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CPE 458

Prof. Lupo

MapReduce Histograms

The goal of this program is to take a csv file of stock trading data and provide histograms for 3 fields: Volume Traded, Adjusted Closing Price, and Daily Differential. We accomplished this by using the MapReduce MPI library provided by Sandia National Laboratories in order to parallelize the map and reduce functions.

$$k = \lceil 2n^{1/3} \rceil,$$

The program first parses through the given csv file in order to retrieve information by date. It then calculates the total number of bins to be used for the histogram using the following equation:

The program then creates 3 map objects to organize by volume traded, adjusted closing price, and daily differential. The mapping function for each map creates an entry for each day, using the bin number that the value belongs to as the key, and null as the value. The program then performs a reduce operation on each map, using the bin number as the key and the number of occurrences of the bin number in the map as the value. The program performs a parallel print of all key-value pairs in all 3 maps, which was used to verify the correctness of the data. For a number of processes greater than one, the output is printed in varying key order but contains the same bin value information.
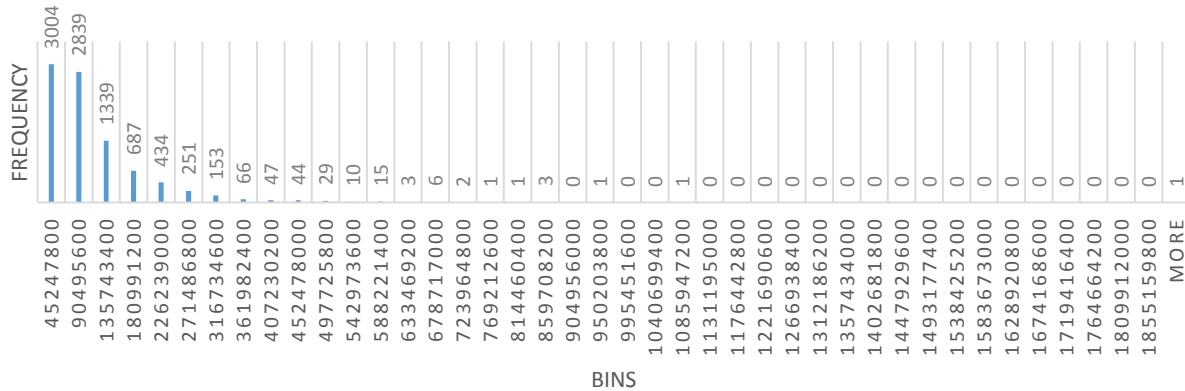
Histograms

1.) AAPL
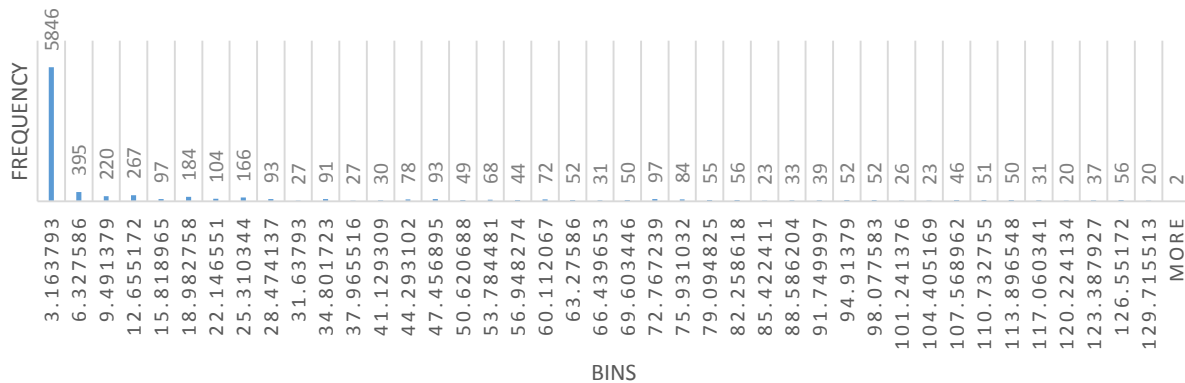
AAPL DAILY DIFFERENTIAL HISTOGRAM
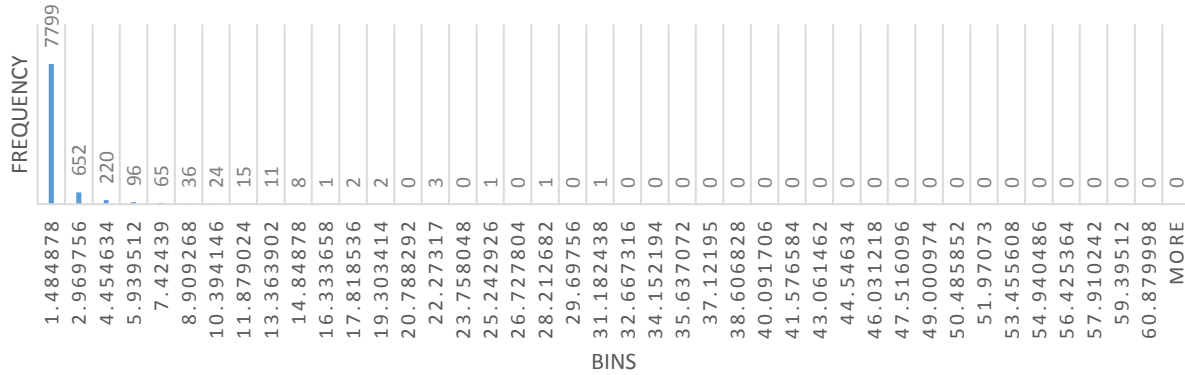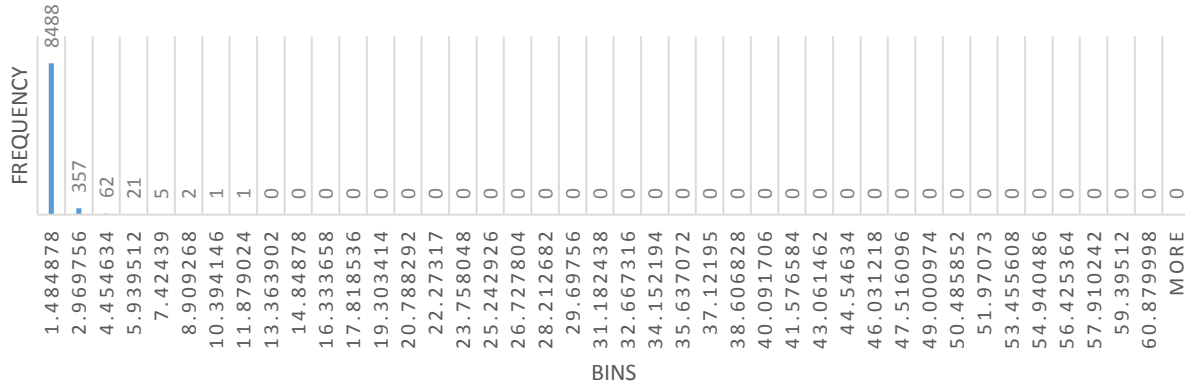

AAPL VOLUME TRADED HISTOGRAM

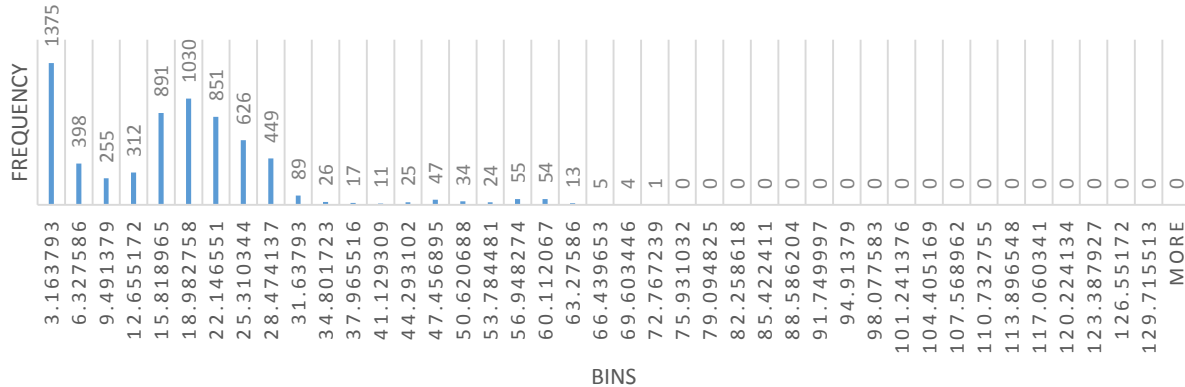## AAPL ADJUSTED CLOSING PRICE HISTOGRAM

2.) CSCO

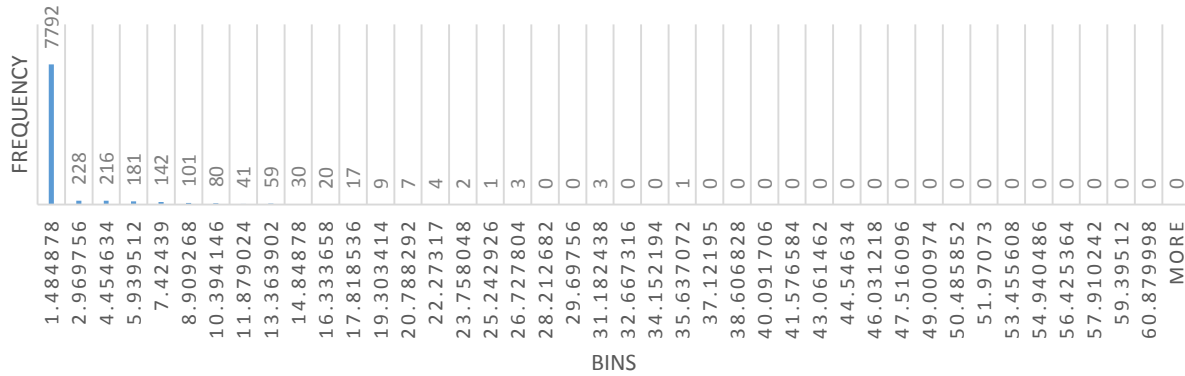## CSCO DAILY DIFFERENTIAL HISTOGRAM

CSCO VOLUME TRADED HISTOGRAM
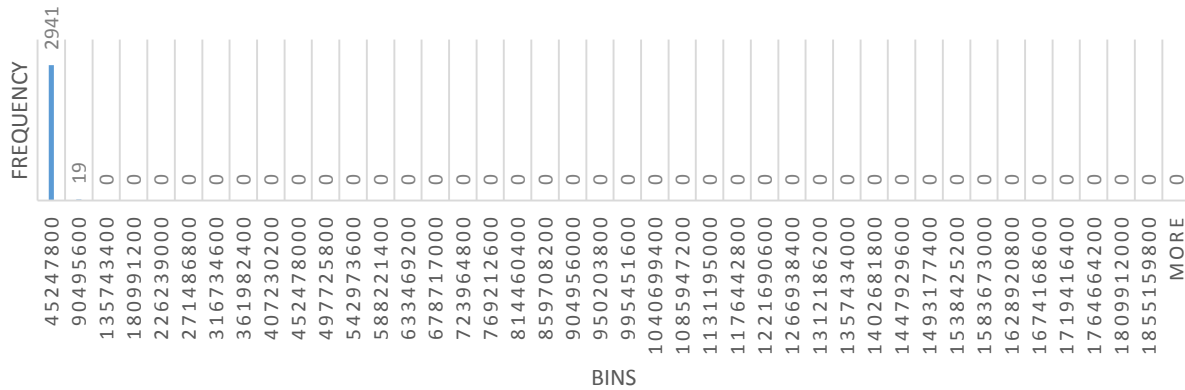

CSCO ADJUSTED CLOSING HISTOGRAM

3.) GOOGL

GOOGL DAILY DIFFERENTIAL HISTOGRAM

BINS	FREQUENCY
1.484878	7792
2.969756	228
4.454634	216
5.939512	181
7.42439	142
8.909268	101
10.394146	80
11.879024	41
13.363902	59
14.84878	30
16.333658	20
17.818536	17
19.303414	9
20.788292	7
22.27317	4
23.758048	2
25.242926	1
26.727804	3
28.212682	0
29.69756	0
31.182438	3
32.667316	0
34.152194	0
35.637072	1
37.12195	0
38.606828	0
40.091706	0
41.576584	0
43.061462	0
44.54634	0
46.031218	0
47.516096	0
49.000974	0
50.485852	0
51.97073	0
53.455608	0
54.940486	0
56.425364	0
57.910242	0
59.39512	0
60.879998	0
MORE	0

GOOGLE VOLUME TRADED HISTOGRAM

BINS	FREQUENCY
45247800	2941
90495600	19
135743400	0
180991200	0
226239000	0
271486800	0
316734600	0
361982400	0
407230200	0
452478000	0
497725800	0
542973600	0
588221400	0
633469200	0
678717000	0
723964800	0
769212600	0
814460400	0
859708200	0
904956000	0
950203800	0
995451600	0
1040699400	0
1085947200	0
1131195000	0
1176442800	0
1221690600	0
1266938400	0
1312186200	0
1357434000	0
1402681800	0
1447929600	0
1493177400	0
1538425200	0
1583673000	0
1628920800	0
1674168600	0
1719416400	0
1764664200	0
1809912000	0
1855159800	0
MORE	0

GOOGL ADJUSTED CLOSING HISTOGRAM

BINS	FREQUENCY
3.163793	0
6.327586	0
9.491379	0
12.655172	0
15.818965	0
18.982758	0
22.146551	0
25.310344	0
28.474137	0
31.63793	0
34.801723	0
37.965516	0
41.129309	0
44.293102	0
47.456895	0
50.620688	3
53.784481	10
56.948274	6
60.112067	7
63.27586	1
66.439653	4
69.603446	7
72.767239	4
75.931032	3
79.094825	0
82.258618	0
85.422411	9
88.586204	12
91.749997	29
94.91379	28
98.077583	31
101.241376	10
104.405169	5
107.568962	1
110.732755	5
113.896548	5
117.060341	8
120.224134	2
123.387927	1
126.55172	0
129.715513	3
MORE	2766

4.) MSFT

MSFT DAILY DIFFERENTIAL HISTOGRAM

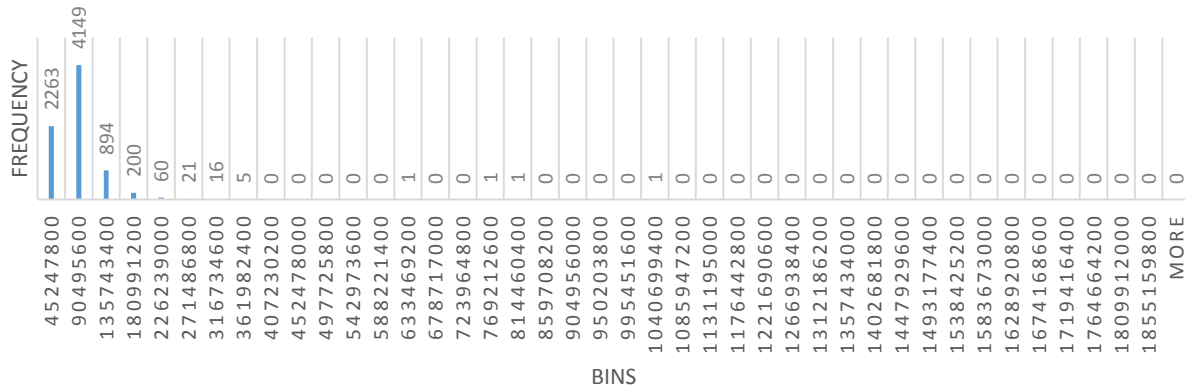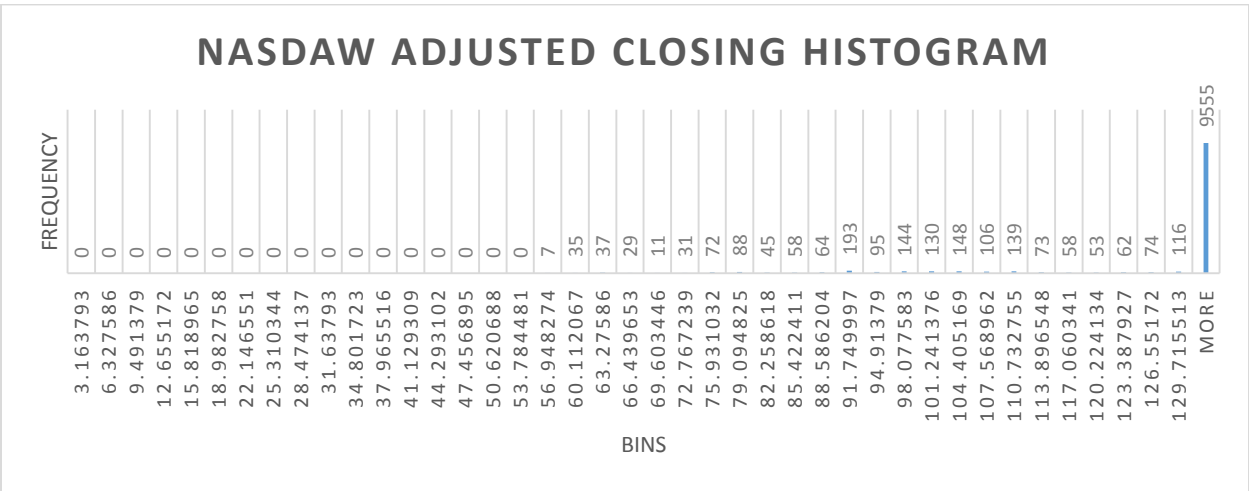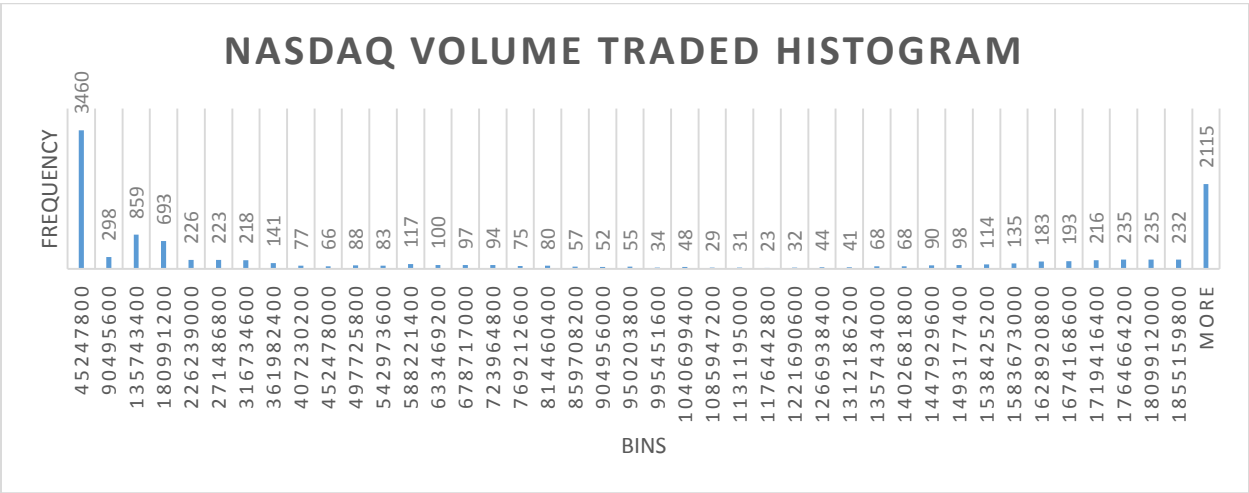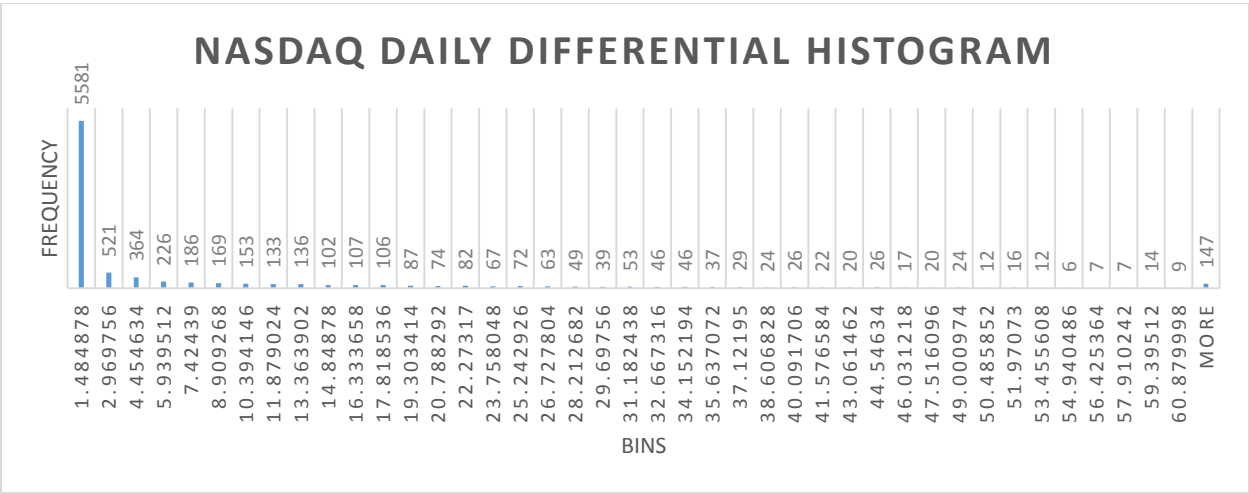## MSFT VOLUME TRADED HISTOGRAM
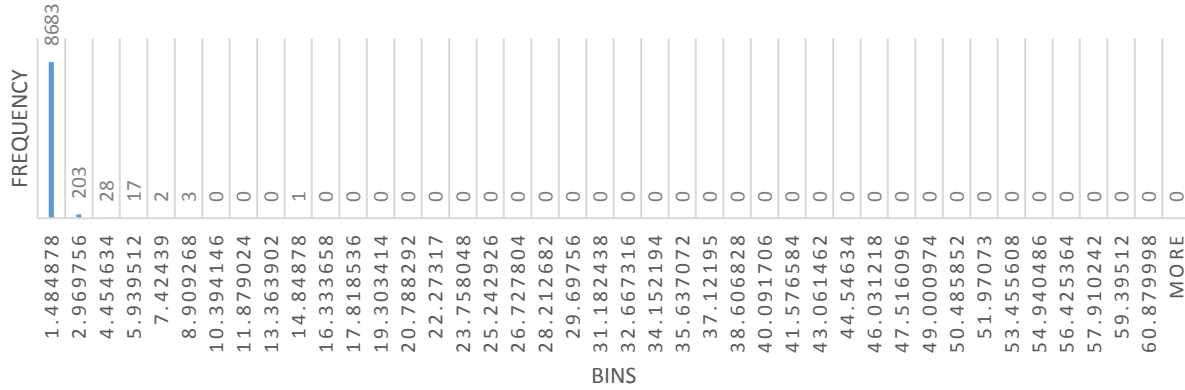

MSFT ADJUSTED CLOSING HISTOGRAM

5.) NASDAQ

NASDAQ DAILY DIFFERENTIAL HISTOGRAM

BINS	FREQUENCY
1.484878	5581
2.969756	521
4.454634	364
5.939512	226
7.42439	186
8.909268	169
10.394146	153
11.879024	133
13.363902	136
14.84878	102
16.333658	107
17.818536	106
19.303414	87
20.788292	74
22.27317	82
23.758048	67
25.242926	72
26.727804	63
28.212682	49
29.69756	39
31.182438	53
32.667316	46
34.152194	46
35.637072	37
37.12195	29
38.606828	24
40.091706	26
41.576584	22
43.061462	20
44.54634	26
46.031218	17
47.516096	20
49.000974	24
50.485852	12
51.97073	16
53.455608	12
54.940486	6
56.425364	7
57.910242	7
59.39512	14
60.879998	9
MORE	147

NASDAQ VOLUME TRADED HISTOGRAM

BINS	FREQUENCY
45247800	3460
90495600	298
135743400	859
180991200	693
226239000	226
271486800	223
316734600	218
361982400	141
407230200	77
452478000	66
497725800	88
542973600	83
588221400	117
633469200	100
678717000	97
723964800	94
769212600	75
814460400	80
859708200	57
904956000	52
950203800	55
995451600	34
1040699400	48
1085947200	29
1131195000	31
1176442800	23
1221690600	32
1266938400	44
1312186200	41
1357434000	68
1402681800	68
1447929600	90
1493177400	98
1538425200	114
1583673000	135
1628920800	183
1674168600	193
1719416400	216
1764664200	235
1809912000	235
1855159800	232
MORE	2115

NASDAW ADJUSTED CLOSING HISTOGRAM

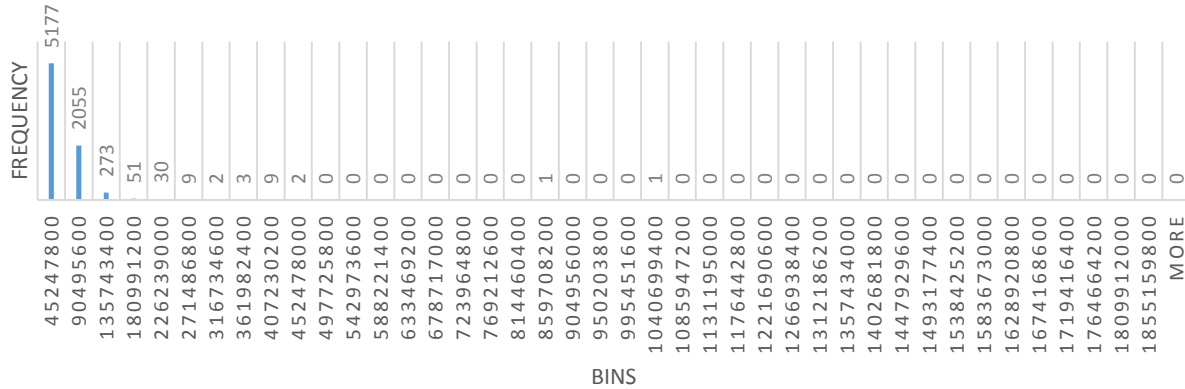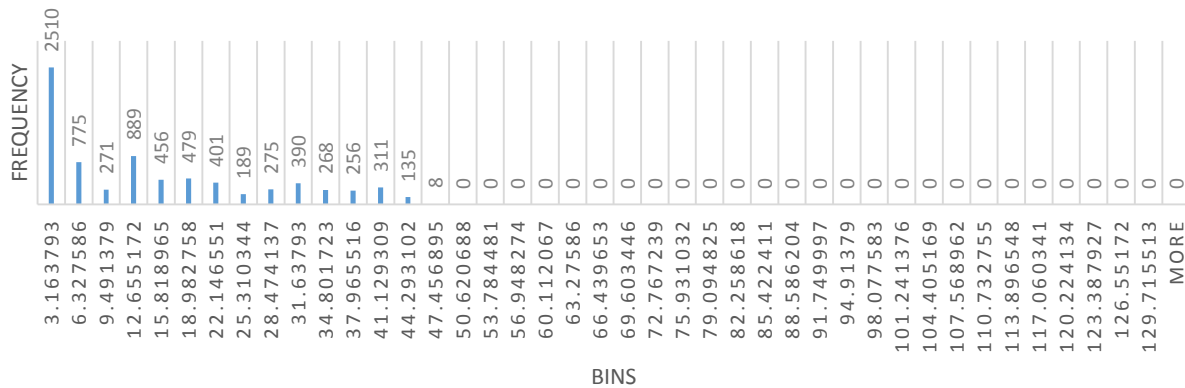| BINS	FREQUENCY
3.163793	0
6.327586	0
9.491379	0
12.655172	0
15.818965	0
18.982758	0
22.146551	0
25.310344	0
28.474137	0
31.63793	0
34.801723	0
37.965516	0
41.129309	0
44.293102	0
47.456895	0
50.620688	0
53.784481	0
56.948274	7
60.112067	35
63.27586	37
66.439653	29
69.603446	11
72.767239	31
75.931032	72
79.094825	88
82.258618	45
85.422411	58
88.586204	64
91.749997	193
94.91379	95
98.077583	144
101.241376	130
104.405169	148
107.568962	106
110.732755	139
113.896548	73
117.060341	58
120.224134	53
123.387927	62
126.55172	74
129.715513	116
MORE	9555

6.) ORCL

ORCL DAILY DIFFERENTIAL HISTOGRAM

ORCL VOLUME TRADED HISTOGRAM

ORCL ADJUSTED CLOSING HISTOGRAM

7.) SANDP500
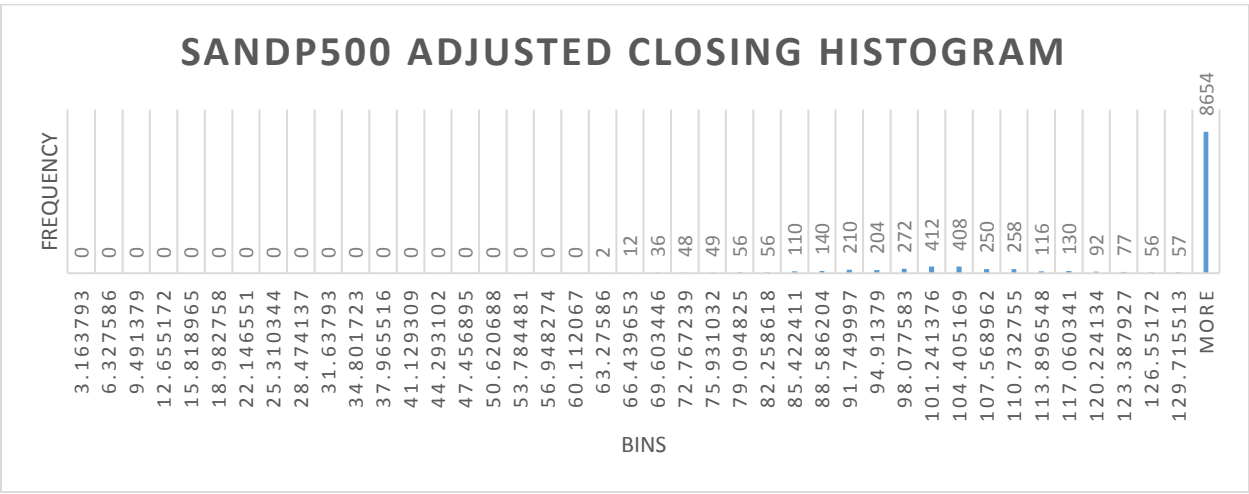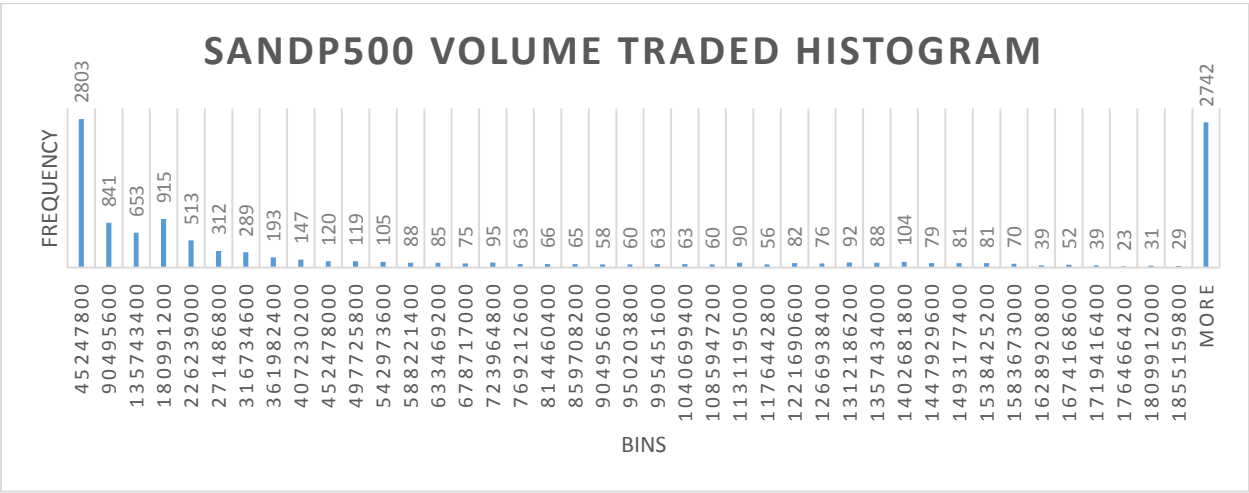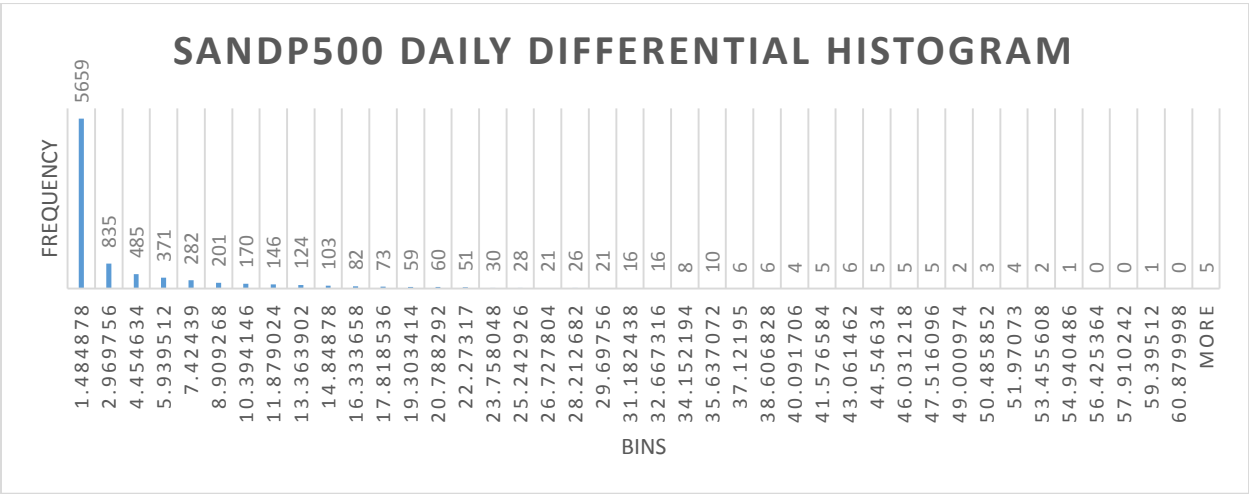
SANDP500 DAILY DIFFERENTIAL HISTOGRAM

SANDP500 VOLUME TRADED HISTOGRAM

SANDP500 ADJUSTED CLOSING HISTOGRAM

Program Output:

mpirun -n 1 mapreduce stockdata/aapl.csv

Num entries: 8937

Num bins: 42

Volume Traded:

KV pair: proc 0, sizes 4 4, key 0, value 3004

KV pair: proc 0, sizes 4 4, key 1, value 2839

KV pair: proc 0, sizes 4 4, key 2, value 1339

KV pair: proc 0, sizes 4 4, key 3, value 687

KV pair: proc 0, sizes 4 4, key 4, value 434

KV pair: proc 0, sizes 4 4, key 5, value 251

KV pair: proc 0, sizes 4 4, key 6, value 153

KV pair: proc 0, sizes 4 4, key 7, value 66

KV pair: proc 0, sizes 4 4, key 8, value 47

KV pair: proc 0, sizes 4 4, key 9, value 44

KV pair: proc 0, sizes 4 4, key 10, value 29

KV pair: proc 0, sizes 4 4, key 11, value 10

KV pair: proc 0, sizes 4 4, key 12, value 15

KV pair: proc 0, sizes 4 4, key 13, value 3

KV pair: proc 0, sizes 4 4, key 14, value 6

KV pair: proc 0, sizes 4 4, key 15, value 2

KV pair: proc 0, sizes 4 4, key 16, value 1

KV pair: proc 0, sizes 4 4, key 17, value 1

KV pair: proc 0, sizes 4 4, key 18, value 3

KV pair: proc 0, sizes 4 4, key 20, value 1

KV pair: proc 0, sizes 4 4, key 23, value 1

KV pair: proc 0, sizes 4 4, key 41, value 1

Adjusted Closing Price:

KV pair: proc 0, sizes 4 4, key 0, value 5846

KV pair: proc 0, sizes 4 4, key 1, value 395

KV pair: proc 0, sizes 4 4, key 2, value 220

KV pair: proc 0, sizes 4 4, key 3, value 267

KV pair: proc 0, sizes 4 4, key 4, value 97

KV pair: proc 0, sizes 4 4, key 5, value 184

KV pair: proc 0, sizes 4 4, key 6, value 104

KV pair: proc 0, sizes 4 4, key 7, value 166

KV pair: proc 0, sizes 4 4, key 8, value 93

KV pair: proc 0, sizes 4 4, key 9, value 27

KV pair: proc 0, sizes 4 4, key 10, value 91

KV pair: proc 0, sizes 4 4, key 11, value 27

KV pair: proc 0, sizes 4 4, key 12, value 30

KV pair: proc 0, sizes 4 4, key 13, value 78

KV pair: proc 0, sizes 4 4, key 14, value 93

KV pair: proc 0, sizes 4 4, key 15, value 49

KV pair: proc 0, sizes 4 4, key 16, value 68

KV pair: proc 0, sizes 4 4, key 17, value 44

KV pair: proc 0, sizes 4 4, key 18, value 72

KV pair: proc 0, sizes 4 4, key 19, value 52

KV pair: proc 0, sizes 4 4, key 20, value 31

KV pair: proc 0, sizes 4 4, key 21, value 50

KV pair: proc 0, sizes 4 4, key 22, value 97

KV pair: proc 0, sizes 4 4, key 23, value 84

KV pair: proc 0, sizes 4 4, key 24, value 55

KV pair: proc 0, sizes 4 4, key 25, value 56

KV pair: proc 0, sizes 4 4, key 26, value 23

KV pair: proc 0, sizes 4 4, key 27, value 33

KV pair: proc 0, sizes 4 4, key 28, value 39

KV pair: proc 0, sizes 4 4, key 29, value 52

KV pair: proc 0, sizes 4 4, key 30, value 52

KV pair: proc 0, sizes 4 4, key 31, value 26

KV pair: proc 0, sizes 4 4, key 32, value 23

KV pair: proc 0, sizes 4 4, key 33, value 46

KV pair: proc 0, sizes 4 4, key 34, value 51

KV pair: proc 0, sizes 4 4, key 35, value 50

KV pair: proc 0, sizes 4 4, key 36, value 31

KV pair: proc 0, sizes 4 4, key 37, value 20

KV pair: proc 0, sizes 4 4, key 38, value 37

KV pair: proc 0, sizes 4 4, key 39, value 56

KV pair: proc 0, sizes 4 4, key 40, value 20

KV pair: proc 0, sizes 4 4, key 41, value 2

Daily Differential:

KV pair: proc 0, sizes 4 4, key 0, value 49

KV pair: proc 0, sizes 4 4, key 1, value 72

KV pair: proc 0, sizes 4 4, key 2, value 75

KV pair: proc 0, sizes 4 4, key 3, value 74

KV pair: proc 0, sizes 4 4, key 4, value 149

KV pair: proc 0, sizes 4 4, key 5, value 133

KV pair: proc 0, sizes 4 4, key 6, value 49

KV pair: proc 0, sizes 4 4, key 7, value 26

KV pair: proc 0, sizes 4 4, key 8, value 25

KV pair: proc 0, sizes 4 4, key 9, value 44

KV pair: proc 0, sizes 4 4, key 10, value 23

KV pair: proc 0, sizes 4 4, key 11, value 27

KV pair: proc 0, sizes 4 4, key 12, value 48

KV pair: proc 0, sizes 4 4, key 13, value 39

KV pair: proc 0, sizes 4 4, key 14, value 57

KV pair: proc 0, sizes 4 4, key 15, value 50

KV pair: proc 0, sizes 4 4, key 16, value 87

KV pair: proc 0, sizes 4 4, key 17, value 147

KV pair: proc 0, sizes 4 4, key 18, value 341

KV pair: proc 0, sizes 4 4, key 19, value 1756

KV pair: proc 0, sizes 4 4, key 20, value 4387

KV pair: proc 0, sizes 4 4, key 21, value 800

KV pair: proc 0, sizes 4 4, key 22, value 264

KV pair: proc 0, sizes 4 4, key 23, value 89

KV pair: proc 0, sizes 4 4, key 24, value 46

KV pair: proc 0, sizes 4 4, key 25, value 30

KV pair: proc 0, sizes 4 4, key 26, value 15

KV pair: proc 0, sizes 4 4, key 27, value 11

KV pair: proc 0, sizes 4 4, key 28, value 8

KV pair: proc 0, sizes 4 4, key 29, value 6

KV pair: proc 0, sizes 4 4, key 30, value 4

KV pair: proc 0, sizes 4 4, key 31, value 2

KV pair: proc 0, sizes 4 4, key 34, value 1

KV pair: proc 0, sizes 4 4, key 37, value 1

KV pair: proc 0, sizes 4 4, key 38, value 1

KV pair: proc 0, sizes 4 4, key 41, value 1

mpirun -n 1 mapreduce stockdata/csco.csv

Num entries: 6592

Num bins: 38

Volume Traded:

KV pair: proc 0, sizes 4 4, key 0, value 308

KV pair: proc 0, sizes 4 4, key 1, value 1896

KV pair: proc 0, sizes 4 4, key 2, value 2291

KV pair: proc 0, sizes 4 4, key 3, value 1048

KV pair: proc 0, sizes 4 4, key 4, value 479

KV pair: proc 0, sizes 4 4, key 5, value 267

KV pair: proc 0, sizes 4 4, key 6, value 110

KV pair: proc 0, sizes 4 4, key 7, value 68

KV pair: proc 0, sizes 4 4, key 8, value 37

KV pair: proc 0, sizes 4 4, key 9, value 29

KV pair: proc 0, sizes 4 4, key 10, value 20

KV pair: proc 0, sizes 4 4, key 11, value 10

KV pair: proc 0, sizes 4 4, key 12, value 6

KV pair: proc 0, sizes 4 4, key 13, value 8

KV pair: proc 0, sizes 4 4, key 14, value 1

KV pair: proc 0, sizes 4 4, key 15, value 3

KV pair: proc 0, sizes 4 4, key 16, value 2

KV pair: proc 0, sizes 4 4, key 17, value 1

KV pair: proc 0, sizes 4 4, key 20, value 1

KV pair: proc 0, sizes 4 4, key 21, value 1

KV pair: proc 0, sizes 4 4, key 23, value 2

KV pair: proc 0, sizes 4 4, key 25, value 2

KV pair: proc 0, sizes 4 4, key 32, value 1

KV pair: proc 0, sizes 4 4, key 37, value 1

Adjusted Closing Price:

KV pair: proc 0, sizes 4 4, key 0, value 1262

KV pair: proc 0, sizes 4 4, key 1, value 183

KV pair: proc 0, sizes 4 4, key 2, value 240

KV pair: proc 0, sizes 4 4, key 3, value 208

KV pair: proc 0, sizes 4 4, key 4, value 128

KV pair: proc 0, sizes 4 4, key 5, value 122

KV pair: proc 0, sizes 4 4, key 6, value 264

KV pair: proc 0, sizes 4 4, key 7, value 501

KV pair: proc 0, sizes 4 4, key 8, value 742

KV pair: proc 0, sizes 4 4, key 9, value 553

KV pair: proc 0, sizes 4 4, key 10, value 535

KV pair: proc 0, sizes 4 4, key 11, value 469

KV pair: proc 0, sizes 4 4, key 12, value 446

KV pair: proc 0, sizes 4 4, key 13, value 207

KV pair: proc 0, sizes 4 4, key 14, value 287

KV pair: proc 0, sizes 4 4, key 15, value 100

KV pair: proc 0, sizes 4 4, key 16, value 37

KV pair: proc 0, sizes 4 4, key 17, value 13

KV pair: proc 0, sizes 4 4, key 18, value 8

KV pair: proc 0, sizes 4 4, key 19, value 14

KV pair: proc 0, sizes 4 4, key 20, value 5

KV pair: proc 0, sizes 4 4, key 21, value 6

KV pair: proc 0, sizes 4 4, key 22, value 10

KV pair: proc 0, sizes 4 4, key 23, value 28

KV pair: proc 0, sizes 4 4, key 24, value 31

KV pair: proc 0, sizes 4 4, key 25, value 25

KV pair: proc 0, sizes 4 4, key 26, value 13

KV pair: proc 0, sizes 4 4, key 27, value 12

KV pair: proc 0, sizes 4 4, key 28, value 19

KV pair: proc 0, sizes 4 4, key 29, value 38

KV pair: proc 0, sizes 4 4, key 30, value 38

KV pair: proc 0, sizes 4 4, key 31, value 25

KV pair: proc 0, sizes 4 4, key 32, value 8

KV pair: proc 0, sizes 4 4, key 33, value 7

KV pair: proc 0, sizes 4 4, key 34, value 2

KV pair: proc 0, sizes 4 4, key 35, value 3

KV pair: proc 0, sizes 4 4, key 36, value 2

KV pair: proc 0, sizes 4 4, key 37, value 1

Daily Differential:

KV pair: proc 0, sizes 4 4, key 0, value 137

KV pair: proc 0, sizes 4 4, key 1, value 1109

KV pair: proc 0, sizes 4 4, key 2, value 1974

KV pair: proc 0, sizes 4 4, key 3, value 624

KV pair: proc 0, sizes 4 4, key 4, value 54

KV pair: proc 0, sizes 4 4, key 5, value 44

KV pair: proc 0, sizes 4 4, key 6, value 46

KV pair: proc 0, sizes 4 4, key 7, value 56

KV pair: proc 0, sizes 4 4, key 8, value 76

KV pair: proc 0, sizes 4 4, key 9, value 64

KV pair: proc 0, sizes 4 4, key 10, value 72

KV pair: proc 0, sizes 4 4, key 11, value 73

KV pair: proc 0, sizes 4 4, key 12, value 54

KV pair: proc 0, sizes 4 4, key 13, value 41

KV pair: proc 0, sizes 4 4, key 14, value 42

KV pair: proc 0, sizes 4 4, key 15, value 79

KV pair: proc 0, sizes 4 4, key 16, value 109

KV pair: proc 0, sizes 4 4, key 17, value 243

KV pair: proc 0, sizes 4 4, key 18, value 341

KV pair: proc 0, sizes 4 4, key 19, value 553

KV pair: proc 0, sizes 4 4, key 20, value 366

KV pair: proc 0, sizes 4 4, key 21, value 219

KV pair: proc 0, sizes 4 4, key 22, value 125

KV pair: proc 0, sizes 4 4, key 23, value 52

KV pair: proc 0, sizes 4 4, key 24, value 25

KV pair: proc 0, sizes 4 4, key 25, value 6

KV pair: proc 0, sizes 4 4, key 26, value 6

KV pair: proc 0, sizes 4 4, key 28, value 1

KV pair: proc 0, sizes 4 4, key 29, value 1

mpirun -n 1 mapreduce stockdata/googl.csv

Num entries: 2960

Num bins: 29

Volume Traded:

KV pair: proc 0, sizes 4 4, key 0, value 553

KV pair: proc 0, sizes 4 4, key 1, value 888

KV pair: proc 0, sizes 4 4, key 2, value 515

KV pair: proc 0, sizes 4 4, key 3, value 281

KV pair: proc 0, sizes 4 4, key 4, value 245

KV pair: proc 0, sizes 4 4, key 5, value 156

KV pair: proc 0, sizes 4 4, key 6, value 89

KV pair: proc 0, sizes 4 4, key 7, value 69

KV pair: proc 0, sizes 4 4, key 8, value 40

KV pair: proc 0, sizes 4 4, key 9, value 26

KV pair: proc 0, sizes 4 4, key 10, value 25

KV pair: proc 0, sizes 4 4, key 11, value 12

KV pair: proc 0, sizes 4 4, key 12, value 18

KV pair: proc 0, sizes 4 4, key 13, value 8

KV pair: proc 0, sizes 4 4, key 14, value 9

KV pair: proc 0, sizes 4 4, key 15, value 10

KV pair: proc 0, sizes 4 4, key 16, value 2

KV pair: proc 0, sizes 4 4, key 17, value 3

KV pair: proc 0, sizes 4 4, key 18, value 1

KV pair: proc 0, sizes 4 4, key 19, value 1

KV pair: proc 0, sizes 4 4, key 22, value 3

KV pair: proc 0, sizes 4 4, key 24, value 1

KV pair: proc 0, sizes 4 4, key 25, value 2

KV pair: proc 0, sizes 4 4, key 26, value 1

KV pair: proc 0, sizes 4 4, key 27, value 1

KV pair: proc 0, sizes 4 4, key 28, value 1

Adjusted Closing Price:

KV pair: proc 0, sizes 4 4, key 1, value 13

KV pair: proc 0, sizes 4 4, key 2, value 32

KV pair: proc 0, sizes 4 4, key 3, value 125

KV pair: proc 0, sizes 4 4, key 4, value 28

KV pair: proc 0, sizes 4 4, key 5, value 146

KV pair: proc 0, sizes 4 4, key 6, value 120

KV pair: proc 0, sizes 4 4, key 7, value 241

KV pair: proc 0, sizes 4 4, key 8, value 286

KV pair: proc 0, sizes 4 4, key 9, value 323

KV pair: proc 0, sizes 4 4, key 10, value 309

KV pair: proc 0, sizes 4 4, key 11, value 304

KV pair: proc 0, sizes 4 4, key 12, value 106

KV pair: proc 0, sizes 4 4, key 13, value 72

KV pair: proc 0, sizes 4 4, key 14, value 50

KV pair: proc 0, sizes 4 4, key 15, value 39

KV pair: proc 0, sizes 4 4, key 16, value 92

KV pair: proc 0, sizes 4 4, key 17, value 22

KV pair: proc 0, sizes 4 4, key 18, value 8

KV pair: proc 0, sizes 4 4, key 19, value 64

KV pair: proc 0, sizes 4 4, key 20, value 169

KV pair: proc 0, sizes 4 4, key 21, value 113

KV pair: proc 0, sizes 4 4, key 22, value 84

KV pair: proc 0, sizes 4 4, key 23, value 7

KV pair: proc 0, sizes 4 4, key 24, value 25

KV pair: proc 0, sizes 4 4, key 25, value 27

KV pair: proc 0, sizes 4 4, key 26, value 28

KV pair: proc 0, sizes 4 4, key 27, value 46

KV pair: proc 0, sizes 4 4, key 28, value 59

KV pair: proc 0, sizes 4 4, key 29, value 22

Daily Differential:

KV pair: proc 0, sizes 4 4, key 0, value 12

KV pair: proc 0, sizes 4 4, key 1, value 6

KV pair: proc 0, sizes 4 4, key 2, value 6

KV pair: proc 0, sizes 4 4, key 3, value 13

KV pair: proc 0, sizes 4 4, key 4, value 17

KV pair: proc 0, sizes 4 4, key 5, value 17

KV pair: proc 0, sizes 4 4, key 6, value 17

KV pair: proc 0, sizes 4 4, key 7, value 33

KV pair: proc 0, sizes 4 4, key 8, value 57

KV pair: proc 0, sizes 4 4, key 9, value 98

KV pair: proc 0, sizes 4 4, key 10, value 140

KV pair: proc 0, sizes 4 4, key 11, value 138

KV pair: proc 0, sizes 4 4, key 12, value 161

KV pair: proc 0, sizes 4 4, key 13, value 127

KV pair: proc 0, sizes 4 4, key 14, value 136

KV pair: proc 0, sizes 4 4, key 15, value 230

KV pair: proc 0, sizes 4 4, key 16, value 335

KV pair: proc 0, sizes 4 4, key 17, value 522

KV pair: proc 0, sizes 4 4, key 18, value 412

KV pair: proc 0, sizes 4 4, key 19, value 239

KV pair: proc 0, sizes 4 4, key 20, value 122

KV pair: proc 0, sizes 4 4, key 21, value 66

KV pair: proc 0, sizes 4 4, key 22, value 35

KV pair: proc 0, sizes 4 4, key 23, value 13

KV pair: proc 0, sizes 4 4, key 24, value 4

KV pair: proc 0, sizes 4 4, key 25, value 3

KV pair: proc 0, sizes 4 4, key 26, value 1

mpirun -n 1 mapreduce stockdata/msft.csv

Num entries: 7612

Num bins: 40

Volume Traded:

KV pair: proc 0, sizes 4 4, key 0, value 457

KV pair: proc 0, sizes 4 4, key 1, value 2819

KV pair: proc 0, sizes 4 4, key 2, value 2552

KV pair: proc 0, sizes 4 4, key 3, value 1054

KV pair: proc 0, sizes 4 4, key 4, value 397

KV pair: proc 0, sizes 4 4, key 5, value 158

KV pair: proc 0, sizes 4 4, key 6, value 78

KV pair: proc 0, sizes 4 4, key 7, value 40

KV pair: proc 0, sizes 4 4, key 8, value 17

KV pair: proc 0, sizes 4 4, key 9, value 14

KV pair: proc 0, sizes 4 4, key 10, value 7

KV pair: proc 0, sizes 4 4, key 11, value 10

KV pair: proc 0, sizes 4 4, key 12, value 5

KV pair: proc 0, sizes 4 4, key 22, value 1

KV pair: proc 0, sizes 4 4, key 28, value 1

KV pair: proc 0, sizes 4 4, key 29, value 1

KV pair: proc 0, sizes 4 4, key 39, value 1

Adjusted Closing Price:

KV pair: proc 0, sizes 4 4, key 0, value 1447

KV pair: proc 0, sizes 4 4, key 1, value 825

KV pair: proc 0, sizes 4 4, key 2, value 252

KV pair: proc 0, sizes 4 4, key 3, value 139

KV pair: proc 0, sizes 4 4, key 4, value 67

KV pair: proc 0, sizes 4 4, key 5, value 69

KV pair: proc 0, sizes 4 4, key 6, value 21

KV pair: proc 0, sizes 4 4, key 7, value 91

KV pair: proc 0, sizes 4 4, key 8, value 98

KV pair: proc 0, sizes 4 4, key 9, value 52

KV pair: proc 0, sizes 4 4, key 10, value 127

KV pair: proc 0, sizes 4 4, key 11, value 204

KV pair: proc 0, sizes 4 4, key 12, value 432

KV pair: proc 0, sizes 4 4, key 13, value 567

KV pair: proc 0, sizes 4 4, key 14, value 511

KV pair: proc 0, sizes 4 4, key 15, value 485

KV pair: proc 0, sizes 4 4, key 16, value 530

KV pair: proc 0, sizes 4 4, key 17, value 287

KV pair: proc 0, sizes 4 4, key 18, value 210

KV pair: proc 0, sizes 4 4, key 19, value 168

KV pair: proc 0, sizes 4 4, key 20, value 106

KV pair: proc 0, sizes 4 4, key 21, value 97

KV pair: proc 0, sizes 4 4, key 22, value 116

KV pair: proc 0, sizes 4 4, key 23, value 58

KV pair: proc 0, sizes 4 4, key 24, value 63

KV pair: proc 0, sizes 4 4, key 25, value 28

KV pair: proc 0, sizes 4 4, key 26, value 52

KV pair: proc 0, sizes 4 4, key 27, value 56

KV pair: proc 0, sizes 4 4, key 28, value 52

KV pair: proc 0, sizes 4 4, key 29, value 63

KV pair: proc 0, sizes 4 4, key 30, value 58

KV pair: proc 0, sizes 4 4, key 31, value 82

KV pair: proc 0, sizes 4 4, key 32, value 52

KV pair: proc 0, sizes 4 4, key 33, value 4

KV pair: proc 0, sizes 4 4, key 34, value 15

KV pair: proc 0, sizes 4 4, key 35, value 35

KV pair: proc 0, sizes 4 4, key 36, value 31

KV pair: proc 0, sizes 4 4, key 37, value 38

KV pair: proc 0, sizes 4 4, key 38, value 23

KV pair: proc 0, sizes 4 4, key 39, value 1

Daily Differential:

KV pair: proc 0, sizes 4 4, key 0, value 51

KV pair: proc 0, sizes 4 4, key 1, value 116

KV pair: proc 0, sizes 4 4, key 2, value 751

KV pair: proc 0, sizes 4 4, key 3, value 2354

KV pair: proc 0, sizes 4 4, key 4, value 450

KV pair: proc 0, sizes 4 4, key 5, value 172

KV pair: proc 0, sizes 4 4, key 6, value 149

KV pair: proc 0, sizes 4 4, key 7, value 134

KV pair: proc 0, sizes 4 4, key 8, value 126

KV pair: proc 0, sizes 4 4, key 9, value 158

KV pair: proc 0, sizes 4 4, key 10, value 198

KV pair: proc 0, sizes 4 4, key 11, value 299

KV pair: proc 0, sizes 4 4, key 12, value 498

KV pair: proc 0, sizes 4 4, key 13, value 516

KV pair: proc 0, sizes 4 4, key 14, value 399

KV pair: proc 0, sizes 4 4, key 15, value 376

KV pair: proc 0, sizes 4 4, key 16, value 190

KV pair: proc 0, sizes 4 4, key 17, value 111

KV pair: proc 0, sizes 4 4, key 18, value 82

KV pair: proc 0, sizes 4 4, key 19, value 48

KV pair: proc 0, sizes 4 4, key 20, value 38

KV pair: proc 0, sizes 4 4, key 21, value 16

KV pair: proc 0, sizes 4 4, key 22, value 41

KV pair: proc 0, sizes 4 4, key 23, value 92

KV pair: proc 0, sizes 4 4, key 24, value 92

KV pair: proc 0, sizes 4 4, key 25, value 64

KV pair: proc 0, sizes 4 4, key 26, value 26

KV pair: proc 0, sizes 4 4, key 27, value 24

KV pair: proc 0, sizes 4 4, key 28, value 14

KV pair: proc 0, sizes 4 4, key 29, value 10

KV pair: proc 0, sizes 4 4, key 30, value 4

KV pair: proc 0, sizes 4 4, key 31, value 5

KV pair: proc 0, sizes 4 4, key 32, value 3

KV pair: proc 0, sizes 4 4, key 34, value 2

KV pair: proc 0, sizes 4 4, key 35, value 1

KV pair: proc 0, sizes 4 4, key 36, value 2

mpirun -n 1 mapreduce stockdata/nasdaq.csv

Num entries: 11423

Num bins: 46

Volume Traded:

KV pair: proc 0, sizes 4 4, key 0, value 3859

KV pair: proc 0, sizes 4 4, key 1, value 1564

KV pair: proc 0, sizes 4 4, key 2, value 497

KV pair: proc 0, sizes 4 4, key 3, value 271

KV pair: proc 0, sizes 4 4, key 4, value 173

KV pair: proc 0, sizes 4 4, key 5, value 225

KV pair: proc 0, sizes 4 4, key 6, value 223

KV pair: proc 0, sizes 4 4, key 7, value 175

KV pair: proc 0, sizes 4 4, key 8, value 124

KV pair: proc 0, sizes 4 4, key 9, value 101

KV pair: proc 0, sizes 4 4, key 10, value 76

KV pair: proc 0, sizes 4 4, key 11, value 61

KV pair: proc 0, sizes 4 4, key 12, value 98

KV pair: proc 0, sizes 4 4, key 13, value 150

KV pair: proc 0, sizes 4 4, key 14, value 232

KV pair: proc 0, sizes 4 4, key 15, value 327

KV pair: proc 0, sizes 4 4, key 16, value 457

KV pair: proc 0, sizes 4 4, key 17, value 516

KV pair: proc 0, sizes 4 4, key 18, value 510

KV pair: proc 0, sizes 4 4, key 19, value 486

KV pair: proc 0, sizes 4 4, key 20, value 338

KV pair: proc 0, sizes 4 4, key 21, value 280

KV pair: proc 0, sizes 4 4, key 22, value 200

KV pair: proc 0, sizes 4 4, key 23, value 135

KV pair: proc 0, sizes 4 4, key 24, value 100

KV pair: proc 0, sizes 4 4, key 25, value 68

KV pair: proc 0, sizes 4 4, key 26, value 44

KV pair: proc 0, sizes 4 4, key 27, value 40

KV pair: proc 0, sizes 4 4, key 28, value 19

KV pair: proc 0, sizes 4 4, key 29, value 12

KV pair: proc 0, sizes 4 4, key 30, value 15

KV pair: proc 0, sizes 4 4, key 31, value 10

KV pair: proc 0, sizes 4 4, key 32, value 8

KV pair: proc 0, sizes 4 4, key 33, value 6

KV pair: proc 0, sizes 4 4, key 34, value 6

KV pair: proc 0, sizes 4 4, key 35, value 4

KV pair: proc 0, sizes 4 4, key 36, value 1

KV pair: proc 0, sizes 4 4, key 37, value 4

KV pair: proc 0, sizes 4 4, key 38, value 2

KV pair: proc 0, sizes 4 4, key 39, value 3

KV pair: proc 0, sizes 4 4, key 41, value 2

KV pair: proc 0, sizes 4 4, key 45, value 1

Adjusted Closing Price:

KV pair: proc 0, sizes 4 4, key 0, value 1523

KV pair: proc 0, sizes 4 4, key 1, value 1466

KV pair: proc 0, sizes 4 4, key 2, value 895

KV pair: proc 0, sizes 4 4, key 3, value 1096

KV pair: proc 0, sizes 4 4, key 4, value 359

KV pair: proc 0, sizes 4 4, key 5, value 264

KV pair: proc 0, sizes 4 4, key 6, value 482

KV pair: proc 0, sizes 4 4, key 7, value 69

KV pair: proc 0, sizes 4 4, key 8, value 91

KV pair: proc 0, sizes 4 4, key 9, value 166

KV pair: proc 0, sizes 4 4, key 10, value 161

KV pair: proc 0, sizes 4 4, key 11, value 214

KV pair: proc 0, sizes 4 4, key 12, value 158

KV pair: proc 0, sizes 4 4, key 13, value 202

KV pair: proc 0, sizes 4 4, key 14, value 213

KV pair: proc 0, sizes 4 4, key 15, value 222

KV pair: proc 0, sizes 4 4, key 16, value 316

KV pair: proc 0, sizes 4 4, key 17, value 337

KV pair: proc 0, sizes 4 4, key 18, value 373

KV pair: proc 0, sizes 4 4, key 19, value 288

KV pair: proc 0, sizes 4 4, key 20, value 289

KV pair: proc 0, sizes 4 4, key 21, value 281

KV pair: proc 0, sizes 4 4, key 22, value 236

KV pair: proc 0, sizes 4 4, key 23, value 194

KV pair: proc 0, sizes 4 4, key 24, value 188

KV pair: proc 0, sizes 4 4, key 25, value 103

KV pair: proc 0, sizes 4 4, key 26, value 98

KV pair: proc 0, sizes 4 4, key 27, value 87

KV pair: proc 0, sizes 4 4, key 28, value 52

KV pair: proc 0, sizes 4 4, key 29, value 43

KV pair: proc 0, sizes 4 4, key 30, value 42

KV pair: proc 0, sizes 4 4, key 31, value 55

KV pair: proc 0, sizes 4 4, key 32, value 47

KV pair: proc 0, sizes 4 4, key 33, value 48

KV pair: proc 0, sizes 4 4, key 34, value 62

KV pair: proc 0, sizes 4 4, key 35, value 77

KV pair: proc 0, sizes 4 4, key 36, value 66

KV pair: proc 0, sizes 4 4, key 37, value 53

KV pair: proc 0, sizes 4 4, key 38, value 60

KV pair: proc 0, sizes 4 4, key 39, value 62

KV pair: proc 0, sizes 4 4, key 40, value 63

KV pair: proc 0, sizes 4 4, key 41, value 89

KV pair: proc 0, sizes 4 4, key 42, value 68

KV pair: proc 0, sizes 4 4, key 43, value 87

KV pair: proc 0, sizes 4 4, key 44, value 74

KV pair: proc 0, sizes 4 4, key 45, value 4

Daily Differential:

KV pair: proc 0, sizes 4 4, key 0, value 22

KV pair: proc 0, sizes 4 4, key 1, value 15

KV pair: proc 0, sizes 4 4, key 2, value 8

KV pair: proc 0, sizes 4 4, key 3, value 21

KV pair: proc 0, sizes 4 4, key 4, value 21

KV pair: proc 0, sizes 4 4, key 5, value 28

KV pair: proc 0, sizes 4 4, key 6, value 40

KV pair: proc 0, sizes 4 4, key 7, value 50

KV pair: proc 0, sizes 4 4, key 8, value 114

KV pair: proc 0, sizes 4 4, key 9, value 201

KV pair: proc 0, sizes 4 4, key 10, value 370

KV pair: proc 0, sizes 4 4, key 11, value 656

KV pair: proc 0, sizes 4 4, key 12, value 967

KV pair: proc 0, sizes 4 4, key 13, value 829

KV pair: proc 0, sizes 4 4, key 14, value 427

KV pair: proc 0, sizes 4 4, key 15, value 162

KV pair: proc 0, sizes 4 4, key 16, value 110

KV pair: proc 0, sizes 4 4, key 17, value 81

KV pair: proc 0, sizes 4 4, key 18, value 135

KV pair: proc 0, sizes 4 4, key 19, value 1177

KV pair: proc 0, sizes 4 4, key 20, value 5735

KV pair: proc 0, sizes 4 4, key 21, value 130

KV pair: proc 0, sizes 4 4, key 22, value 46

KV pair: proc 0, sizes 4 4, key 23, value 34

KV pair: proc 0, sizes 4 4, key 24, value 15

KV pair: proc 0, sizes 4 4, key 25, value 8

KV pair: proc 0, sizes 4 4, key 26, value 7

KV pair: proc 0, sizes 4 4, key 27, value 4

KV pair: proc 0, sizes 4 4, key 28, value 2

KV pair: proc 0, sizes 4 4, key 29, value 3

KV pair: proc 0, sizes 4 4, key 30, value 1

KV pair: proc 0, sizes 4 4, key 31, value 2

KV pair: proc 0, sizes 4 4, key 34, value 1

KV pair: proc 0, sizes 4 4, key 37, value 1

mpirun -n 1 mapreduce stockdata/orcl.csv

Num entries: 7613

Num bins: 40

Volume Traded:

KV pair: proc 0, sizes 4 4, key 0, value 2265

KV pair: proc 0, sizes 4 4, key 1, value 3672

KV pair: proc 0, sizes 4 4, key 2, value 1117

KV pair: proc 0, sizes 4 4, key 3, value 318

KV pair: proc 0, sizes 4 4, key 4, value 123

KV pair: proc 0, sizes 4 4, key 5, value 48

KV pair: proc 0, sizes 4 4, key 6, value 19

KV pair: proc 0, sizes 4 4, key 7, value 18

KV pair: proc 0, sizes 4 4, key 8, value 9

KV pair: proc 0, sizes 4 4, key 9, value 4

KV pair: proc 0, sizes 4 4, key 10, value 4

KV pair: proc 0, sizes 4 4, key 12, value 2

KV pair: proc 0, sizes 4 4, key 13, value 1

KV pair: proc 0, sizes 4 4, key 14, value 4

KV pair: proc 0, sizes 4 4, key 15, value 6

KV pair: proc 0, sizes 4 4, key 16, value 1

KV pair: proc 0, sizes 4 4, key 31, value 1

KV pair: proc 0, sizes 4 4, key 39, value 1

Adjusted Closing Price:

KV pair: proc 0, sizes 4 4, key 0, value 1870

KV pair: proc 0, sizes 4 4, key 1, value 451

KV pair: proc 0, sizes 4 4, key 2, value 275

KV pair: proc 0, sizes 4 4, key 3, value 424

KV pair: proc 0, sizes 4 4, key 4, value 198

KV pair: proc 0, sizes 4 4, key 5, value 91

KV pair: proc 0, sizes 4 4, key 6, value 63

KV pair: proc 0, sizes 4 4, key 7, value 156

KV pair: proc 0, sizes 4 4, key 8, value 152

KV pair: proc 0, sizes 4 4, key 9, value 425

KV pair: proc 0, sizes 4 4, key 10, value 364

KV pair: proc 0, sizes 4 4, key 11, value 205

KV pair: proc 0, sizes 4 4, key 12, value 117

KV pair: proc 0, sizes 4 4, key 13, value 169

KV pair: proc 0, sizes 4 4, key 14, value 147

KV pair: proc 0, sizes 4 4, key 15, value 212

KV pair: proc 0, sizes 4 4, key 16, value 152

KV pair: proc 0, sizes 4 4, key 17, value 185

KV pair: proc 0, sizes 4 4, key 18, value 122

KV pair: proc 0, sizes 4 4, key 19, value 74

KV pair: proc 0, sizes 4 4, key 20, value 60

KV pair: proc 0, sizes 4 4, key 21, value 72

KV pair: proc 0, sizes 4 4, key 22, value 82

KV pair: proc 0, sizes 4 4, key 23, value 119

KV pair: proc 0, sizes 4 4, key 24, value 105

KV pair: proc 0, sizes 4 4, key 25, value 135

KV pair: proc 0, sizes 4 4, key 26, value 175

KV pair: proc 0, sizes 4 4, key 27, value 127

KV pair: proc 0, sizes 4 4, key 28, value 99

KV pair: proc 0, sizes 4 4, key 29, value 75

KV pair: proc 0, sizes 4 4, key 30, value 62

KV pair: proc 0, sizes 4 4, key 31, value 107

KV pair: proc 0, sizes 4 4, key 32, value 109

KV pair: proc 0, sizes 4 4, key 33, value 115

KV pair: proc 0, sizes 4 4, key 34, value 125

KV pair: proc 0, sizes 4 4, key 35, value 72

KV pair: proc 0, sizes 4 4, key 36, value 57

KV pair: proc 0, sizes 4 4, key 37, value 55

KV pair: proc 0, sizes 4 4, key 38, value 9

KV pair: proc 0, sizes 4 4, key 39, value 1

Daily Differential:

KV pair: proc 0, sizes 4 4, key 0, value 100

KV pair: proc 0, sizes 4 4, key 1, value 580

KV pair: proc 0, sizes 4 4, key 2, value 2547

KV pair: proc 0, sizes 4 4, key 3, value 611

KV pair: proc 0, sizes 4 4, key 4, value 55

KV pair: proc 0, sizes 4 4, key 5, value 18

KV pair: proc 0, sizes 4 4, key 6, value 10

KV pair: proc 0, sizes 4 4, key 7, value 6

KV pair: proc 0, sizes 4 4, key 8, value 13

KV pair: proc 0, sizes 4 4, key 9, value 14

KV pair: proc 0, sizes 4 4, key 10, value 8

KV pair: proc 0, sizes 4 4, key 11, value 25

KV pair: proc 0, sizes 4 4, key 12, value 49

KV pair: proc 0, sizes 4 4, key 13, value 117

KV pair: proc 0, sizes 4 4, key 14, value 312

KV pair: proc 0, sizes 4 4, key 15, value 884

KV pair: proc 0, sizes 4 4, key 16, value 1221

KV pair: proc 0, sizes 4 4, key 17, value 649

KV pair: proc 0, sizes 4 4, key 18, value 235

KV pair: proc 0, sizes 4 4, key 19, value 76

KV pair: proc 0, sizes 4 4, key 20, value 35

KV pair: proc 0, sizes 4 4, key 21, value 19

KV pair: proc 0, sizes 4 4, key 22, value 8

KV pair: proc 0, sizes 4 4, key 23, value 4

KV pair: proc 0, sizes 4 4, key 24, value 10

KV pair: proc 0, sizes 4 4, key 25, value 2

KV pair: proc 0, sizes 4 4, key 27, value 1

KV pair: proc 0, sizes 4 4, key 28, value 1

KV pair: proc 0, sizes 4 4, key 29, value 1

KV pair: proc 0, sizes 4 4, key 30, value 1

KV pair: proc 0, sizes 4 4, key 39, value 1

mpirun -n 1 mapreduce stockdata/SandP500.csv

Num entries: 11705

Num bins: 46

Volume Traded:

KV pair: proc 0, sizes 4 4, key 0, value 5923

KV pair: proc 0, sizes 4 4, key 1, value 1012

KV pair: proc 0, sizes 4 4, key 2, value 477

KV pair: proc 0, sizes 4 4, key 3, value 347

KV pair: proc 0, sizes 4 4, key 4, value 408

KV pair: proc 0, sizes 4 4, key 5, value 497

KV pair: proc 0, sizes 4 4, key 6, value 253

KV pair: proc 0, sizes 4 4, key 7, value 135

KV pair: proc 0, sizes 4 4, key 8, value 127

KV pair: proc 0, sizes 4 4, key 9, value 168

KV pair: proc 0, sizes 4 4, key 10, value 183

KV pair: proc 0, sizes 4 4, key 11, value 175

KV pair: proc 0, sizes 4 4, key 12, value 238

KV pair: proc 0, sizes 4 4, key 13, value 279

KV pair: proc 0, sizes 4 4, key 14, value 285

KV pair: proc 0, sizes 4 4, key 15, value 243

KV pair: proc 0, sizes 4 4, key 16, value 226

KV pair: proc 0, sizes 4 4, key 17, value 139

KV pair: proc 0, sizes 4 4, key 18, value 112

KV pair: proc 0, sizes 4 4, key 19, value 96

KV pair: proc 0, sizes 4 4, key 20, value 73

KV pair: proc 0, sizes 4 4, key 21, value 54

KV pair: proc 0, sizes 4 4, key 22, value 57

KV pair: proc 0, sizes 4 4, key 23, value 39

KV pair: proc 0, sizes 4 4, key 24, value 29

KV pair: proc 0, sizes 4 4, key 25, value 32

KV pair: proc 0, sizes 4 4, key 26, value 24

KV pair: proc 0, sizes 4 4, key 27, value 14

KV pair: proc 0, sizes 4 4, key 28, value 15

KV pair: proc 0, sizes 4 4, key 29, value 11

KV pair: proc 0, sizes 4 4, key 30, value 9

KV pair: proc 0, sizes 4 4, key 31, value 3

KV pair: proc 0, sizes 4 4, key 32, value 6

KV pair: proc 0, sizes 4 4, key 33, value 2

KV pair: proc 0, sizes 4 4, key 34, value 1

KV pair: proc 0, sizes 4 4, key 35, value 5

KV pair: proc 0, sizes 4 4, key 36, value 1

KV pair: proc 0, sizes 4 4, key 37, value 4

KV pair: proc 0, sizes 4 4, key 39, value 1

KV pair: proc 0, sizes 4 4, key 41, value 1

KV pair: proc 0, sizes 4 4, key 45, value 1

Adjusted Closing Price:

KV pair: proc 0, sizes 4 4, key 1, value 723

KV pair: proc 0, sizes 4 4, key 2, value 2522

KV pair: proc 0, sizes 4 4, key 3, value 654

KV pair: proc 0, sizes 4 4, key 4, value 199

KV pair: proc 0, sizes 4 4, key 5, value 493

KV pair: proc 0, sizes 4 4, key 6, value 371

KV pair: proc 0, sizes 4 4, key 7, value 385

KV pair: proc 0, sizes 4 4, key 8, value 316

KV pair: proc 0, sizes 4 4, key 9, value 445

KV pair: proc 0, sizes 4 4, key 10, value 282

KV pair: proc 0, sizes 4 4, key 11, value 59

KV pair: proc 0, sizes 4 4, key 12, value 95

KV pair: proc 0, sizes 4 4, key 13, value 83

KV pair: proc 0, sizes 4 4, key 14, value 139

KV pair: proc 0, sizes 4 4, key 15, value 42

KV pair: proc 0, sizes 4 4, key 16, value 82

KV pair: proc 0, sizes 4 4, key 17, value 84

KV pair: proc 0, sizes 4 4, key 18, value 133

KV pair: proc 0, sizes 4 4, key 19, value 204

KV pair: proc 0, sizes 4 4, key 20, value 178

KV pair: proc 0, sizes 4 4, key 21, value 168

KV pair: proc 0, sizes 4 4, key 22, value 153

KV pair: proc 0, sizes 4 4, key 23, value 300

KV pair: proc 0, sizes 4 4, key 24, value 424

KV pair: proc 0, sizes 4 4, key 25, value 321

KV pair: proc 0, sizes 4 4, key 26, value 297

KV pair: proc 0, sizes 4 4, key 27, value 339

KV pair: proc 0, sizes 4 4, key 28, value 346

KV pair: proc 0, sizes 4 4, key 29, value 306

KV pair: proc 0, sizes 4 4, key 30, value 291

KV pair: proc 0, sizes 4 4, key 31, value 226

KV pair: proc 0, sizes 4 4, key 32, value 160

KV pair: proc 0, sizes 4 4, key 33, value 97

KV pair: proc 0, sizes 4 4, key 34, value 25

KV pair: proc 0, sizes 4 4, key 35, value 44

KV pair: proc 0, sizes 4 4, key 36, value 55

KV pair: proc 0, sizes 4 4, key 37, value 16

KV pair: proc 0, sizes 4 4, key 38, value 34

KV pair: proc 0, sizes 4 4, key 39, value 40

KV pair: proc 0, sizes 4 4, key 40, value 81

KV pair: proc 0, sizes 4 4, key 41, value 48

KV pair: proc 0, sizes 4 4, key 42, value 75

KV pair: proc 0, sizes 4 4, key 43, value 89

KV pair: proc 0, sizes 4 4, key 44, value 110

KV pair: proc 0, sizes 4 4, key 45, value 150

KV pair: proc 0, sizes 4 4, key 46, value 21

Daily Differential:

KV pair: proc 0, sizes 4 4, key 0, value 22

KV pair: proc 0, sizes 4 4, key 1, value 7

KV pair: proc 0, sizes 4 4, key 2, value 6

KV pair: proc 0, sizes 4 4, key 3, value 11

KV pair: proc 0, sizes 4 4, key 4, value 13

KV pair: proc 0, sizes 4 4, key 5, value 14

KV pair: proc 0, sizes 4 4, key 6, value 11

KV pair: proc 0, sizes 4 4, key 7, value 17

KV pair: proc 0, sizes 4 4, key 8, value 22

KV pair: proc 0, sizes 4 4, key 9, value 29

KV pair: proc 0, sizes 4 4, key 10, value 21

KV pair: proc 0, sizes 4 4, key 11, value 49

KV pair: proc 0, sizes 4 4, key 12, value 58

KV pair: proc 0, sizes 4 4, key 13, value 82

KV pair: proc 0, sizes 4 4, key 14, value 132

KV pair: proc 0, sizes 4 4, key 15, value 182

KV pair: proc 0, sizes 4 4, key 16, value 259

KV pair: proc 0, sizes 4 4, key 17, value 302

KV pair: proc 0, sizes 4 4, key 18, value 332

KV pair: proc 0, sizes 4 4, key 19, value 317

KV pair: proc 0, sizes 4 4, key 20, value 268

KV pair: proc 0, sizes 4 4, key 21, value 379

KV pair: proc 0, sizes 4 4, key 22, value 637

KV pair: proc 0, sizes 4 4, key 23, value 5454

KV pair: proc 0, sizes 4 4, key 24, value 1973

KV pair: proc 0, sizes 4 4, key 25, value 489

KV pair: proc 0, sizes 4 4, key 26, value 255

KV pair: proc 0, sizes 4 4, key 27, value 146

KV pair: proc 0, sizes 4 4, key 28, value 90

KV pair: proc 0, sizes 4 4, key 29, value 38

KV pair: proc 0, sizes 4 4, key 30, value 38

KV pair: proc 0, sizes 4 4, key 31, value 15

KV pair: proc 0, sizes 4 4, key 32, value 11

KV pair: proc 0, sizes 4 4, key 33, value 6

KV pair: proc 0, sizes 4 4, key 34, value 12

KV pair: proc 0, sizes 4 4, key 35, value 3

KV pair: proc 0, sizes 4 4, key 36, value 1

KV pair: proc 0, sizes 4 4, key 38, value 1

KV pair: proc 0, sizes 4 4, key 39, value 2

KV pair: proc 0, sizes 4 4, key 41, value 1