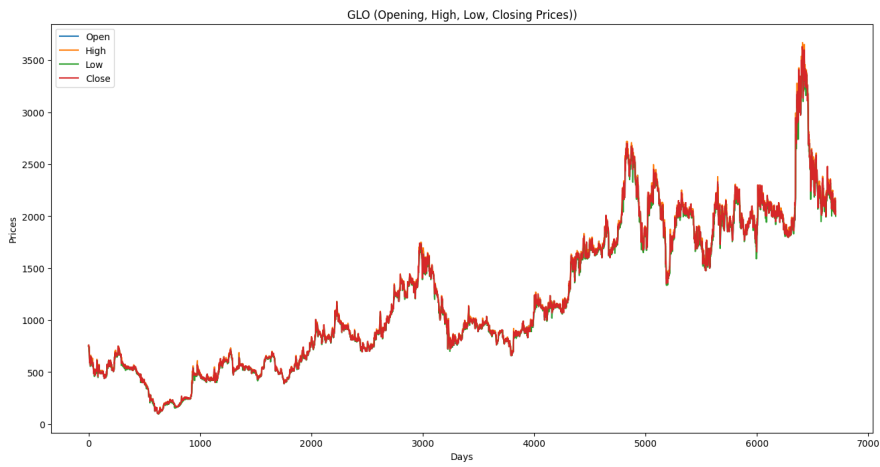
Figure B.7: Opening, High, Low, and Closing Prices for GLO
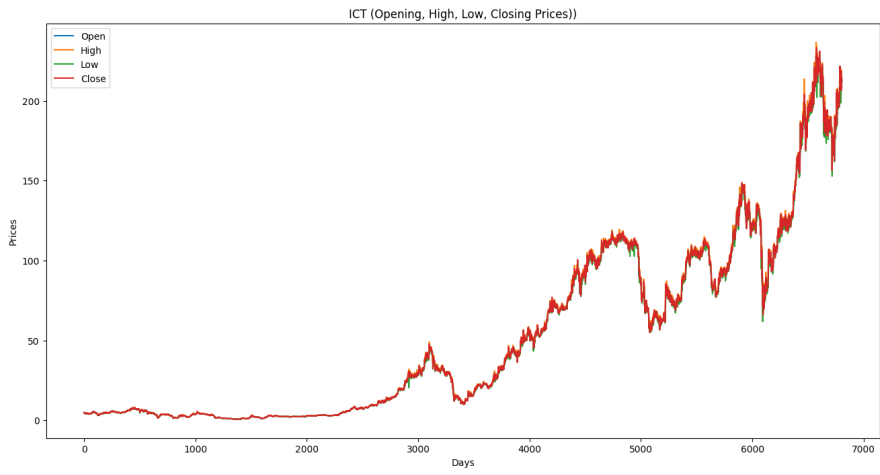
Figure B.8: Opening, High, Low, and Closing Prices for ICT
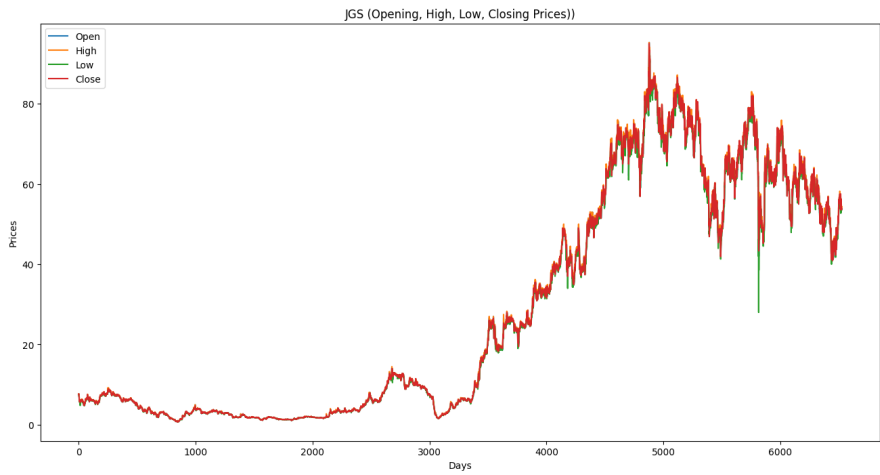
Figure B.9: Opening, High, Low, and Closing Prices on JGS
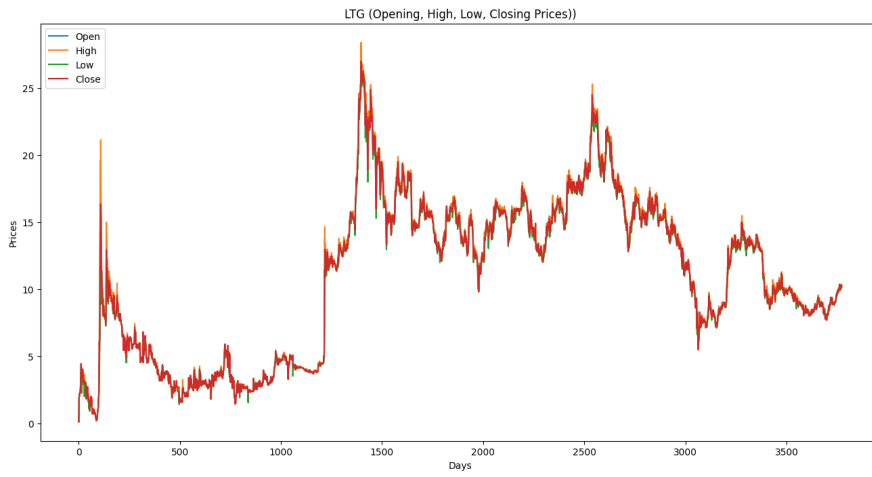
Figure B.10: Opening, High, Low, and Closing Prices on LTG
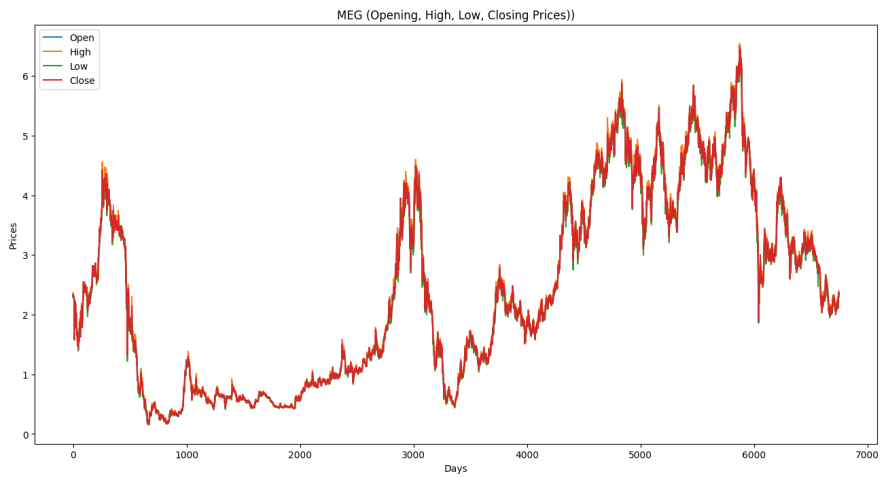
Figure B.11: Opening, High, Low, and Closing Prices on MEG
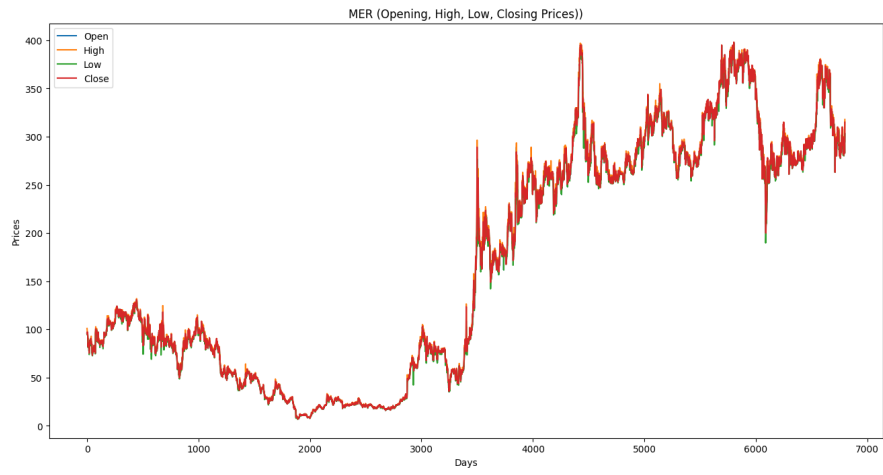
Figure B.12: Opening, High, Low, and Closing Prices on MER
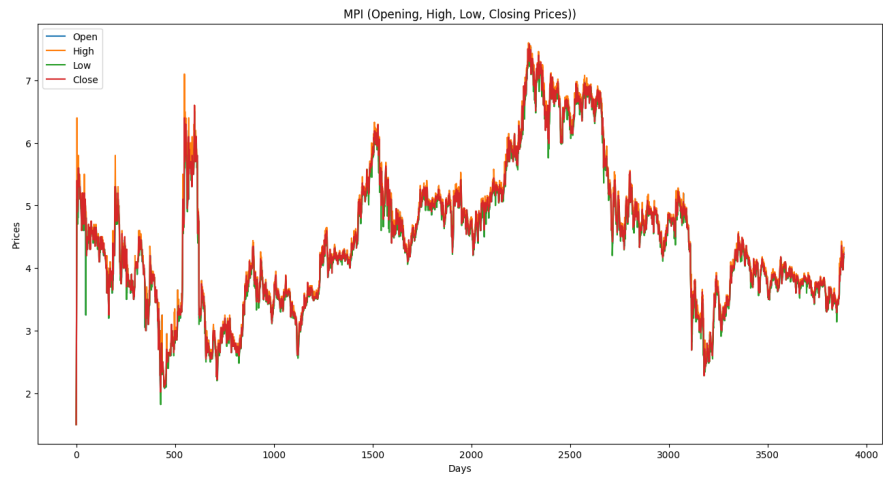
Figure B.13: Opening, High, Low, and Closing Prices on MPI

Figure B.14: Opening, High, Low, and Closing Prices on PGOLD
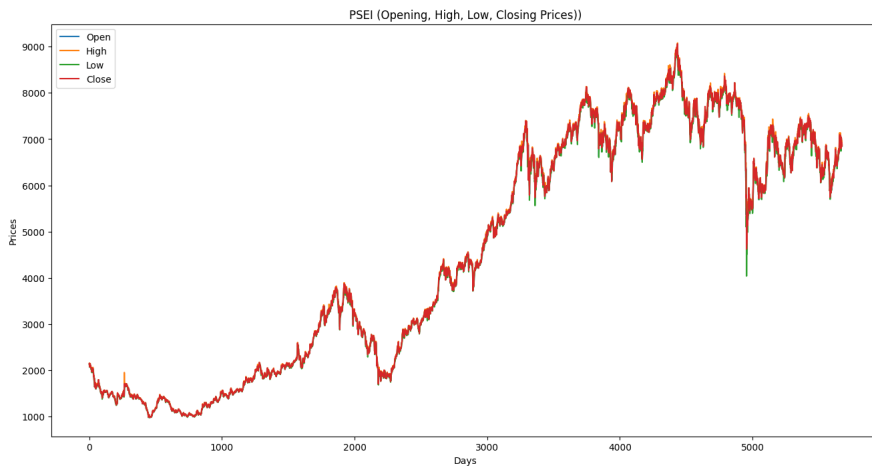

Figure B.15: Opening, High, Low, and Closing Prices on PSEI
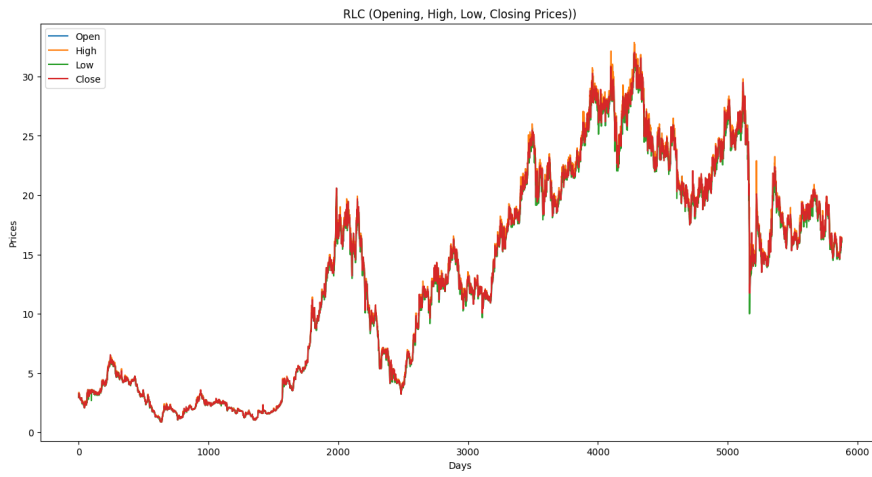
Figure B.16: Opening, High, Low, and Closing Prices on RLC
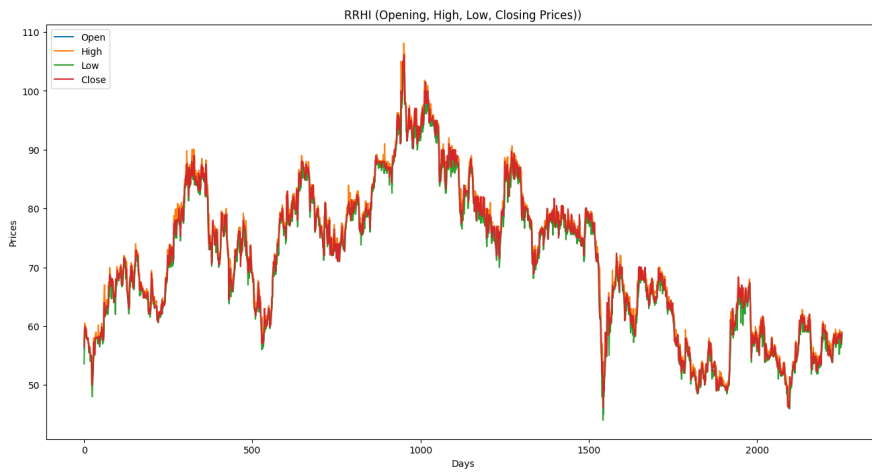
Figure B.17: Opening, High, Low, and Closing Prices on RRHI
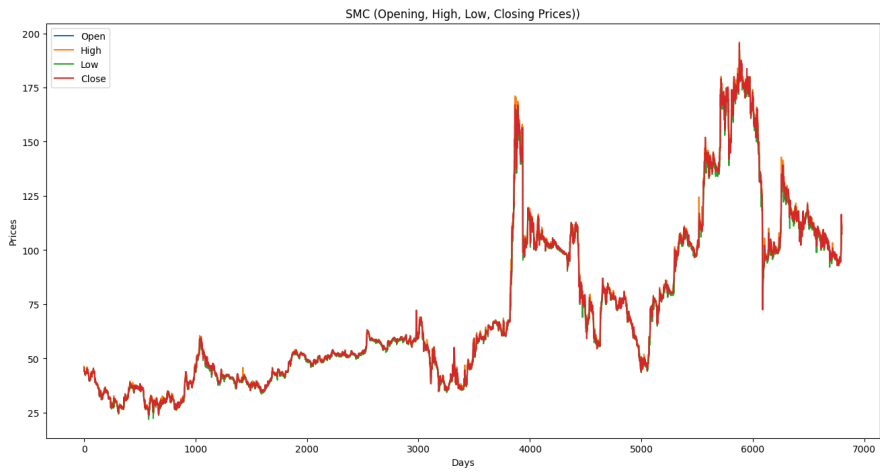
Figure B.18: Opening, High, Low, and Closing Prices on SMC
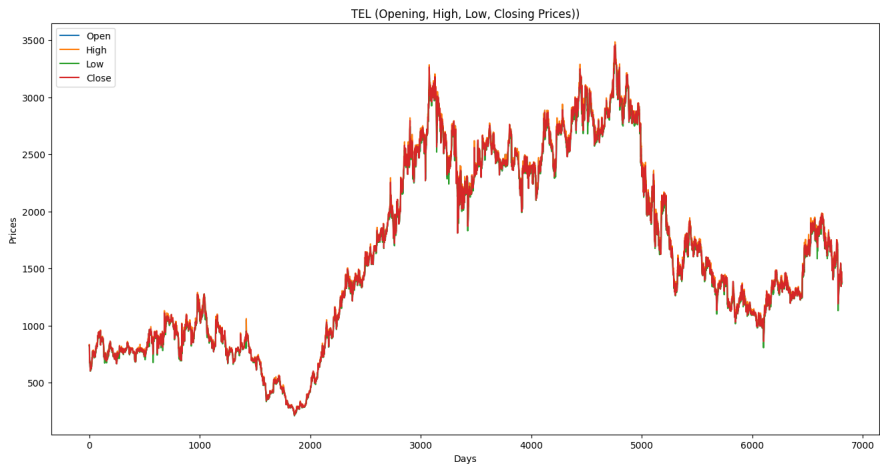
Figure B.19: Opening, High, Low, and Closing Prices on TEL
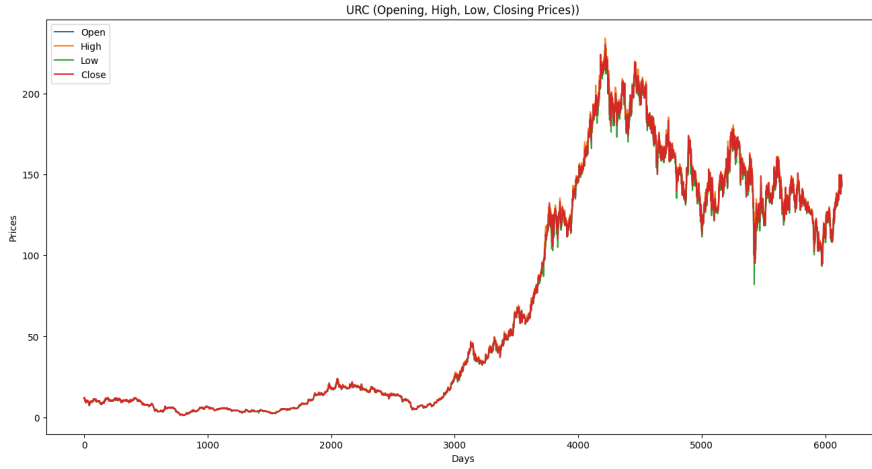
Figure B.20: Opening, High, Low, and Closing Prices on URC

B.2   Raw Model Testing and Cross-Validation Results

The loss metric scores for all eight models trained in this special problem are shown in the figures below.

Figure B.21: Raw Model Scores for Baseline 5

model_baseline10.csv ✕

```
,MSE,RMSE,MAE,MAPE
MEG,0.009889911754036293,0.0994480354458362,0.06758199064508962,434720971982.4056
JGS,0.007846138726297082,0.08857843262497414,0.06152327438608147,85566335564.84262
BDO,0.0032789824378326032,0.05726239986092622,0.04134258195038248,0.010787188658697832
FGEN,0.004700003599831854,0.06855657225847755,0.049436469316649294,0.018101504501868163
ICT,0.007829080848597167,0.08848209337824896,0.05683387085820871,357524334780.4415
ALI,0.005405470132370961,0.07352190239901958,0.05348223646735878,0.02371867110290755
SMC,0.0032675047380823336,0.05716209179239624,0.03835913806689466,0.009415067971236714
TEL,0.003890710198736975,0.06237555770281317,0.046544974902766156,0.006570764404334346
GLO,0.004703932277881038,0.06858521909187895,0.049996579018796145,0.0074512575673198805
BLOOM,0.042053914090353764,0.20507051004557864,0.10369141607734932,2475475634567.023
RLC,0.007579224342571167,0.0870587407591631,0.05984216628062193,0.09443111972264119
MER,0.006914484697945786,0.08315338055632968,0.056430766701572516,0.013803759059196301
AC,0.004979648327052059,0.07056662332187973,0.05068551267808547,0.009095293073218335
PGOLD,0.0031896313274378794,0.05647682115202554,0.042048119990808236,0.011758645358492095
LTG,0.03750821267854841,0.193670371194327,0.08933890463198181,3758594209106.506
MPI,0.0055622165729049605,0.07458026932711466,0.04957733886385026,0.03681429790598718
AP,0.0025557353305988954,0.05055428103137157,0.036624170155080946,0.013458472431218822
RRHI,0.0028975891955775315,0.05382925966031422,0.040626489078535964,0.009641290779521416
URC,0.0068894743382426505,0.08300285741010757,0.057194705397388856,0.028217183434511548
PSEI,9.232829705334228e-05,0.009608761473433623,0.008494095263759951,0.0038998382619416603
```

model_baseline20.csv ✕

```
,MSE,RMSE,MAE,MAPE
MEG,0.026776145694400132,0.16363418253653522,0.1200530791025837,351366074670.9161
JGS,0.023218979019200704,0.15237775106360082,0.11203671688465545,37079236101.84903
BDO,0.010908683929902947,0.10444464529071343,0.08434523255132731,0.021781428827316717
FGEN,0.01328404000198452,0.1152564098086719,0.09013206705640547,0.032225858232777696
ICT,0.023345216418908073,0.15279141474215124,0.1113250141499374,329061136398.89325
ALI,0.015286408733345764,0.12363821712296633,0.09754795116104639,0.04187354853357004
SMC,0.010628930207385257,0.10309670318388099,0.07783085131763114,0.018916425305997443
TEL,0.009939364863936338,0.0996963633435861,0.0788610299993594,0.01109755333457707
GLO,0.012562185108249477,0.1120811541172265,0.08280467054196113,0.012332156586357538
BLOOM,0.08783425054231923,0.29636843715604944,0.16887164674288263,3169069166729.4937
RLC,0.020691999516582075,0.14384713941049393,0.10718897405956002,0.1199250772426462
MER,0.01812308145308288,0.13462199468542604,0.09868743232128989,0.023716153012441354
AC,0.01394238486958509,0.11807787629181468,0.089344392564019,0.01585107064231005
PGOLD,0.010904295680437671,0.10442363564077661,0.0817661727419002,0.02275191781967227
LTG,0.08067359183535965,0.28403096985251386,0.13829894362117306,1705928819526.0623
MPI,0.014631546535808101,0.12096092979060677,0.0922015670902739,0.06615668537253527
AP,0.01002913628735902,0.10014557547569947,0.08141626445268184,0.029241478007478686
RRHI,0.0087973607580564962,0.09379424693479319,0.07504927916672673,0.01764922385349229
URC,0.01970034871975187,0.14035793073336422,0.10510373384399553,0.04846541830892664
PSEI,0.004074235411641981,0.06382973767486422,0.06342811204197056,0.029093785646223835
```

Figure B.24: Raw Model Scores for Baseline 20

model_s5.csv ✕

```
,MSE,RMSE,MAE,MAPE
MEG,0.004309424873421442,0.06564620989380454,0.04421975007142992,139304189558.7179
JGS,0.003308890006950838,0.05752295200136062,0.039920870940521255,200992323983.5872
BDO,0.0015994420966082207,0.039993025599574496,0.027988833139579814,0.007247630327583592
FGEN,0.002240528999740447,0.04733422651465266,0.03265112428473698,0.011974381470464668
ICT,0.0033466528508440136,0.05785026232303544,0.03731193820350593,300581835474.86523
ALI,0.0025544953299240854,0.050542015491312625,0.03645126031585048,0.01596931133193516
SMC,0.00137030869797771,0.03701768088329832,0.023174377850353648,0.005691306162396273
TEL,0.0017757163226041189,0.0421392491936451,0.030019849241503773,0.004239817355480039
GLO,0.002111310296700873,0.04594899668872948,0.03149099407019305,0.004676968507849213
BLOOM,0.018825601880785605,0.13720642069810585,0.06900741213238494,1052898138850.6415
RLC,0.0033839823305168376,0.058172006416461496,0.03977738120052245,0.06922003880110895
MER,0.0032586824275804447,0.057084870391202996,0.037700469138267696,0.009169601650480272
AC,0.00235848383696010636,0.04856422383772918,0.034137620893650,0.006109170178242572
PGOLD,0.0014934950745029397,0.038645763991709874,0.028179754460478487,0.007879349189599448
LTG,0.015669529634599597,0.1251779918140549,0.05857964135132494,3583334717407.9917
MPI,0.00273483507602531,0.052295650641571614,0.033903050342583584,0.024971153007954654
AP,0.0012930670339860782,0.03595924128768679,0.0251507346489651,0.009217250854869657
RRHI,0.0013093195909130609,0.036184521427166355,0.026990284358758658,0.00638869156609276
URC,0.002966671813785288,0.05446716271098843,0.037421547517402926,0.017977619586139627
PSEI,1.7547831110700054e-05,0.004189013142817775,0.003282715775307006,0.001507895828047589
```

Figure B.25: Raw Model Scores for DMD-LSTM 5

14

model_s10.csv ✕

,MSE,RMSE,MAE,MAPE
MEG,0.009865752600343098,0.09932649495649737,0.06737299027636771,435734064705.6676
JGS,0.007845334501853743,0.08857389289092889,0.06135788509350167,103893946584.96439
BDO,0.00327995409232174,0.05727088346028669,0.0413452891693641,0.010743648101452627
FGEN,0.004617395242386965,0.06795141825147556,0.048889136842270545,0.017866975592035
ICT,0.007884621330006128,0.08879539025200649,0.057237276691394216,320809756127.44025
ALI,0.005390492967401505,0.07341997662354234,0.05328993535240997,0.023548819706954743
SMC,0.003187718406540048,0.05645988316087847,0.03586861396100476,0.00880857357236526
TEL,0.0036866145213750832,0.060717497654095426,0.04474277319282044,0.006319036216914404
GLO,0.004552884186453377,0.06747506344164025,0.047282846382667394,0.0070468257691598275
BLOOM,0.04206409341784911,0.20509532763534402,0.10301736984181184,2396590596797.983
RLC,0.007585752882284707,0.0870962277155831,0.059771887078320866,0.09172759091241212
MER,0.006828068233221027,0.08263212591493109,0.055823760181086673,0.013659473951391473
AC,0.004871472887048709,0.06979593746808412,0.04979303078429352,0.008922829587183788
PGOLD,0.00318314791633025,0.056419393087220035,0.04133830254008775,0.011574060171746585
LTG,0.03746444033346064,0.19355733009458997,0.08800307126114834,3804223137493.905
MPI,0.005520841190178309,0.07430236328797564,0.0492521638149232,0.03649038768402956
AP,0.0026026827963171323,0.05101649533550038,0.0367471692891345,0.013583309298257755
RRHI,0.002777849936982922,0.05270531222735449,0.03922510794653118,0.009295106895914377
URC,0.006898006661078345,0.08305423927216686,0.057343117943704225,0.02816949652429363
PSEI,4.085433653393971e-05,0.00639173971105987,0.004984381407170562,0.002288420978937786

Figure B.26: Raw Model Scores for DMD-LSTM 10

model_s15.csv ✕

,MSE,RMSE,MAE,MAPE
MEG,0.015632947601103515,0.1250317863629226,0.08599908102247829,282985182400.4937
JGS,0.012964389929998767,0.11386127493576895,0.07835242363030513,109315071771.05272
BDO,0.004860908219981323,0.06972021385495976,0.05080170327959182,0.013273483429938518
FGEN,0.0069629478504800255,0.08344427991468334,0.06153289935423559,0.022449511828279718
ICT,0.013007479593210832,0.1140503379793801,0.07292148376731492,396061318234.26843
ALI,0.00810466519619875,0.09002591402590007,0.066367103228538,0.029520448994738713
SMC,0.005101124231403319,0.07142215504591919,0.04582754439638881,0.011229080466157778
TEL,0.005439188193806359,0.07375085215647585,0.05519736046986012,0.007819104873858874
GLO,0.007018476178400337,0.0837763461748025,0.05858766515961793,0.008779822537746144
BLOOM,0.06054300374145961,0.24605487953190364,0.1309550411508476,5900492566389.731
RLC,0.011676685314347363,0.10805871234818303,0.07540320907116821,0.11945476091327935
MER,0.010688164462570354,0.10338357926948726,0.07023073059570062,0.0172829760936001
AC,0.007595390918192069,0.0871515399645472,0.06145688930225037,0.011039297095713095
PGOLD,0.004859201309319683,0.06970797163395076,0.0512276244385843,0.014339564237239416
LTG,0.05808674831062965,0.24101192566059806,0.10807781590206503,2316692766061.9355
MPI,0.008080401796946723,0.0898910551553753,0.06020282472442268,0.04473013446882734
AP,0.0038632369071855297,0.06215494274139049,0.04434230453119878,0.016505958531928256
RRHI,0.004132716283832857,0.06428620601523205,0.04803456414328379,0.011401074357359176
URC,0.010867588278427435,0.10424772553119534,0.07207244516575859,0.036246928116491314
PSEI,3.912591469048572e-05,0.006255071117939885,0.004142081727067567,0.0019046016464762977

Figure B.27: Raw Model Scores for DMD-LSTM 15

15

```
,MSE,RMSE,MAE,MAPE
MEG,0.022323896742406167,0.14941183601845662,0.10290009425682627,266729753264.34708
JGS,0.018713341878839475,0.13679671735403404,0.09445716160359285,33462393302.143425
BDO,0.006756430654995097,0.08219751002916753,0.060170842223956744,0.015760545579428267
FGEN,0.009597141213378582,0.09796499994068587,0.07234479676026784,0.026376477197220943
ICT,0.01852442554536271,0.13610446555996136,0.0884036204475373,501915336431.2399
ALI,0.011079138682075038,0.10525748753449816,0.07817609171626877,0.034775151593376956
SMC,0.007048757669965641,0.08395687982509617,0.0546836838155754,0.013374177511788293
TEL,0.007329064462734207,0.08560995539500185,0.06517997383340782,0.009244621847414265
GLO,0.0097586928820700095,0.09878609660306502,0.06921019624724692,0.010395214033356167
BLOOM,0.08238165998516955,0.28702205487587457,0.1577616055528068,3419715539589.91
RLC,0.01615196335933326,0.1270903747706067,0.08988687939937239,0.12828506623288913
MER,0.01468617694758008,0.12118653781497382,0.08247620417598935,0.020392816829558198
AC,0.010767353439365156,0.10376585873670181,0.07244617014525238,0.013014703427266284
PGOLD,0.006606336237122399,0.08127937153498666,0.06071069833794954,0.016982336902546864
LTG,0.07756279210367704,0.2785009732544521,0.12605638618291093,1762772789831.8323
MPI,0.010612065609680215,0.1030148805254863,0.06982793923155896,0.05185919561554108
AP,0.0052532780558852705,0.07247950093568023,0.05175236778740295,0.019295214734668182
RRHI,0.0054869934800239875,0.07407424302700627,0.0564675805420636,0.013389493057254155
URC,0.015310641590353787,0.12373617737086348,0.0868352222276058,0.04379474785289333
PSEI,7.322582229059844e-05,0.00855720879087325,0.006455499639920296,0.0029648261136105067
```

Figure B.28: Raw Model Scores for DMD-LSTM 20

B.3 Model Testing Raw Test Results for DMD-LSTM

The graphs below show the performance of the different DMD-LSTM models trained in the conduct of this special problem based on the test data split of PSEI.
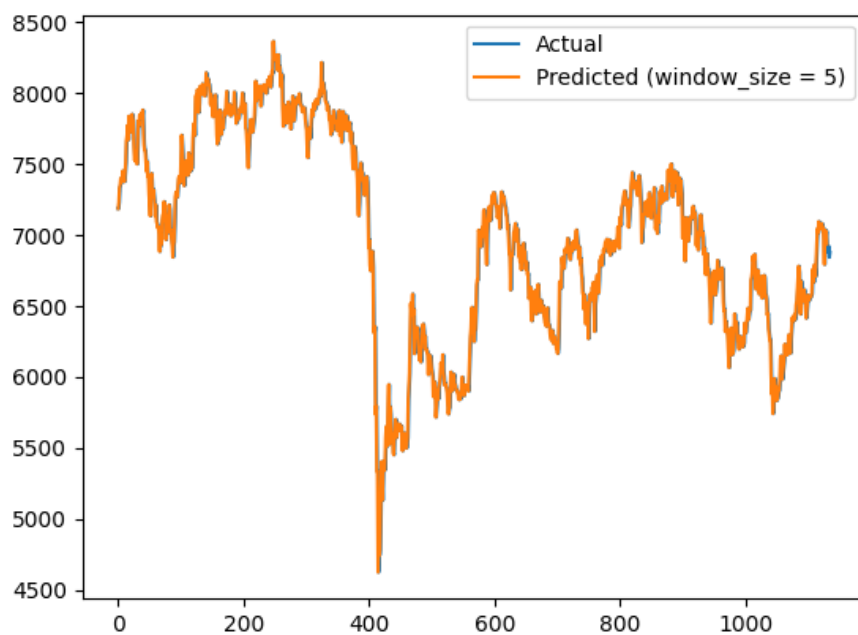
Figure B.29: Actual vs Predicted Closing Prices for DMD-LSTM 5 (Using Train Data from PSEI)
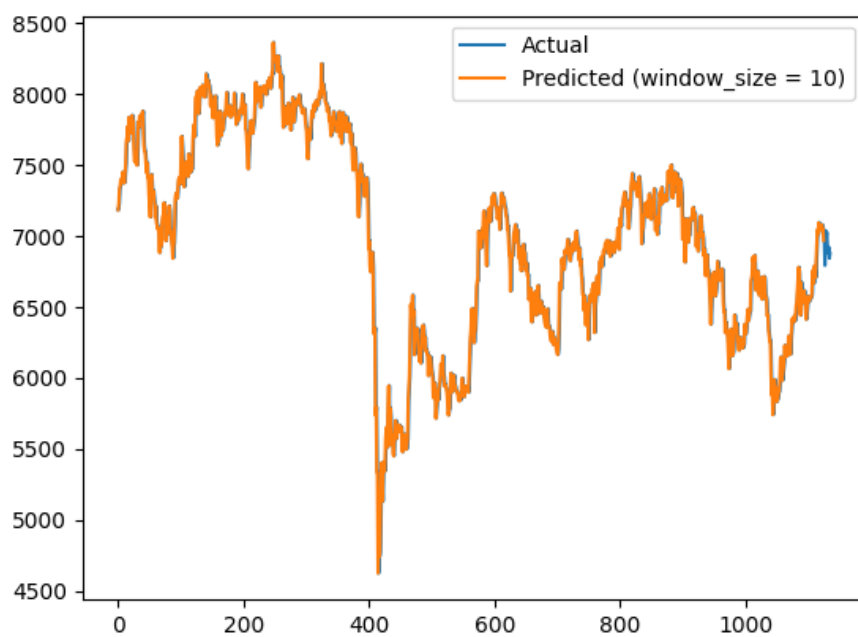
Figure B.30: Actual vs Predicted Closing Prices for DMD-LSTM 10 (Using Train Data from PSEI)
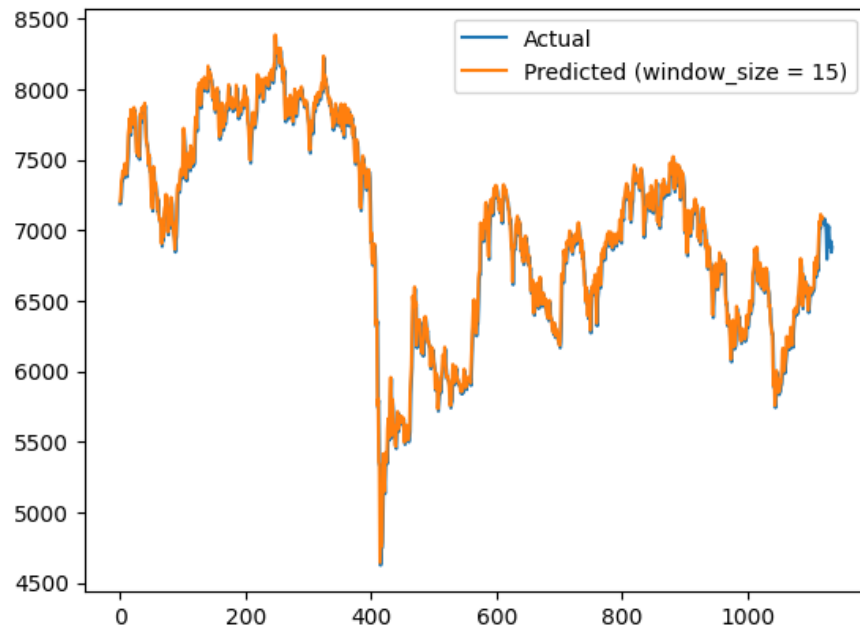
Figure B.31: Actual vs Predicted Closing Prices for DMD-LSTM 15 (Using Train Data from PSEI)
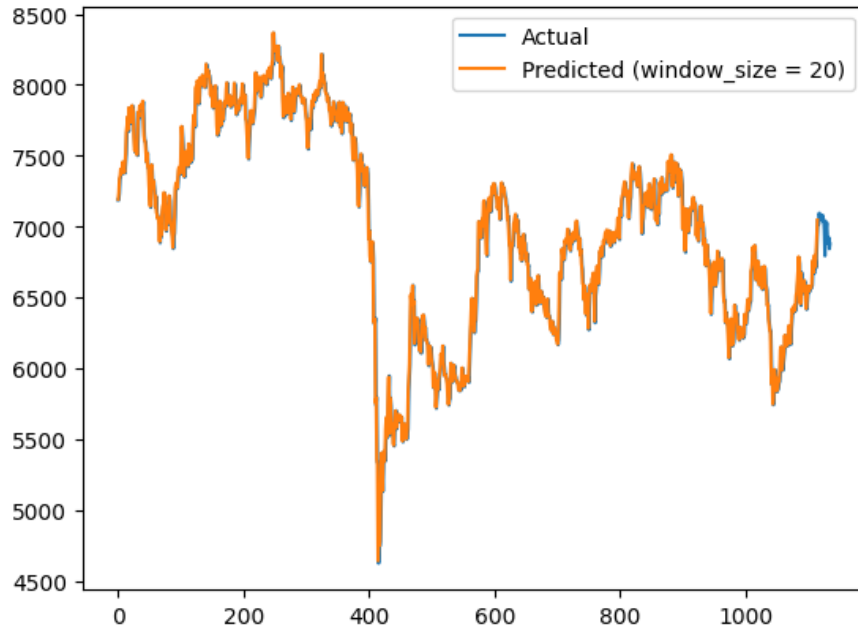
Figure B.32: Actual vs Predicted Closing Prices for DMD-LSTM 20 (Using Train Data from PSEI)

B.4 Daily Return Distribution of the Different Stocks

Figures below show the daily return distribution of each stock, which was used to calculate each stock's risk profile.
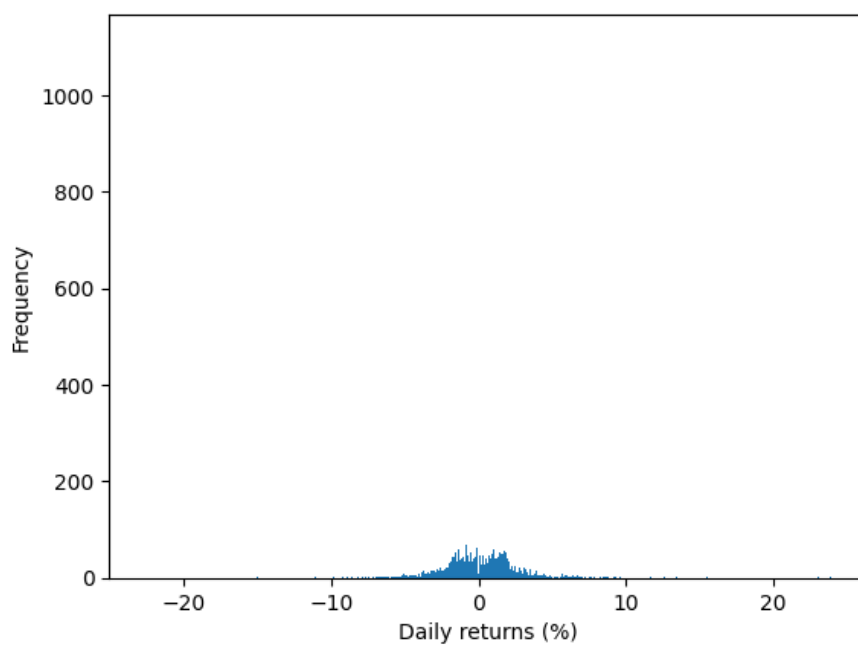
Figure B.33: Daily Return Distribution of AC
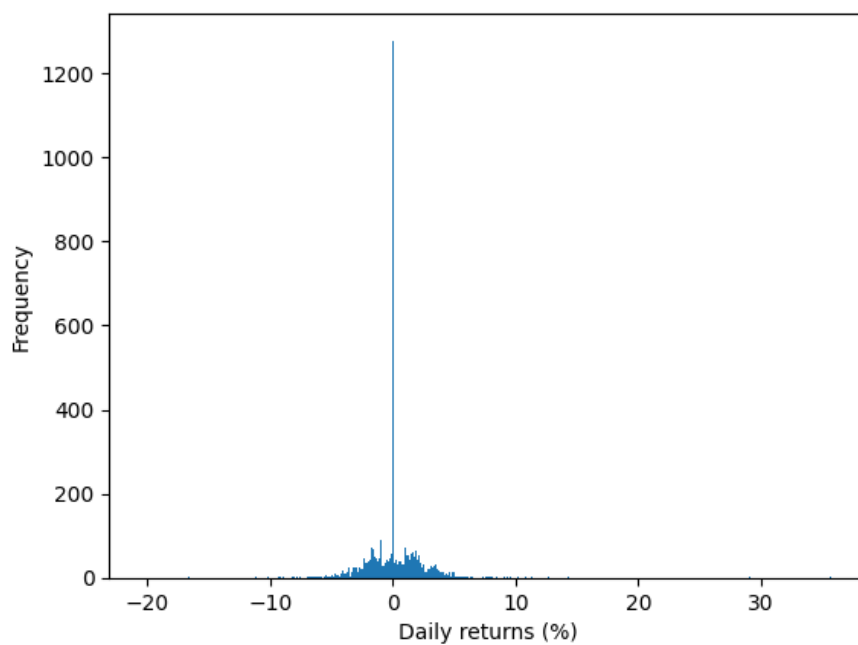
Figure B.34: Opening, High, Low, and Closing Prices for ALI
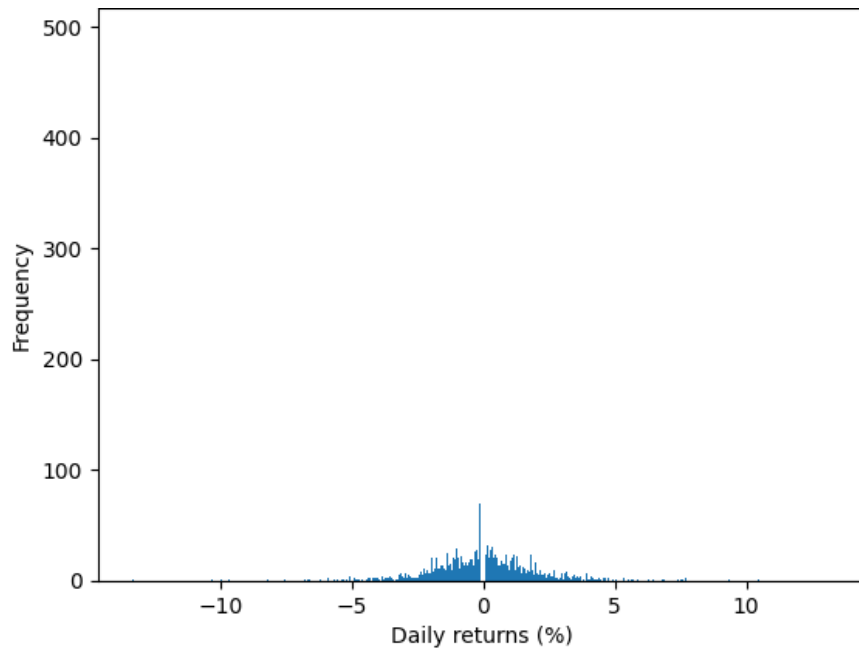
Figure B.35: Opening, High, Low, and Closing Prices for AP
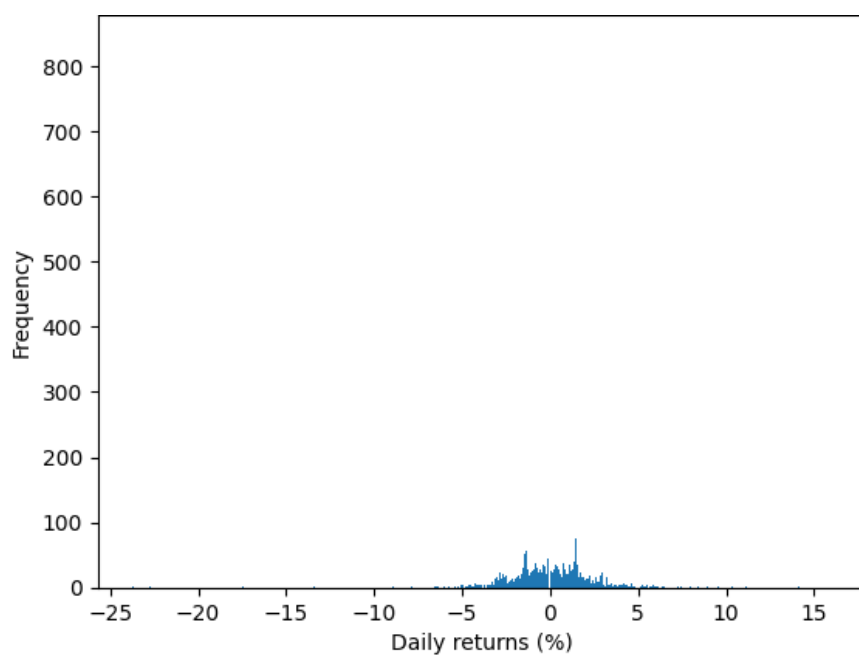
Figure B.36: Opening, High, Low, and Closing Prices for BDO
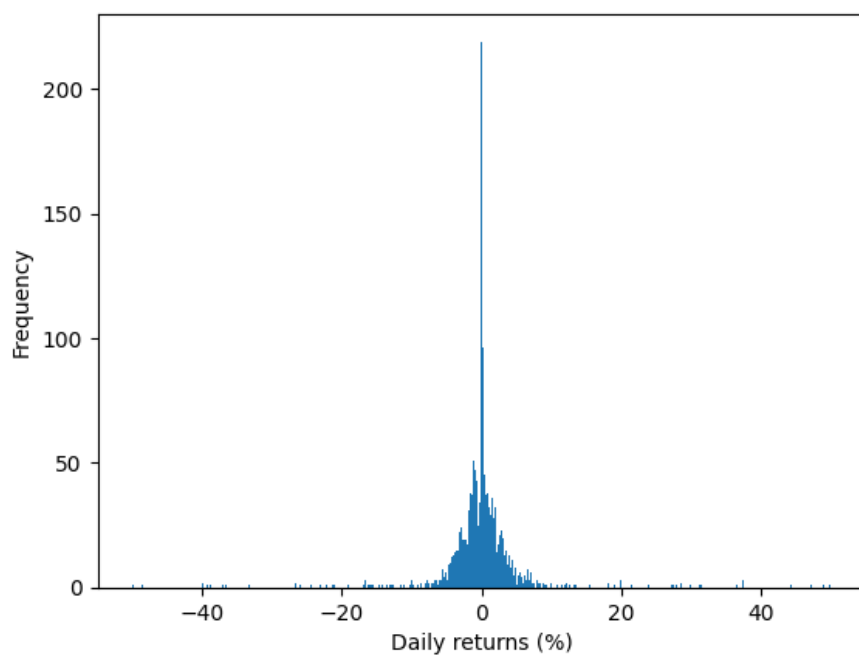
Figure B.37: Opening, High, Low, and Closing Prices for BLOOM
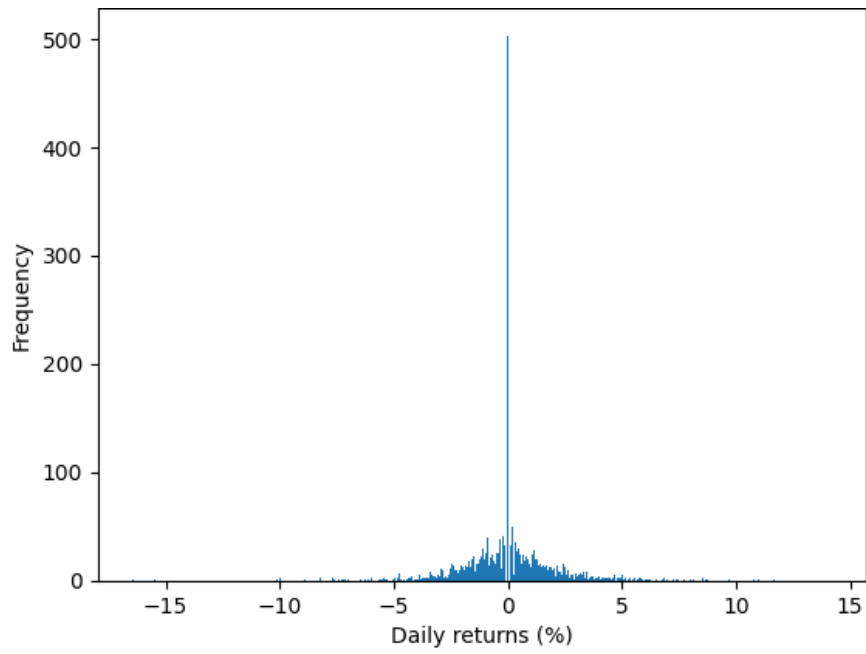
Figure B.38: Opening, High, Low, and Closing Prices for FGEN
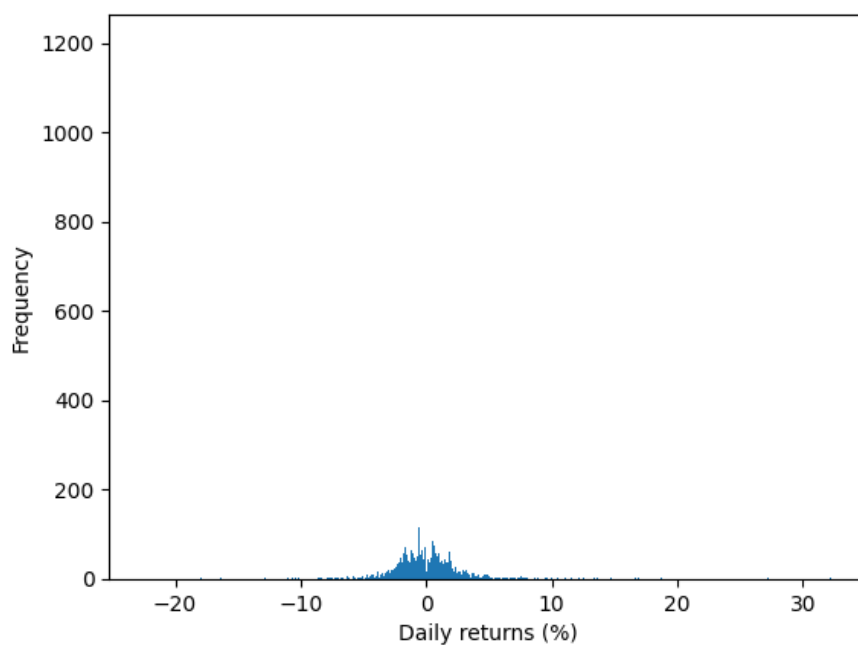
Figure B.39: Opening, High, Low, and Closing Prices for GLO
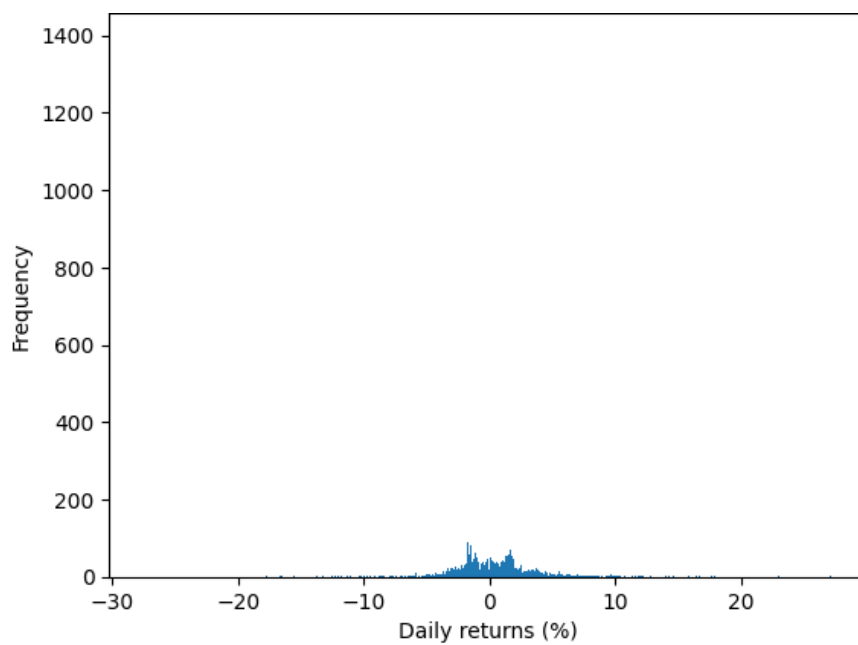
Figure B.40: Opening, High, Low, and Closing Prices for ICT
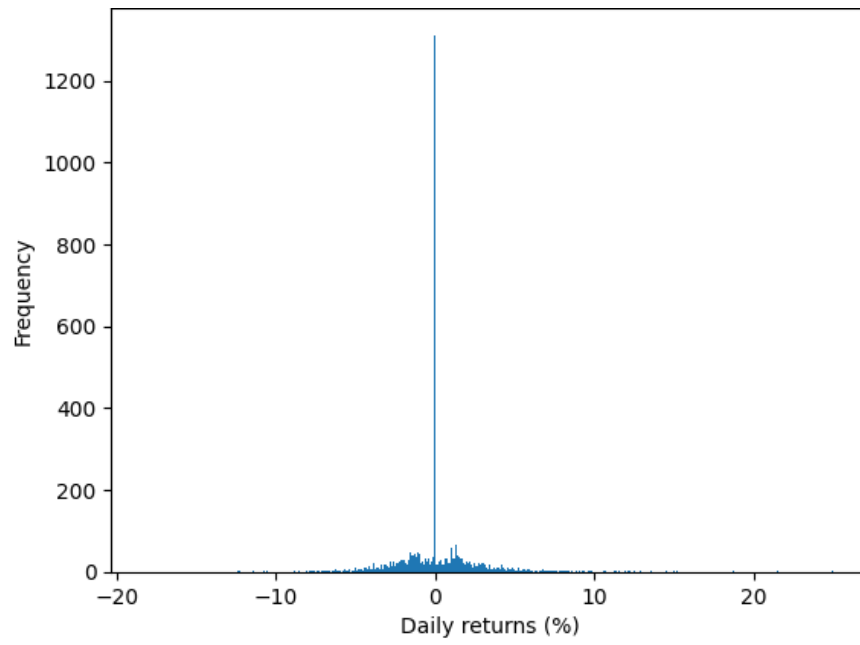
Figure B.41: Daily Return Distribution of JGS
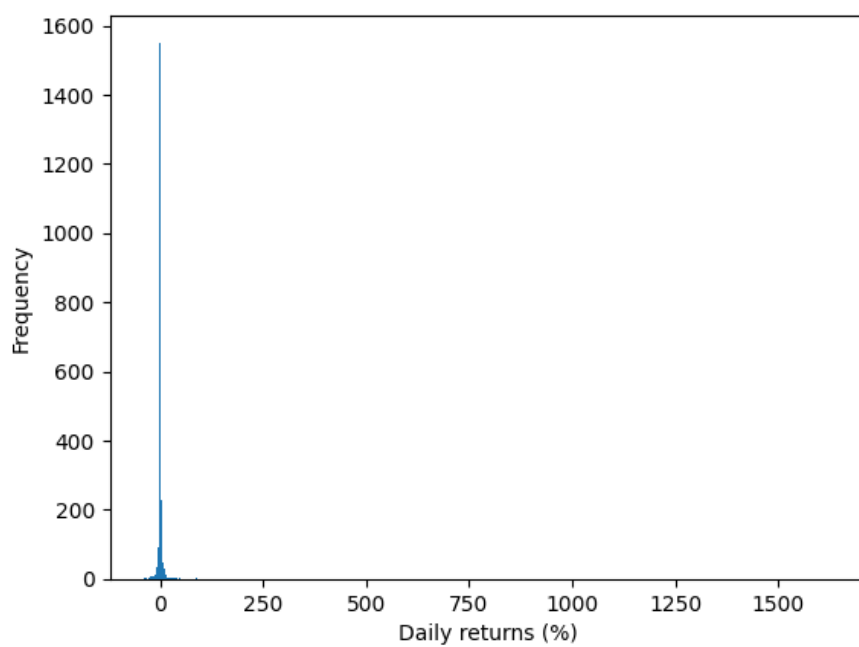
Figure B.42: Daily Return Distribution of LTG
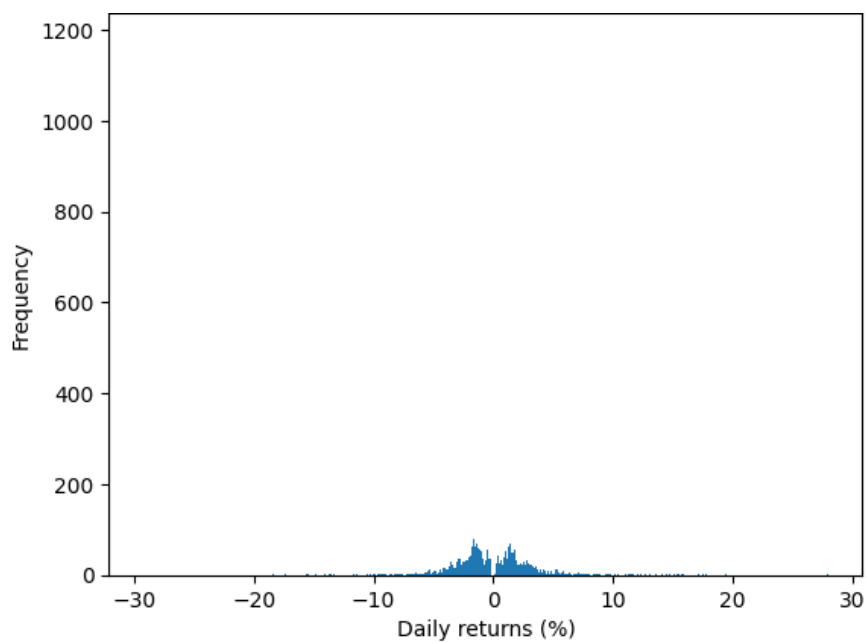
Figure B.43: Daily Return Distribution of MEG
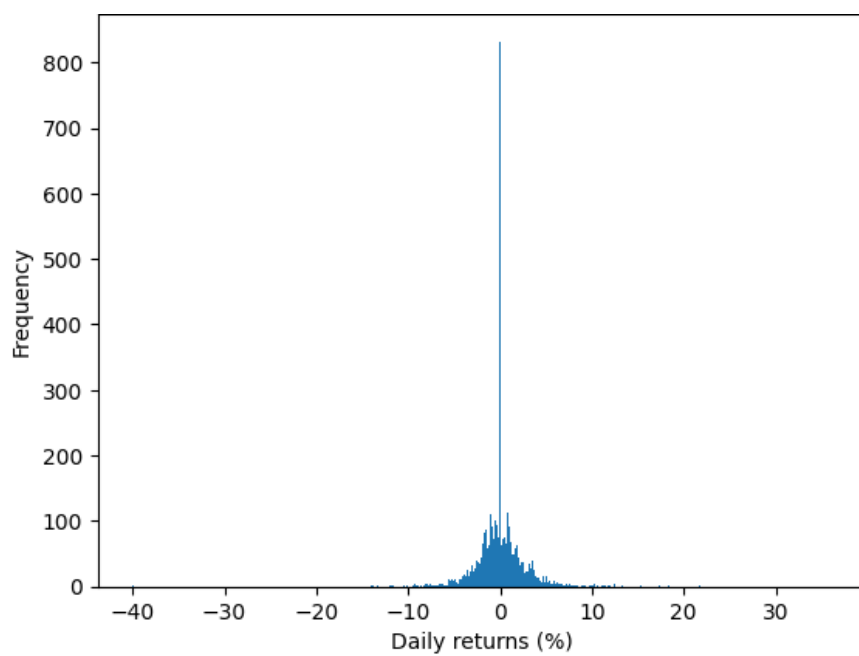
Figure B.44: Daily Return Distribution of MER
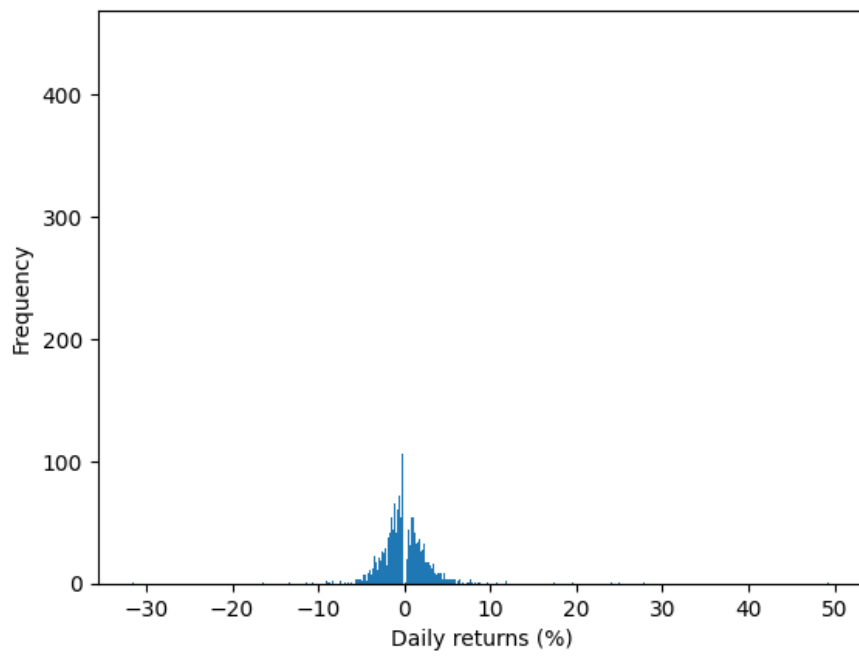
Figure B.45: Daily Return Distribution of MPI
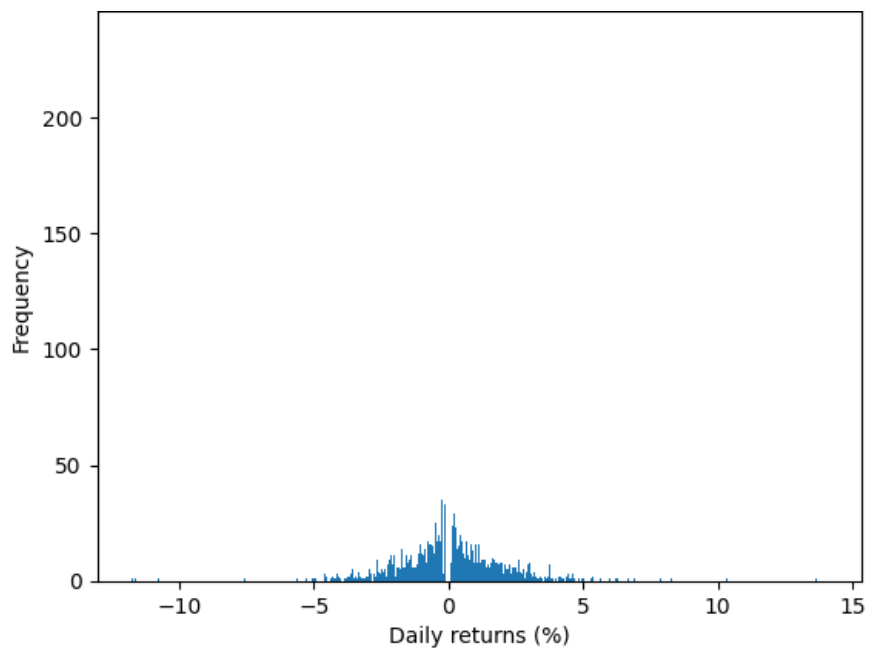
Figure B.46: Daily Return Distribution of PGOLD
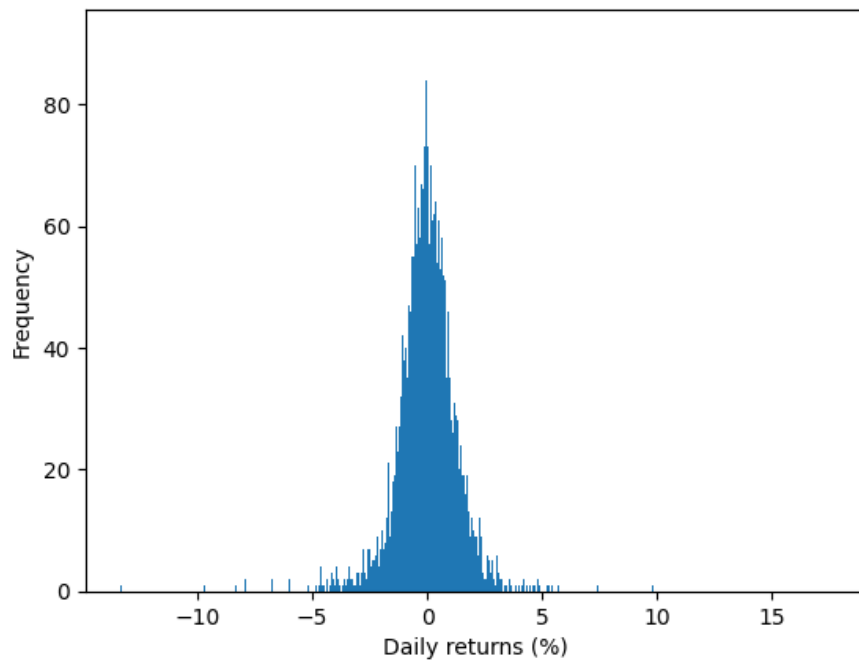
Figure B.47: Daily Return Distribution of PSEI
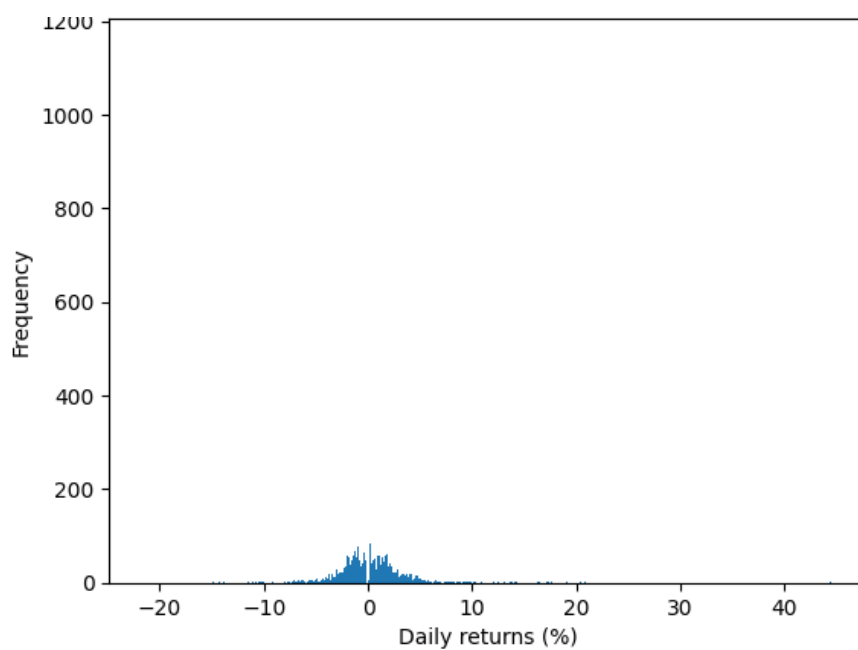
Figure B.48: Daily Return Distribution of RLC
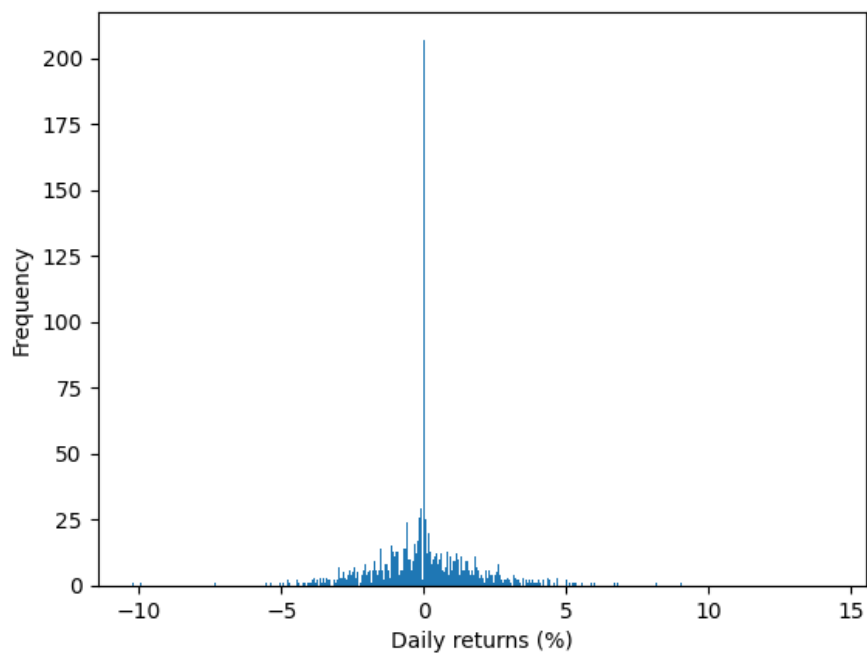
Figure B.49: Daily Return Distribution of RRHI
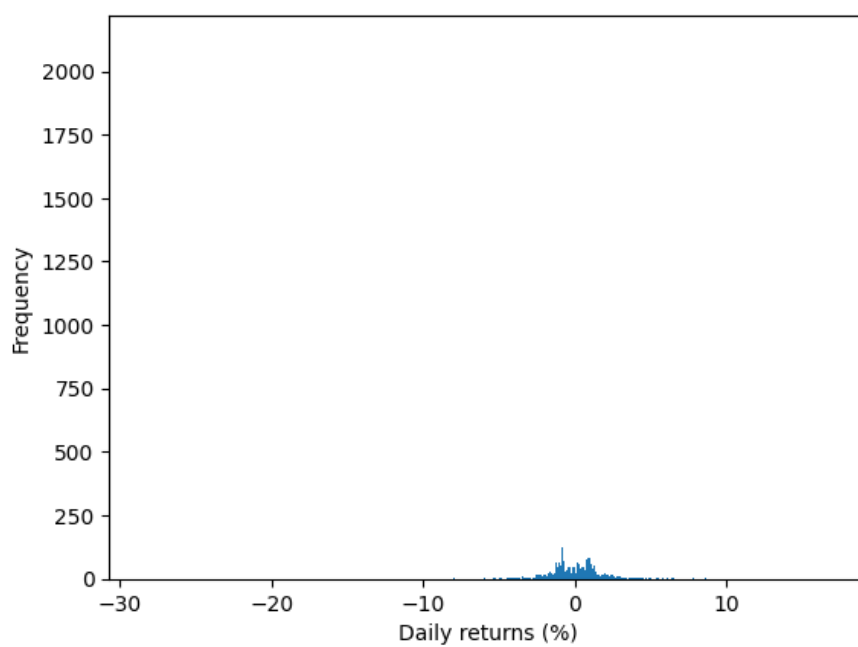
Figure B.50: Daily Return Distribution of SMC
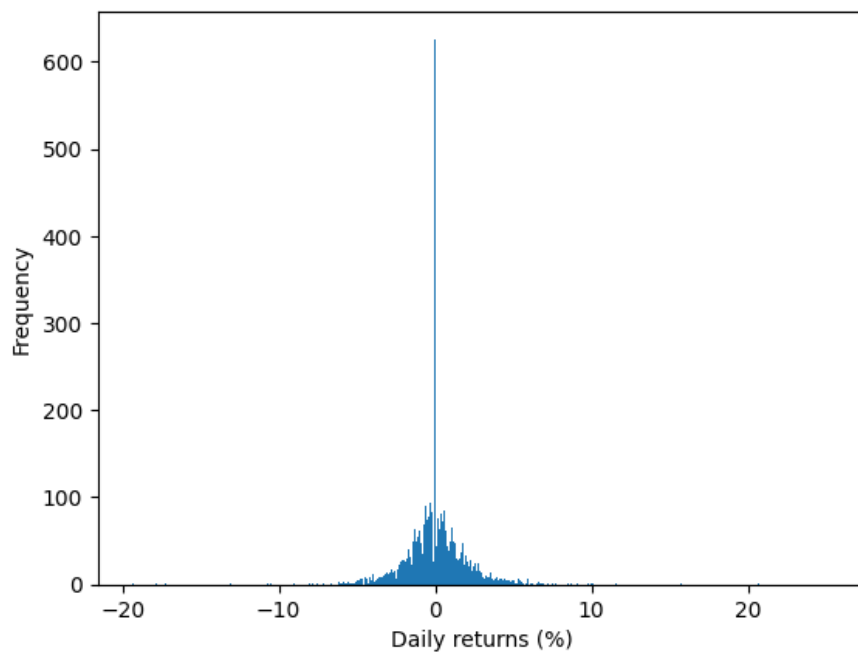
Figure B.51: Daily Return Distribution of TEL
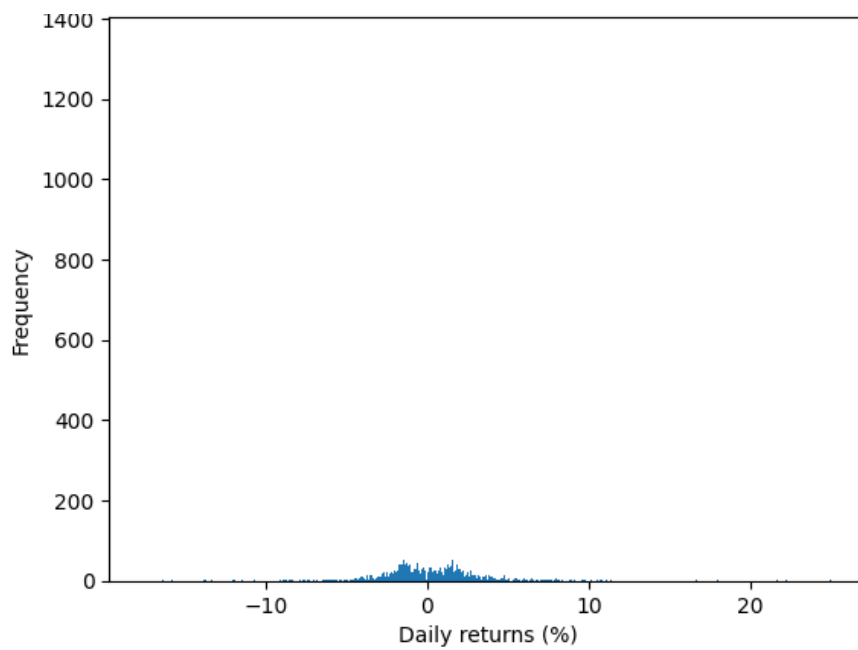
Figure B.52: Daily Return Distribution of URC

stock	value_at_risk%	volatility%	drawdown%	start_date	end_date
MEG	-5.365715	3.949969	57.248140	2000-01-03	2023-02-10
JGS	-4.762357	3.361099	43.184044	2000-01-03	2023-02-10
BDO	-3.302488	2.364049	39.670648	2000-01-03	2023-02-10
FGEN	-3.819079	2.559254	30.604259	2000-01-03	2023-02-10
ICT	-4.827050	3.520840	54.645013	2000-01-03	2023-02-10
ALI	-4.390485	3.070487	56.026166	2000-01-03	2023-02-10
SMC	-3.403674	2.385956	45.298783	2000-01-03	2023-02-10
TEL	-3.693763	2.460023	44.659116	2000-01-03	2023-02-10
GLO	-4.120044	3.092601	54.758065	2000-01-03	2023-02-10
BLOOM	-5.984996	7.061554	100.000000	2000-01-03	2023-02-10
RLC	-4.529364	3.416989	65.982906	2000-01-03	2023-02-10
MER	-4.498595	3.254736	76.000028	2000-01-03	2023-02-10
AC	-4.290654	2.796171	46.688827	2000-01-03	2023-02-10
PGOLD	-3.114919	2.134819	25.799794	2000-01-03	2023-02-10
LTG	-6.153221	31.223317	1667.806911	2000-01-03	2023-02-10
MPI	-4.055836	3.499676	81.132519	2000-01-03	2023-02-10
AP	-3.197641	2.187289	26.540881	2000-01-03	2023-02-10
RRHI	-3.032063	2.053932	24.509668	2000-01-03	2023-02-10
URC	-4.532392	3.199716	42.542617	2000-01-03	2023-02-10
PSEI	-1.887800	1.318818	30.903657	2000-01-03	2023-02-10

Figure B.53: Raw Risk Profile Scores

B.5   Raw alamSYS Test Data

This section is divided into three sections: raw system logs, PSEI trading baseline data, and raw real-world alamSYS application.

B.5.1   Raw System Logs

```
≡ stats.txt   ✕
    1    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
    2    d878d6975a9c    alamDB          0.23%    159MiB / 7.684GiB    2.02%    9.55kB / 9.65kB    55.5MB / 680kB     ■
    3    00b3dc1eb4ce    alamAPI         0.17%    45.7MiB / 7.684GiB   0.58%    9.07kB / 5.64kB    28.2MB / 0B        3
    4    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
    5    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
    6    d878d6975a9c    alamDB          0.20%    159MiB / 7.684GiB    2.02%    9.55kB / 9.65kB    55.5MB / 680kB     ■
    7    00b3dc1eb4ce    alamAPI         0.15%    45.7MiB / 7.684GiB   0.58%    9.07kB / 5.64kB    28.2MB / 0B        3
    8    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
    9    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
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   11    00b3dc1eb4ce    alamAPI         0.17%    45.7MiB / 7.684GiB   0.58%    9.07kB / 5.64kB    28.2MB / 0B        3
   12    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
   13    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
   14    d878d6975a9c    alamDB          0.21%    159MiB / 7.684GiB    2.02%    9.55kB / 9.65kB    55.5MB / 680kB     ■
   15    00b3dc1eb4ce    alamAPI         0.16%    45.7MiB / 7.684GiB   0.58%    9.07kB / 5.64kB    28.2MB / 0B        3
   16    47dba53c6237    alamPREPROCESSOR 0.00%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
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   19    00b3dc1eb4ce    alamAPI         0.23%    45.7MiB / 7.684GiB   0.58%    9.36kB / 5.83kB    28.2MB / 0B        3
   20    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
   21    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
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   23    00b3dc1eb4ce    alamAPI         0.17%    45.7MiB / 7.684GiB   0.58%    9.36kB / 5.83kB    28.2MB / 0B        3
   24    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
   25    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
   26    d878d6975a9c    alamDB          0.16%    159MiB / 7.684GiB    2.02%    9.75kB / 9.94kB    55.5MB / 696kB     ■
   27    00b3dc1eb4ce    alamAPI         0.19%    45.7MiB / 7.684GiB   0.58%    9.36kB / 5.83kB    28.2MB / 0B        3
   28    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
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   31    00b3dc1eb4ce    alamAPI         0.16%    45.7MiB / 7.684GiB   0.58%    9.36kB / 5.83kB    28.2MB / 0B        3
   32    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
   33    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
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   35    00b3dc1eb4ce    alamAPI         0.17%    45.7MiB / 7.684GiB   0.58%    9.36kB / 5.83kB    28.2MB / 0B        3
   36    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
   37    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
   38    d878d6975a9c    alamDB          0.25%    159MiB / 7.684GiB    2.02%    9.94kB / 10.2kB    55.5MB / 696kB     ■
   39    00b3dc1eb4ce    alamAPI         0.21%    45.7MiB / 7.684GiB   0.58%    9.65kB / 6.03kB    28.2MB / 0B        3
   40    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
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   44    47dba53c6237    alamPREPROCESSOR 0.01%   356.7MiB / 7.684GiB  4.53%    3.1kB / 2.65kB     283MB / 12.3kB     15
   45    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS

                    ●       ●       ●

 7077    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
 7078    d878d6975a9c    alamDB          0.17%    179.5MiB / 7.684GiB  2.28%    80.5kB / 114kB     55.5MB / 6.55MB    29
 7079    00b3dc1eb4ce    alamAPI         0.16%    45.73MiB / 7.684GiB  0.58%    113kB / 76.4kB     28.2MB / 0B        3
 7080    47dba53c6237    alamPREPROCESSOR 0.01%   359MiB / 7.684GiB    4.56%    3.38kB / 2.65kB    283MB / 12.3kB     15
 7081    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
 7082    d878d6975a9c    alamDB          0.20%    179.5MiB / 7.684GiB  2.28%    80.5kB / 114kB     55.5MB / 6.55MB    29
 7083    00b3dc1eb4ce    alamAPI         0.16%    45.73MiB / 7.684GiB  0.58%    113kB / 76.4kB     28.2MB / 0B        3
 7084    47dba53c6237    alamPREPROCESSOR 0.01%   359MiB / 7.684GiB    4.56%    3.38kB / 2.65kB    283MB / 12.3kB     15
 7085    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
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 7087    00b3dc1eb4ce    alamAPI         0.14%    45.73MiB / 7.684GiB  0.58%    113kB / 76.4kB     28.2MB / 0B        3
 7088    47dba53c6237    alamPREPROCESSOR 0.01%   359MiB / 7.684GiB    4.56%    3.38kB / 2.65kB    283MB / 12.3kB     15
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 7091    00b3dc1eb4ce    alamAPI         0.18%    45.73MiB / 7.684GiB  0.58%    113kB / 76.4kB     28.2MB / 0B        3
 7092    47dba53c6237    alamPREPROCESSOR 0.01%   359MiB / 7.684GiB    4.56%    3.38kB / 2.65kB    283MB / 12.3kB     15
 7093    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
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 7095    00b3dc1eb4ce    alamAPI         0.23%    45.73MiB / 7.684GiB  0.58%    114kB / 76.6kB     28.2MB / 0B        3
 7096    47dba53c6237    alamPREPROCESSOR 0.01%   359MiB / 7.684GiB    4.56%    3.38kB / 2.65kB    283MB / 12.3kB     15
 7097    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
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 7099    00b3dc1eb4ce    alamAPI         0.15%    45.73MiB / 7.684GiB  0.58%    114kB / 76.6kB     28.2MB / 0B        3
 7100    47dba53c6237    alamPREPROCESSOR 0.01%   359MiB / 7.684GiB    4.56%    3.38kB / 2.65kB    283MB / 12.3kB     15
 7101    CONTAINER ID    NAME            CPU %    MEM USAGE / LIMIT    MEM %    NET I/O            BLOCK I/O          PIDS
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 7103    00b3dc1eb4ce    alamAPI         0.15%    45.73MiB / 7.684GiB  0.58%    114kB / 76.6kB     28.2MB / 0B        3
 7104    47dba53c6237    alamPREPROCESSOR 0.01%   359MiB / 7.684GiB    4.56%    3.38kB / 2.65kB    283MB / 12.3kB     15
```

Figure B.54: Raw Logs of Idle System Statistics

	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
1	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
2	e6af858e1766	alamPREPROCESSOR2	0.01%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
3	f73c98947a50	alamAPI2	2.30%	44.24MiB / 7.684GiB	0.56%	60.1kB / 39.2kB	0B / 0B	3
4	daf25cdfc1f2	alamDB2	0.32%	122MiB / 7.684GiB	1.55%	42.5kB / 57.8kB	0B / 0B	29
5	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6	e6af858e1766	alamPREPROCESSOR2	0.01%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
7	f73c98947a50	alamAPI2	27.35%	45.62MiB / 7.684GiB	0.58%	286kB / 273kB	0B / 0B	12
8	daf25cdfc1f2	alamDB2	1.54%	122.4MiB / 7.684GiB	1.56%	64.8kB / 187kB	0B / 0B	36
9	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
10	e6af858e1766	alamPREPROCESSOR2	0.01%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
11	f73c98947a50	alamAPI2	31.85%	45.65MiB / 7.684GiB	0.58%	531kB / 526kB	0B / 0B	12
12	daf25cdfc1f2	alamDB2	1.61%	122.4MiB / 7.684GiB	1.56%	85.1kB / 329kB	0B / 0B	36
13	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
14	e6af858e1766	alamPREPROCESSOR2	0.01%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
15	f73c98947a50	alamAPI2	30.66%	45.96MiB / 7.684GiB	0.58%	800kB / 808kB	0B / 0B	12
16	daf25cdfc1f2	alamDB2	1.61%	122.4MiB / 7.684GiB	1.56%	108kB / 491kB	0B / 0B	36
17	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
18	e6af858e1766	alamPREPROCESSOR2	0.01%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
19	f73c98947a50	alamAPI2	24.59%	45.96MiB / 7.684GiB	0.58%	1MB / 1.02MB	0B / 0B	12
20	daf25cdfc1f2	alamDB2	1.32%	122.4MiB / 7.684GiB	1.56%	125kB / 610kB	0B / 0B	36
21	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
22	e6af858e1766	alamPREPROCESSOR2	0.01%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
23	f73c98947a50	alamAPI2	28.89%	45.96MiB / 7.684GiB	0.58%	1.23MB / 1.25MB	0B / 0B	12
24	daf25cdfc1f2	alamDB2	1.51%	122.4MiB / 7.684GiB	1.56%	145kB / 744kB	0B / 0B	36
25	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
26	e6af858e1766	alamPREPROCESSOR2	0.01%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
27	f73c98947a50	alamAPI2	29.01%	45.98MiB / 7.684GiB	0.58%	1.5MB / 1.54MB	0B / 0B	11
28	daf25cdfc1f2	alamDB2	1.72%	122.4MiB / 7.684GiB	1.56%	169kB / 914kB	0B / 0B	36
29	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
30	e6af858e1766	alamPREPROCESSOR2	0.02%	294.6MiB / 7.684GiB	3.74%	3.45kB / 2.65kB	0B / 0B	8
31	f73c98947a50	alamAPI2	23.69%	45.93MiB / 7.684GiB	0.58%	1.68MB / 1.73MB	0B / 0B	11
32	daf25cdfc1f2	alamDB2	1.23%	122.4MiB / 7.684GiB	1.56%	184kB / 1.02MB	0B / 0B	36

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6908	daf25cdfc1f2	alamDB2	0.30%	145.6MiB / 7.684GiB	1.85%	21.2MB / 178MB	0B / 0B	41
6909	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6910	e6af858e1766	alamPREPROCESSOR2	0.01%	296.6MiB / 7.684GiB	3.77%	3.59kB / 2.65kB	0B / 0B	8
6911	f73c98947a50	alamAPI2	0.20%	45.76MiB / 7.684GiB	0.58%	273MB / 293MB	0B / 0B	4
6912	daf25cdfc1f2	alamDB2	0.71%	145.6MiB / 7.684GiB	1.85%	21.2MB / 178MB	0B / 0B	41
6913	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6914	e6af858e1766	alamPREPROCESSOR2	0.01%	296.6MiB / 7.684GiB	3.77%	3.59kB / 2.65kB	0B / 0B	8
6915	f73c98947a50	alamAPI2	0.18%	45.76MiB / 7.684GiB	0.58%	273MB / 293MB	0B / 0B	4
6916	daf25cdfc1f2	alamDB2	0.19%	145.6MiB / 7.684GiB	1.85%	21.2MB / 178MB	0B / 0B	41
6917	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6918	e6af858e1766	alamPREPROCESSOR2	0.01%	296.6MiB / 7.684GiB	3.77%	3.59kB / 2.65kB	0B / 0B	8
6919	f73c98947a50	alamAPI2	0.24%	45.76MiB / 7.684GiB	0.58%	273MB / 293MB	0B / 0B	4
6920	daf25cdfc1f2	alamDB2	0.49%	145.6MiB / 7.684GiB	1.85%	21.2MB / 178MB	0B / 0B	41
6921	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6922	e6af858e1766	alamPREPROCESSOR2	0.02%	296.6MiB / 7.684GiB	3.77%	3.59kB / 2.65kB	0B / 0B	8
6923	f73c98947a50	alamAPI2	0.28%	45.76MiB / 7.684GiB	0.58%	273MB / 293MB	0B / 0B	4
6924	daf25cdfc1f2	alamDB2	0.31%	145.6MiB / 7.684GiB	1.85%	21.2MB / 178MB	0B / 0B	41
6925	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6926	e6af858e1766	alamPREPROCESSOR2	0.01%	296.6MiB / 7.684GiB	3.77%	3.59kB / 2.65kB	0B / 0B	8
6927	f73c98947a50	alamAPI2	0.25%	45.76MiB / 7.684GiB	0.58%	273MB / 293MB	0B / 0B	4
6928	daf25cdfc1f2	alamDB2	0.28%	145.6MiB / 7.684GiB	1.85%	21.2MB / 178MB	0B / 0B	41
6929	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6930	e6af858e1766	alamPREPROCESSOR2	0.01%	296.6MiB / 7.684GiB	3.77%	3.59kB / 2.65kB	0B / 0B	8
6931	f73c98947a50	alamAPI2	0.18%	45.76MiB / 7.684GiB	0.58%	273MB / 293MB	0B / 0B	4
6932	daf25cdfc1f2	alamDB2	0.46%	145.6MiB / 7.684GiB	1.85%	21.2MB / 178MB	0B / 0B	41

Figure B.55: Raw Logs of Deployment System Statistics

```
1    CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
2    f10bc4b28a7e    alamDB             0.21%    160.1MiB / 7.684GiB    2.04%     20.4kB / 25kB        54.4MB / 1.99MB      29
3    650af2d6431c    alamPREPROCESSOR   1.63%    611.4MiB / 7.684GiB    7.77%     96.5kB / 7.02kB      352MB / 49.2kB       33
4    8302c7cefe70    alamAPI            0.21%    45.71MiB / 7.684GiB    0.58%     25kB / 16.1kB        28.5MB / 0B          3
5    CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
6    f10bc4b28a7e    alamDB             0.26%    160.1MiB / 7.684GiB    2.04%     20.4kB / 25kB        54.4MB / 1.99MB      29
7    650af2d6431c    alamPREPROCESSOR   0.16%    611.4MiB / 7.684GiB    7.77%     124kB / 8.39kB       352MB / 49.2kB       33
8    8302c7cefe70    alamAPI            0.26%    45.71MiB / 7.684GiB    0.58%     25kB / 16.1kB        28.5MB / 0B          3
9    CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
10   f10bc4b28a7e    alamDB             0.28%    160.1MiB / 7.684GiB    2.04%     20.4kB / 25kB        54.4MB / 1.99MB      29
11   650af2d6431c    alamPREPROCESSOR   0.75%    611.4MiB / 7.684GiB    7.77%     201kB / 11.7kB       352MB / 385kB        33
12   8302c7cefe70    alamAPI            0.19%    45.71MiB / 7.684GiB    0.58%     25kB / 16.1kB        28.5MB / 0B          3
13   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
14   f10bc4b28a7e    alamDB             0.41%    160.1MiB / 7.684GiB    2.04%     20.4kB / 25kB        54.4MB / 1.99MB      29
15   650af2d6431c    alamPREPROCESSOR   2.86%    611.5MiB / 7.684GiB    7.77%     266kB / 14.3kB       352MB / 385kB        33
16   8302c7cefe70    alamAPI            0.19%    45.71MiB / 7.684GiB    0.58%     25kB / 16.1kB        28.5MB / 0B          3
17   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
18   f10bc4b28a7e    alamDB             0.69%    160.2MiB / 7.684GiB    2.04%     20.6kB / 25.3kB      54.4MB / 2.01MB      29
19   650af2d6431c    alamPREPROCESSOR   0.01%    611.5MiB / 7.684GiB    7.77%     313kB / 15.4kB       352MB / 385kB        33
20   8302c7cefe70    alamAPI            0.22%    45.71MiB / 7.684GiB    0.58%     25.3kB / 16.3kB      28.5MB / 0B          3
21   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
22   f10bc4b28a7e    alamDB             0.18%    160.2MiB / 7.684GiB    2.04%     20.6kB / 25.3kB      54.4MB / 2.01MB      29
23   650af2d6431c    alamPREPROCESSOR   0.47%    611.5MiB / 7.684GiB    7.77%     355kB / 17.8kB       352MB / 385kB        33
24   8302c7cefe70    alamAPI            0.19%    45.71MiB / 7.684GiB    0.58%     25.3kB / 16.3kB      28.5MB / 0B          3
25   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
26   f10bc4b28a7e    alamDB             0.36%    160.1MiB / 7.684GiB    2.04%     20.6kB / 25.3kB      54.4MB / 2.01MB      29
27   650af2d6431c    alamPREPROCESSOR   1.13%    611.5MiB / 7.684GiB    7.77%     442kB / 21.5kB       352MB / 385kB        33
28   8302c7cefe70    alamAPI            0.28%    45.71MiB / 7.684GiB    0.58%     25.3kB / 16.3kB      28.5MB / 0B          3
29   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
30   f10bc4b28a7e    alamDB             0.30%    160.1MiB / 7.684GiB    2.03%     20.6kB / 25.3kB      54.4MB / 2.01MB      29
31   650af2d6431c    alamPREPROCESSOR   0.91%    611.6MiB / 7.684GiB    7.77%     534kB / 25.3kB       352MB / 385kB        33
32   8302c7cefe70    alamAPI            0.19%    45.71MiB / 7.684GiB    0.58%     25.3kB / 16.3kB      28.5MB / 0B          3
33   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
34   f10bc4b28a7e    alamDB             0.26%    160.1MiB / 7.684GiB    2.03%     20.6kB / 25.3kB      54.4MB / 2.01MB      29


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9456   8302c7cefe70    alamAPI            0.18%    45.72MiB / 7.684GiB    0.58%     165kB / 111kB        28.5MB / 0B          3
9457   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
9458   f10bc4b28a7e    alamDB             0.20%    192MiB / 7.684GiB      2.44%     1.13MB / 507kB       54.5MB / 24.9MB      29
9459   650af2d6431c    alamPREPROCESSOR   1.56%    1.017GiB / 7.684GiB    13.24%    154MB / 7.51MB       354MB / 527MB        33
9460   8302c7cefe70    alamAPI            0.20%    45.72MiB / 7.684GiB    0.58%     165kB / 111kB        28.5MB / 0B          3
9461   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
9462   f10bc4b28a7e    alamDB             0.31%    192MiB / 7.684GiB      2.44%     1.13MB / 507kB       54.5MB / 24.9MB      29
9463   650af2d6431c    alamPREPROCESSOR   2.17%    1.017GiB / 7.684GiB    13.24%    154MB / 7.51MB       354MB / 527MB        33
9464   8302c7cefe70    alamAPI            0.21%    45.72MiB / 7.684GiB    0.58%     165kB / 111kB        28.5MB / 0B          3
9465   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
9466   f10bc4b28a7e    alamDB             0.27%    192MiB / 7.684GiB      2.44%     1.13MB / 508kB       54.5MB / 24.9MB      29
9467   650af2d6431c    alamPREPROCESSOR   0.40%    1.017GiB / 7.684GiB    13.24%    154MB / 7.52MB       354MB / 527MB        33
9468   8302c7cefe70    alamAPI            0.26%    45.73MiB / 7.684GiB    0.58%     165kB / 111kB        28.5MB / 0B          3
9469   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
9470   f10bc4b28a7e    alamDB             0.14%    192MiB / 7.684GiB      2.44%     1.13MB / 508kB       54.5MB / 24.9MB      29
9471   650af2d6431c    alamPREPROCESSOR   98.62%   1.041GiB / 7.684GiB    13.54%    154MB / 7.52MB       354MB / 528MB        51
9472   8302c7cefe70    alamAPI            0.10%    45.72MiB / 7.684GiB    0.58%     165kB / 111kB        28.5MB / 0B          3
9473   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
9474   f10bc4b28a7e    alamDB             0.15%    192MiB / 7.684GiB      2.44%     1.13MB / 508kB       54.5MB / 24.9MB      29
9475   650af2d6431c    alamPREPROCESSOR   98.60%   1.054GiB / 7.684GiB    13.71%    154MB / 7.52MB       354MB / 528MB        51
9476   8302c7cefe70    alamAPI            0.10%    45.72MiB / 7.684GiB    0.58%     165kB / 111kB        28.5MB / 0B          3
9477   CONTAINER ID    NAME               CPU %    MEM USAGE / LIMIT      MEM %     NET I/O              BLOCK I/O            PIDS
9478   f10bc4b28a7e    alamDB             0.19%    192MiB / 7.684GiB      2.44%     1.13MB / 508kB       54.5MB / 24.9MB      29
9479   650af2d6431c    alamPREPROCESSOR   98.17%   1.065GiB / 7.684GiB    13.86%    154MB / 7.52MB       354MB / 528MB        51
9480   8302c7cefe70    alamAPI            0.14%    45.72MiB / 7.684GiB    0.58%     165kB / 111kB        28.5MB / 0B          3
```

Figure B.56: Raw Logs of Data Collector Module (DCM) System Statistics

```
1   CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
2   f10bc4b28a7e   alamDB           0.15%     192MiB / 7.684GiB      2.44%     1.23MB / 623kB   54.5MB / 33.2MB   29
3   650af2d6431c   alamPREPROCESSOR 98.18%    1.055GiB / 7.684GiB    13.73%    154MB / 7.54MB   354MB / 528MB     51
4   8302c7cefe70   alamAPI          0.10%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
5   CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
6   f10bc4b28a7e   alamDB           0.14%     192MiB / 7.684GiB      2.44%     1.23MB / 623kB   54.5MB / 33.2MB   29
7   650af2d6431c   alamPREPROCESSOR 97.02%    1.063GiB / 7.684GiB    13.84%    154MB / 7.54MB   354MB / 528MB     51
8   8302c7cefe70   alamAPI          0.10%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
9   CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
10  f10bc4b28a7e   alamDB           0.16%     192MiB / 7.684GiB      2.44%     1.23MB / 624kB   54.5MB / 33.2MB   29
11  650af2d6431c   alamPREPROCESSOR 98.16%    1.075GiB / 7.684GiB    14.00%    154MB / 7.54MB   354MB / 528MB     59
12  8302c7cefe70   alamAPI          0.14%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
13  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
14  f10bc4b28a7e   alamDB           0.21%     192MiB / 7.684GiB      2.44%     1.24MB / 627kB   54.5MB / 33.2MB   29
15  650af2d6431c   alamPREPROCESSOR 168.69%   930.9MiB / 7.684GiB    11.83%    154MB / 7.55MB   354MB / 528MB     26
16  8302c7cefe70   alamAPI          0.12%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
17  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
18  f10bc4b28a7e   alamDB           0.16%     192MiB / 7.684GiB      2.44%     1.24MB / 627kB   54.5MB / 33.2MB   29
19  650af2d6431c   alamPREPROCESSOR 122.66%   1.058GiB / 7.684GiB    13.77%    154MB / 7.55MB   354MB / 528MB     51
20  8302c7cefe70   alamAPI          0.11%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
21  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
22  f10bc4b28a7e   alamDB           0.16%     192MiB / 7.684GiB      2.44%     1.24MB / 627kB   54.5MB / 33.2MB   29
23  650af2d6431c   alamPREPROCESSOR 98.37%    1.071GiB / 7.684GiB    13.94%    154MB / 7.55MB   354MB / 528MB     62
24  8302c7cefe70   alamAPI          0.10%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
25  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
26  f10bc4b28a7e   alamDB           0.14%     192MiB / 7.684GiB      2.44%     1.24MB / 627kB   54.5MB / 33.2MB   29
27  650af2d6431c   alamPREPROCESSOR 96.23%    1.083GiB / 7.684GiB    14.09%    154MB / 7.55MB   354MB / 528MB     59
28  8302c7cefe70   alamAPI          0.13%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
29  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
30  f10bc4b28a7e   alamDB           0.38%     192MiB / 7.684GiB      2.44%     1.25MB / 631kB   54.5MB / 33.3MB   29
31  650af2d6431c   alamPREPROCESSOR 162.19%   921.1MiB / 7.684GiB    11.71%    154MB / 7.56MB   354MB / 528MB     26
32  8302c7cefe70   alamAPI          0.21%     45.91MiB / 7.684GiB    0.58%     275kB / 192kB    28.5MB / 0B       3
```

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1632  8302c7cefe70   alamAPI          0.13%     45.7MiB / 7.684GiB     0.58%     299kB / 208kB    28.5MB / 0B       3
1633  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
1634  f10bc4b28a7e   alamDB           0.12%     189.7MiB / 7.684GiB    2.41%     2.25MB / 987kB   54.5MB / 38.1MB   29
1635  650af2d6431c   alamPREPROCESSOR 96.58%    1.3GiB / 7.684GiB      16.92%    154MB / 8.55MB   356MB / 530MB     51
1636  8302c7cefe70   alamAPI          0.10%     45.7MiB / 7.684GiB     0.58%     299kB / 208kB    28.5MB / 0B       3
1637  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
1638  f10bc4b28a7e   alamDB           0.16%     189.7MiB / 7.684GiB    2.41%     2.26MB / 990kB   54.5MB / 38.1MB   29
1639  650af2d6431c   alamPREPROCESSOR 177.50%   1.168GiB / 7.684GiB    15.20%    154MB / 8.56MB   356MB / 530MB     26
1640  8302c7cefe70   alamAPI          0.12%     45.7MiB / 7.684GiB     0.58%     299kB / 208kB    28.5MB / 0B       3
1641  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
1642  f10bc4b28a7e   alamDB           0.37%     189.7MiB / 7.684GiB    2.41%     2.26MB / 990kB   54.5MB / 38.1MB   29
1643  650af2d6431c   alamPREPROCESSOR 99.58%    1.284GiB / 7.684GiB    16.71%    154MB / 8.56MB   356MB / 530MB     51
1644  8302c7cefe70   alamAPI          0.15%     45.7MiB / 7.684GiB     0.58%     299kB / 208kB    28.5MB / 0B       3
1645  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
1646  f10bc4b28a7e   alamDB           0.17%     189.7MiB / 7.684GiB    2.41%     2.26MB / 990kB   54.5MB / 38.2MB   29
1647  650af2d6431c   alamPREPROCESSOR 99.86%    1.294GiB / 7.684GiB    16.84%    154MB / 8.56MB   356MB / 530MB     51
1648  8302c7cefe70   alamAPI          0.10%     45.7MiB / 7.684GiB     0.58%     299kB / 208kB    28.5MB / 0B       3
1649  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
1650  f10bc4b28a7e   alamDB           0.18%     189.5MiB / 7.684GiB    2.41%     2.26MB / 991kB   54.5MB / 38.3MB   29
1651  650af2d6431c   alamPREPROCESSOR 100.66%   1.301GiB / 7.684GiB    16.93%    154MB / 8.56MB   356MB / 530MB     51
1652  8302c7cefe70   alamAPI          0.15%     45.69MiB / 7.684GiB    0.58%     299kB / 208kB    28.5MB / 0B       3
1653  CONTAINER ID   NAME             CPU %     MEM USAGE / LIMIT      MEM %     NET I/O          BLOCK I/O         PIDS
1654  f10bc4b28a7e   alamDB           0.46%     189.5MiB / 7.684GiB    2.41%     2.27MB / 994kB   54.5MB / 38.4MB   29
1655  650af2d6431c   alamPREPROCESSOR 40.26%    1.064GiB / 7.684GiB    13.85%    154MB / 8.57MB   356MB / 530MB     17
1656  8302c7cefe70   alamAPI          0.12%     45.68MiB / 7.684GiB    0.58%     299kB / 208kB    28.5MB / 0B       3
```

Figure B.57: Raw Logs of Data Processor Module (DPM) System Statistics

	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
1	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
2	f10bc4b28a7e	alamDB	0.22%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
3	650af2d6431c	alamPREPROCESSOR	2.60%	1.303GiB / 7.684GiB	16.96%	156MB / 8.65MB	356MB / 536MB	53
4	8302c7cefe70	alamAPI	0.17%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
5	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
6	f10bc4b28a7e	alamDB	0.22%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
7	650af2d6431c	alamPREPROCESSOR	3.44%	1.303GiB / 7.684GiB	16.96%	156MB / 8.65MB	356MB / 536MB	53
8	8302c7cefe70	alamAPI	0.18%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
9	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
10	f10bc4b28a7e	alamDB	0.30%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
11	650af2d6431c	alamPREPROCESSOR	2.87%	1.303GiB / 7.684GiB	16.95%	156MB / 8.66MB	356MB / 537MB	53
12	8302c7cefe70	alamAPI	0.21%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
13	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
14	f10bc4b28a7e	alamDB	0.20%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
15	650af2d6431c	alamPREPROCESSOR	1.33%	1.303GiB / 7.684GiB	16.95%	156MB / 8.66MB	356MB / 537MB	53
16	8302c7cefe70	alamAPI	0.18%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
17	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
18	f10bc4b28a7e	alamDB	0.30%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
19	650af2d6431c	alamPREPROCESSOR	2.47%	1.302GiB / 7.684GiB	16.94%	156MB / 8.67MB	356MB / 537MB	53
20	8302c7cefe70	alamAPI	0.19%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
21	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
22	f10bc4b28a7e	alamDB	0.21%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
23	650af2d6431c	alamPREPROCESSOR	1.58%	1.302GiB / 7.684GiB	16.94%	156MB / 8.67MB	356MB / 538MB	53
24	8302c7cefe70	alamAPI	0.13%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
25	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
26	f10bc4b28a7e	alamDB	0.51%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
27	650af2d6431c	alamPREPROCESSOR	1.88%	1.3GiB / 7.684GiB	16.92%	156MB / 8.67MB	356MB / 538MB	53
28	8302c7cefe70	alamAPI	0.26%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
29	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
30	f10bc4b28a7e	alamDB	0.45%	189.4MiB / 7.684GiB	2.41%	2.3MB / 1.03MB	54.5MB / 40.6MB	31
31	650af2d6431c	alamPREPROCESSOR	4.15%	1.3GiB / 7.684GiB	16.92%	157MB / 8.68MB	356MB / 538MB	53
32	8302c7cefe70	alamAPI	0.22%	45.67MiB / 7.684GiB	0.58%	322kB / 224kB	28.5MB / 0B	3
33	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS

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	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8139	650af2d6431c	alamPREPROCESSOR	2.46%	1.135GiB / 7.684GiB	14.77%	308MB / 15.2MB	359MB / 1.06GB	53
8140	8302c7cefe70	alamAPI	0.26%	45.51MiB / 7.684GiB	0.58%	442kB / 305kB	28.5MB / 0B	3
8141	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8142	f10bc4b28a7e	alamDB	0.30%	186.9MiB / 7.684GiB	2.38%	2.49MB / 1.27MB	54.5MB / 49.7MB	31
8143	650af2d6431c	alamPREPROCESSOR	0.28%	1.135GiB / 7.684GiB	14.77%	308MB / 15.2MB	359MB / 1.06GB	53
8144	8302c7cefe70	alamAPI	0.27%	45.51MiB / 7.684GiB	0.58%	442kB / 305kB	28.5MB / 0B	3
8145	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8146	f10bc4b28a7e	alamDB	0.55%	186.9MiB / 7.684GiB	2.38%	2.49MB / 1.27MB	54.5MB / 49.7MB	31
8147	650af2d6431c	alamPREPROCESSOR	0.50%	1.135GiB / 7.684GiB	14.77%	309MB / 15.2MB	359MB / 1.06GB	53
8148	8302c7cefe70	alamAPI	0.15%	45.51MiB / 7.684GiB	0.58%	442kB / 305kB	28.5MB / 0B	3
8149	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8150	f10bc4b28a7e	alamDB	0.20%	186.9MiB / 7.684GiB	2.38%	2.49MB / 1.27MB	54.5MB / 49.7MB	31
8151	650af2d6431c	alamPREPROCESSOR	2.51%	1.135GiB / 7.684GiB	14.77%	309MB / 15.2MB	359MB / 1.06GB	53
8152	8302c7cefe70	alamAPI	0.19%	45.51MiB / 7.684GiB	0.58%	442kB / 305kB	28.5MB / 0B	3
8153	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8154	f10bc4b28a7e	alamDB	0.32%	186.9MiB / 7.684GiB	2.38%	2.49MB / 1.27MB	54.5MB / 49.7MB	31
8155	650af2d6431c	alamPREPROCESSOR	2.70%	1.135GiB / 7.684GiB	14.77%	309MB / 15.2MB	359MB / 1.06GB	53
8156	8302c7cefe70	alamAPI	0.16%	45.51MiB / 7.684GiB	0.58%	442kB / 305kB	28.5MB / 0B	3
8157	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8158	f10bc4b28a7e	alamDB	0.31%	186.9MiB / 7.684GiB	2.38%	2.49MB / 1.27MB	54.5MB / 49.7MB	31
8159	650af2d6431c	alamPREPROCESSOR	3.63%	1.135GiB / 7.684GiB	14.77%	309MB / 15.2MB	359MB / 1.06GB	53
8160	8302c7cefe70	alamAPI	0.23%	45.51MiB / 7.684GiB	0.58%	443kB / 305kB	28.5MB / 0B	3
8161	CONTAINER ID	NAME	CPU %	MEM USAGE / LIMIT	MEM %	NET I/O	BLOCK I/O	PIDS
8162	f10bc4b28a7e	alamDB	0.72%	187MiB / 7.684GiB	2.38%	2.49MB / 1.27MB	54.5MB / 49.7MB	31
8163	650af2d6431c	alamPREPROCESSOR	4.19%	1.135GiB / 7.684GiB	14.77%	309MB / 15.2MB	359MB / 1.06GB	53
8164	8302c7cefe70	alamAPI	0.21%	45.51MiB / 7.684GiB	0.58%	443kB / 305kB	28.5MB / 0B	3

Figure B.58: Raw Logs of alamPREPROCESSOR System Statistics

B.5.2   PSEI Trading Baseline Data

Figure B.59: Day 1 PSEI Trading Raw Data

Figure B.60: Day 2 PSEI Trading Raw Data

Figure B.61: Day 3 PSEI Trading Raw Data

Figure B.62: Day 4 PSEI Trading Raw Data

Figure B.63: Day 5 PSEI Trading Raw Data

Figure B.64: Day 6 PSEI Trading Raw Data

Figure B.65: Day 7 PSEI Trading Raw Data

Figure B.66: Day 8 PSEI Trading Raw Data

Figure B.67: Day 9 PSEI Trading Raw Data

Figure B.68: Day 10 PSEI Trading Raw Data

B.5.3 Raw Real-world alamSYS Application

Dates

Stocks	0	1	2	3	4	5	6	7	8	9	10	
	(March 24, 2023)	(March 27, 2023)	(March 28, 2023)	(March 29, 2023)	(March 30, 2023)	(March 31, 2023)	(April 3, 2023)	(April 4, 2023)	(April 5, 2023)	(April 10, 2023)	(April 11, 2023)	
MEG	₱10,380.53	₱9,910.50	₱10,079.64	₱9,960.05						₱10,179.94	₱10,129.79	
JGS	₱2,645.29	₱2,572.78	₱2,501.97	₱2,586.45				₱2,585.28	₱2,497.00	₱2,472.76	₱2,429.92	
BDO			₱6,348.35	₱6,298.34	₱6,363.08	₱6,363.08			₱6,273.33	₱6,139.47	₱6,523.37	₱6,533.37
FGEN	₱8,174.04	₱8,146.43	₱8,244.24	₱8,106.78				₱8,274.33	₱8,195.98	₱8,294.39	₱8,195.98	
ICT									₱10,530.97	₱10,530.97	₱10,455.57	
ALI	₱14,292.03	₱14,292.04	₱14,097.68	₱14,320.37	₱14,292.03	₱13,131.41		₱13,715.34	₱13,726.04	₱13,690.26	₱13,403.95	
SMC		₱5,303.19	₱5,273.18	₱5,195.31	₱5,195.31			₱5,373.20	₱5,225.12	₱2,598.19	₱5,220.15	
TEL	₱33,849.56	₱32,977.19	₱34,300.89	₱34,191.22		₱35,604.72	₱33,125.84		₱32,119.47	₱30,995.08		
GLO	₱46,386.43	₱45,659.30	₱45,836.06	₱45,687.40							₱45,082.60	
BLOOM		₱4,573.08	₱4,574.15					₱4,633.09	₱4,683.09	₱4,559.24	₱4,578.08	
RLC										₱7,473.51	₱7,302.27	
MER		₱14,943.96	₱15,365.19	₱15,014.40	₱15,361.27		₱15,525.66	₱15,545.72	₱15,545.72	₱15,846.61	₱15,946.90	
AC	₱33,398.23	₱33,348.09	₱32,977.18	₱32,655.09				₱32,646.02	₱32,595.87	₱32,445.43	₱32,110.02	
PGOLD	₱16,398.23	₱16,205.67	₱16,548.67	₱16,352.32		₱15,696.16	₱16,203.66	₱16,548.67	16302.77	₱16,222.71	₱16,297.93	
LTG	₱5,018.14	₱4,966.73		₱4,983.14	₱4,922.00	₱4,973.14	4,897.15	₱4,968.14	₱4,946.85		₱5,018.14	
MPI	₱18,203.54	₱18,185.77	₱19,156.34	₱19,077.71		₱18,454.28	₱18,383.97	₱18,454.28	₱18,554.57			
AP	₱18,429.20	₱18,379.06			₱18,654.87	₱18,284.87				₱18,805.31	₱18,554.57	
RRHI				₱2,717.80	₱2,660.99			₱2,740.30	₱2,722.80	₱2,670.93	₱2,697.80	₱2,700.30
URC	₱7,363.50	₱7,262.52							₱7,098.46	₱7,073.45	₱7,033.93	₱7,178.47

		0	1	2	3	4	5	6	7	8	9	10	CUMMULATIVE
	Profit (Realized)	-₱1,784.87	-₱1,257.88	₱15,291.24	-₱135.00	-₱1,160.62	-₱2,487.68	₱0.00	-₱774.43	-₱1,262.77	₱1,411.76		₱7,839.75
	Total Equity	₱498,215.13	₱496,957.25	₱512,248.49	₱512,113.49	₱510,952.87	₱508,465.19	₱508,465.19	₱507,690.76	₱506,427.99	₱507,839.75		
	Gain (%)	-0.36%	-0.25%	2.99%	-0.03%	-0.23%	-0.49%	0.00%	-0.15%	-0.25%	0.28%		1.51%
	Baseline (PSEI)	-₱2,141.04	-₱1,760.83	-₱1,275.16	-₱1,631.29	-₱5,571.10	-₱1,182.68	-₱3,378.45	-₱1,517.36	-₱2,150.34	-₱2,180.65		-₱22,788.90
		-1.290%	-1.060%	-0.770%	-0.980%	-3.34%	-0.72%	-2.060%	-0.930%	-1.32%	-1.34%		-13.810%

Action Legends
Bought
Sold

Figure B.69: Real World Application Raw Data Logs

Appendix C

Project Management Documentation

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Appendix D

Glossary of Terms

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Appendix E

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Appendix F

Author's Contact Information

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