In [1]:
```
%config InlineBackend.figure_format = 'retina'
import pandas as pd
import os
```

Benchmarking the System Performance

In [ ]:
```
run_id = 'BP_2Predictors_live_training_Horizon30'
```

In [ ]:
```
os.mkdir(run_id)
```

In [ ]:
```
dir_ = './' + run_id + '/'
```

This Jupyter notebook serves to benchmark the performance of the prototype system.

Loading and importing the system

In [2]:
```
%run ../system/activate.py
```

Loading and importing financial data to forecast and to benchmark the system on

Prophet and Neural prophet training set-up

In [ ]:
```
#training_data = DataLoader('BP', '2010-02-01', '2018-02-01')
#training_data = training_data.get_adjclose()
```

Normal set-up

In [4]:
```
# AlternativeDataLoader data retrievel trough the investpy python library from investing.com
# predict = AlternativeDataLoader('F','United States', '01/02/2018', '01/05/2018', 'stock')
# predict = AlternativeDataLoader('S&P 500','United States', '01/02/2018', '01/05/2018', 'index')
# predict = AlternativeDataLoader('BP','United States', '01/02/2018', '01/05/2018', 'stock')
# predict = predict.get_close()


predict = DataLoader('BP', '2018-02-01', '2018-05-01')
predict = predict.get_adjclose()
```

```
[**********************100%**********************]  1 of 1 completed
```

In [5]:
```
predict_req, real = data_prep(predict, 20, 30) # dividing data into predictor input and real data
```

Individual predictor forecasts

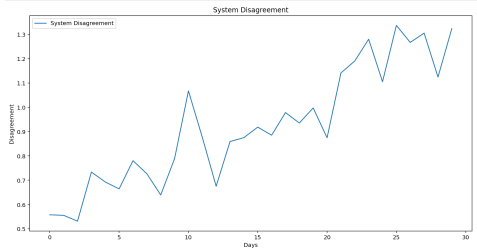
In [6]:
```
individual_predictors_forecasts = individual_predictors_pretrained_BP_30_5(predict_req, 30)
```

```
WARNING:tensorflow:5 out of the last 5 calls to <function Model.make_predict_function.<locals>.predict_function at 0x000002047921379> triggered tf.function retracing. Tracing is expensive and the excessive number of tracings could be due to (1) creating @tf.function repeatedly in a loop, (2) passing tensors with different shapes, (3) passing Python objects instead of tensors. For (1), please define your @tf.function outside of the loop. For (2), @tf.function has experimental_relax_shapes=True option that relaxes argument shapes that can avoid unnecessary retracing. For (3), please refer to https://www.tensorflow.org/tutorials/customization/performance#python_or_tensor_args and https://www.tensorflow.org/api_docs/python/tf/function for  more details.
```

In [ ]:
```
#individual_predictors_forecasts = individual_predictors_template2(training_data, 30)
```

System disagreement between individual predictor forecasts

In [7]:
```
system_disagreement(individual_predictors_forecasts)
```



Building consensus forecast values

In [8]:
```
consensus_forecasts = consensus(individual_predictors_forecasts, real)
```

Only using correcting consensus algorithm:

In [ ]:
```
#consensus_forecasts = consensus_optimal(individual_predictors_forecasts, real)
```

In [9]:
```
all_forecasts = combined_frame(individual_predictors_forecasts, consensus_forecasts, real)
```

In [10]:
```
summary = all_stats_frame(all_forecasts, individual_predictors_forecasts) # combining individual predictor forecasts, consensus forecasts and disagreement scores
summary
```

Out[10]:

Date	Average	NoMemory	Memory	Focus	Anchor	Correcting	Correcting Memory	Real Value	LSTM	CNN	MLP	BI-LSTM	CNN-LSTM	System Disagreement	LSTM disagreement score	CNN disagreement score	MLP disagreement score	BI-LSTM disagreement score	CNN-LSTM disagreement score
2018-03-02	32.057995	32.057995	32.057995	32.057995	32.523025	32.057995	32.057995	31.549549	31.623466	31.880047	32.736618	31.471310	32.578533	0.557709	0.495391	0.444075	0.678623	0.586685	0.583772
2018-03-05	32.065960	31.953417	32.009688	31.729818	31.986536	31.557295	31.811627	31.924553	31.729818	31.777794	32.716793	31.445732	32.659660	0.555514	0.449776	0.440181	0.650834	0.620227	0.616554
2018-03-06	32.022451	31.957288	31.967768	31.597425	32.030640	31.882846	31.807039	32.242489	31.517956	31.597425	32.807880	31.849337	32.339657	0.531533	0.504495	0.456813	0.785429	0.406431	0.504495

Date	Average	NoMemory	Memory	Focus	Anchor	Correcting	Correcting Memory	Real Value	LSTM	CNN	MLP	BI-LSTM	CNN-LSTM	System Disagreement	LSTM disagreement score	CNN disagreement score	MLP disagreement score	BI-LSTM disagreement score	CNN-LSTM disagreement score
2018-03-07	32.012259	32.043612	31.972258	32.903393	32.150193	32.232560	31.904189	32.046844	31.784128	31.757584	32.589111	31.027081	32.903393	0.733464	0.541568	0.546877	0.702565	0.985179	0.891133
2018-03-08	31.812527	31.797720	31.773543	31.124746	31.774269	31.848728	31.733468	32.169121	31.124746	31.592314	32.631039	31.198761	32.515774	0.692736	0.687780	0.564661	0.818512	0.643372	0.749353
2018-03-09	31.950656	32.004453	31.932180	32.786556	32.035747	32.310114	31.944751	32.332169	31.580156	31.640572	32.550377	31.195620	32.786556	0.664335	0.524314	0.512231	0.694193	0.755037	0.835900
2018-03-12	31.626331	31.700479	31.614635	32.589863	31.746764	32.002638	31.673673	32.487061	30.841606	31.352814	32.589863	30.983175	32.364197	0.780406	0.784725	0.625856	0.963532	0.699783	0.828132
2018-03-13	31.628548	31.747339	31.634263	32.658768	31.796463	32.490786	31.778594	32.242489	30.952255	31.415283	32.658768	30.993832	32.122601	0.726687	0.676292	0.567056	1.030220	0.651347	0.708520
2018-03-14	31.546650	31.622090	31.559809	31.965233	31.623198	32.160704	31.748977	31.688131	31.002180	31.358593	32.461731	30.945511	31.965233	0.639279	0.567137	0.495855	0.915081	0.601139	0.617183
2018-03-15	31.525586	31.548476	31.543126	32.305202	31.583087	31.665548	31.720125	31.818569	30.494377	31.470905	32.323750	31.033695	32.305202	0.788840	1.031209	0.620176	0.798164	0.707618	0.787035
2018-03-16	31.626559	31.707968	31.653871	31.343279	31.858671	31.915399	31.826004	32.185429	30.512856	31.343279	32.967461	30.773546	32.535656	1.067411	1.113704	0.843343	1.340901	0.957290	1.081818
2018-03-19	31.356893	31.441041	31.387309	32.143757	31.363830	31.916536	31.587692	31.590307	30.319023	31.342659	32.317341	30.661686	32.143757	0.876593	1.037870	0.696078	0.960448	0.832272	0.856297
2018-03-20	31.465942	31.497974	31.482564	31.139688	31.426624	31.706601	31.702513	31.826719	30.483341	31.139688	32.122837	31.502970	32.080875	0.675229	0.982601	0.588793	0.656895	0.516137	0.631718
2018-03-21	31.341715	31.464986	31.374109	32.067471	31.535598	31.697884	31.582528	32.715321	30.100700	31.094524	32.299019	31.146860	32.067471	0.859133	1.241014	0.644720	0.957304	0.634253	0.818375
2018-03-22	31.252287	31.362438	31.293492	32.075035	31.499334	32.622329	31.567057	31.818569	30.128309	31.047598	32.075035	30.789753	32.220741	0.875223	1.123978	0.675543	0.881030	0.727112	0.968454
2018-03-23	31.080245	31.193901	31.130309	31.689701	31.238644	31.643388	31.408890	31.891941	30.044018	31.119741	31.689701	30.318882	32.228882	0.918488	1.036227	0.711137	0.825129	0.871309	1.148637
2018-03-26	31.116398	31.252966	31.169557	31.899099	31.218937	31.929637	31.473795	32.951744	30.225798	31.160625	31.899099	30.183403	32.113064	0.885220	0.907558	0.720592	0.868287	0.932995	0.996666
2018-03-27	31.178338	31.273386	31.237885	32.519054	31.627690	33.015941	31.617862	32.584892	30.192274	31.132256	31.754568	30.293539	32.519054	0.978334	0.986064	0.757562	0.882024	0.925305	1.340716
2018-03-28	30.816196	30.947747	30.880984	31.933893	31.030171	32.207245	31.301695	32.283257	29.787560	31.183582	31.364401	29.811543	31.933893	0.935284	1.028636	0.739838	0.776002	1.014246	1.117698
2018-03-29	30.914125	31.040578	30.984008	32.124378	31.259434	32.386250	31.449929	33.049572	29.582930	31.119732	31.447124	30.296463	32.124378	0.997369	1.331196	0.738422	0.803901	0.903076	1.210253
2018-04-02	30.941407	31.017530	30.998582	31.688742	31.253734	33.083454	31.555980	32.535973	29.552906	30.782200	31.832544	30.850641	31.688742	0.874531	1.388501	0.650924	0.891138	0.637236	0.804856
2018-04-03	30.873331	30.994473	30.954268	31.642401	31.333478	32.460605	31.526010	33.188171	29.364607	30.847815	31.642401	30.268072	32.243759	1.141221	1.508724	0.850696	1.009613	0.966645	1.370428
2018-04-04	30.833676	30.947730	30.919701	32.312386	31.290732	33.144441	31.556393	33.449039	29.486235	30.819382	31.670305	29.880072	32.312386	1.190806	1.347441	0.923277	1.093462	1.111139	1.478710
2018-04-05	30.697345	30.809799	30.791249	32.207317	31.269293	33.298956	31.494202	34.174595	28.899019	30.798977	31.482540	30.098873	32.207317	1.280042	1.798326	0.938393	1.075106	1.078414	1.509972
2018-04-06	30.622324	30.703797	30.703442	31.916775	31.194879	34.096999	31.527841	34.044163	28.962044	30.738535	31.246233	30.248035	31.916775	1.105226	1.660281	0.790586	0.892125	0.888686	1.294450
2018-04-09	30.539360	30.623273	30.637005	31.984367	31.226203	33.946326	31.532984	33.962635	28.856272	30.525694	31.715170	29.615295	31.984367	1.336971	1.683088	1.045594	1.283489	1.227674	1.445008
2018-04-10	30.769633	30.865348	30.854888	31.803997	31.420704	34.223707	31.863706	34.875694	29.450188	30.439219	32.389729	29.765036	31.803997	1.266887	1.319446	0.995700	1.620095	1.130537	1.268656
2018-04-11	30.472913	30.547651	30.569338	31.417479	31.219012	34.541549	31.661917	35.103962	28.826012	30.760849	31.417479	29.442587	31.917637	1.305303	1.646901	1.013303	1.144629	1.276956	1.444724
2018-04-12	30.449667	30.512887	30.531574	31.662251	31.185459	35.084633	31.760243	35.103962	28.995661	30.588392	31.348377	29.653656	31.662251	1.124464	1.454007	0.872262	1.024259	1.059209	1.212583
2018-04-13	30.489672	30.551635	30.580917	31.532991	31.434076	35.144562	31.909419	35.022434	28.782688	30.535643	31.968452	29.628588	31.532991	1.324149	1.706984	1.018034	1.478780	1.199445	1.217503

In [ ]:
```
summary.to_csv(dir_ + run_id + '_Forecast_Summary.csv')
```

Absolute error analysis of individual predictors and consensus forecasts

In [11]:
```
prediction_error = absolute_error_analytics(individual_predictors_forecasts, consensus_forecasts, real)
prediction_error
```

Out[11]:

Date	LSTM absolute error	CNN absolute error	MLP absolute error	BI-LSTM absolute error	CNN-LSTM absolute error	Average absolute error	NoMemory absolute error	Memory absolute error	Focus absolute error	Anchor absolute error	Correcting absolute error	Correcting Memory absolute error	LSTM disagreement score	CNN disagreement score	MLP disagreement score	BI-LSTM disagreement score	CNN-LSTM disagreement score	System Disagreement
2018-03-02	0.073917	0.330498	1.187069	0.078239	1.028984	0.508446	0.508446	0.508446	0.508446	0.973476	0.508446	0.508446	0.495391	0.444075	0.678623	0.586685	0.583772	0.557709
2018-03-05	0.194735	0.146759	0.792240	0.478821	0.735107	0.141407	0.028864	0.085135	0.194735	0.061983	0.367258	0.112926	0.449776	0.440181	0.650834	0.620227	0.616554	0.555514
2018-03-06	0.724533	0.645063	0.565392	0.393152	0.097168	0.220038	0.285200	0.274721	0.645063	0.211849	0.359643	0.435450	0.504495	0.456813	0.785429	0.406431	0.504495	0.531533
2018-03-07	0.262716	0.289261	0.542267	1.019764	0.856548	0.034585	0.003233	0.074587	0.856548	0.103348	0.185716	0.142656	0.541568	0.546877	0.702565	0.985179	0.891133	0.733464
2018-03-08	1.044374	0.576807	0.461918	0.970360	0.346653	0.356594	0.371400	0.395578	1.044374	0.394852	0.320393	0.435652	0.687780	0.564661	0.818512	0.643372	0.749353	0.692736
2018-03-09	0.752012	0.691597	0.218208	1.136549	0.454388	0.381512	0.327715	0.399988	0.454388	0.296421	0.022054	0.387418	0.524314	0.512231	0.694193	0.755037	0.835900	0.664335
2018-03-12	1.645454	1.134247	0.102802	1.503885	0.122864	0.860730	0.786582	0.872425	0.102802	0.740297	0.484423	0.813388	0.784725	0.625856	0.963532	0.699783	0.828132	0.780406
2018-03-13	1.290234	0.827206	0.416279	1.248657	0.119888	0.613941	0.495150	0.608226	0.416279	0.446026	0.248298	0.463895	0.676292	0.567056	1.030220	0.651347	0.708520	0.726687
2018-03-14	0.685951	0.329538	0.773600	0.742620	0.277102	0.141482	0.066041	0.128322	0.277102	0.064933	0.472573	0.060846	0.567137	0.495855	0.915081	0.601139	0.617183	0.639279
2018-03-15	1.324192	0.347664	0.505180	0.784874	0.486633	0.292983	0.270093	0.275443	0.486633	0.235482	0.153021	0.098444	1.031209	0.620176	0.798164	0.707618	0.787035	0.788840
2018-03-16	1.672573	0.842150	0.782032	1.411882	0.350227	0.558869	0.477461	0.531558	0.842150	0.326758	0.270030	0.359425	1.113704	0.843343	1.340901	0.957290	1.081818	1.067411
2018-03-19	1.271284	0.247648	0.727034	0.928621	0.553450	0.233414	0.149266	0.202999	0.553450	0.226477	0.326228	0.002616	1.037870	0.696078	0.960448	0.832272	0.856297	0.876593
2018-03-20	1.343378	0.687031	0.296118	0.323750	0.254156	0.360777	0.328745	0.344155	0.687031	0.400095	0.120118	0.124206	0.982601	0.588793	0.656895	0.516137	0.631718	0.675229
2018-03-21	2.614620	1.620796	0.416302	1.568460	0.647850	1.373606	1.250334	1.341212	0.647850	1.179722	1.017436	1.132792	1.241014	0.644720	0.957304	0.634253	0.818375	0.859133
2018-03-22	1.690260	0.770971	0.256466	1.028816	0.402172	0.566282	0.456131	0.525077	0.256466	0.319235	0.803760	0.251512	1.123978	0.675543	0.881030	0.727112	0.968454	0.875223
2018-03-23	1.847923	0.772200	0.202240	1.573059	0.336941	0.811696	0.698040	0.761632	0.202240	0.653297	0.248553	0.483051	1.036227	0.711137	0.825129	0.871309	1.148637	0.918488
2018-03-26	2.725946	1.791119	1.052645	2.768341	0.838680	1.835346	1.698778	1.782187	1.052645	1.732807	1.022107	1.477949	0.907558	0.720592	0.868287	0.932995	0.996666	0.885220
2018-03-27	2.392618	1.452637	0.830324	2.291353	0.065838	1.406554	1.311506	1.347008	0.065838	0.957203	0.431048	0.967030	0.986064	0.757562	0.882024	0.925305	1.340716	0.978334
2018-03-28	2.495697	1.099674	0.918856	2.471714	0.349363	1.467061	1.335509	1.402273	0.349363	1.253086	0.076011	0.981562	1.028636	0.739838	0.776002	1.014246	1.117698	0.935284
2018-03-29	3.466642	1.929840	1.602448	2.753109	0.925194	2.135447	2.008994	2.065564	0.925194	1.790138	0.663322	1.599643	1.331196	0.738422	0.803901	0.903076	1.210253	0.997369
2018-04-02	2.983067	1.753773	0.703428	1.685331	0.847231	1.594566	1.518443	1.537391	0.847231	1.282238	0.547481	0.979993	1.388501	0.650924	0.891138	0.637236	0.804856	0.874531
2018-04-03	3.823565	2.340357	1.545771	2.920099	0.944412	2.314841	2.193699	2.233903	1.545771	1.854693	0.727566	1.662162	1.508724	0.850696	1.009613	0.966645	1.370428	1.141221
2018-04-04	3.962805	2.629658	1.778734	3.568968	1.136654	2.615364	2.501309	2.529338	1.136654	2.158307	0.304599	1.892646	1.347441	0.923277	1.093462	1.111139	1.478710	1.190806
2018-04-05	5.275576	3.375618	2.692055	4.075722	1.967278	3.477250	3.364796	3.383346	1.967278	2.905302	0.875639	2.680393	1.798326	0.938393	1.075106	1.078414	1.509972	1.280042

Date	LSTM absolute error	CNN absolute error	MLP absolute error	BI-LSTM absolute error	CNN-LSTM absolute error	Average absolute error	NoMemory absolute error	Memory absolute error	Focus absolute error	Anchor absolute error	Correcting absolute error	Correcting Memory absolute error	LSTM disagreement score	CNN disagreement score	MLP disagreement score	BI-LSTM disagreement score	CNN-LSTM disagreement score	System Disagreement
2018-04-06	5.082119	3.305628	2.797930	3.796127	2.127388	3.421838	3.340366	3.340721	2.127388	2.849284	0.052836	2.516322	1.660281	0.790586	0.892125	0.888686	1.294450	1.105226
2018-04-09	5.106363	3.436941	2.247465	4.347340	1.978268	3.423275	3.339362	3.325630	1.978268	2.736432	0.016309	2.429651	1.683088	1.045594	1.283489	1.227674	1.445008	1.336971
2018-04-10	5.425507	4.436476	2.485966	5.110659	3.071697	4.106061	4.010346	4.020806	3.071697	3.454991	0.651988	3.011988	1.319446	0.995700	1.620095	1.130537	1.268656	1.266887
2018-04-11	6.277950	4.343113	3.686483	5.661375	3.186325	4.631049	4.556311	4.534624	3.686483	3.884949	0.562413	3.442045	1.646901	1.013303	1.144629	1.276956	1.444724	1.305303
2018-04-12	6.108301	4.515570	3.755585	5.450306	3.441711	4.654295	4.591075	4.572388	3.441711	3.918503	0.019329	3.343719	1.454007	0.872262	1.024259	1.059209	1.212583	1.124464
2018-04-13	6.239746	4.486792	3.053982	5.393847	3.489443	4.532762	4.470799	4.441517	3.489443	3.588358	0.122128	3.113016	1.706984	1.018034	1.478780	1.199445	1.217503	1.324149

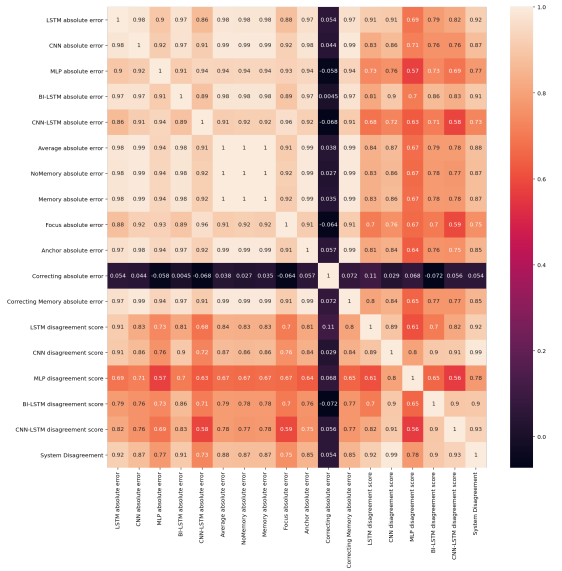
In [ ]:
```
prediction_error.to_csv(dir_ + run_id + '_Prediction_Errors.csv')
```

Correlation matrix of individual predictor and consensus forecast absolute errors

In [12]:
```
correlation_ = correlation(prediction_error, True)
correlation_
```

Out[12]:

	LSTM absolute error	CNN absolute error	MLP absolute error	BI-LSTM absolute error	CNN-LSTM absolute error	Average absolute error	NoMemory absolute error	Memory absolute error	Focus absolute error	Anchor absolute error	Correcting absolute error	Correcting Memory absolute error	LSTM disagreement score	CNN disagreement score	MLP disagreement score	BI-LSTM disagreement score	CNN-LSTM disagreement score	System Disagreement
LSTM absolute error	1.000000	0.979551	0.896150	0.971669	0.862986	0.984193	0.982053	0.982849	0.878228	0.967329	0.054019	0.969309	0.910768	0.907563	0.687235	0.785409	0.819510	0.919860
CNN absolute error	0.979551	1.000000	0.915344	0.974770	0.912816	0.992493	0.993104	0.993340	0.920793	0.983014	0.043673	0.988562	0.827500	0.864083	0.712537	0.760654	0.759198	0.870832
MLP absolute error	0.896150	0.915344	1.000000	0.909202	0.938706	0.936876	0.940665	0.937520	0.926633	0.942741	-0.057524	0.935442	0.734994	0.760377	0.569030	0.734964	0.689558	0.774950
BI-LSTM absolute error	0.971669	0.974770	0.909202	1.000000	0.885733	0.981889	0.979587	0.981567	0.892225	0.967180	0.004451	0.974340	0.812864	0.902575	0.704271	0.864869	0.833308	0.907625
CNN-LSTM absolute error	0.862986	0.912816	0.938706	0.885733	1.000000	0.914990	0.920294	0.917275	0.963495	0.923040	-0.067956	0.908204	0.682523	0.724571	0.628291	0.706988	0.582339	0.731748
Average absolute error	0.984193	0.992493	0.936876	0.981889	0.914990	1.000000	0.999554	0.999842	0.911356	0.994327	0.038417	0.993847	0.838619	0.866715	0.669158	0.785270	0.782807	0.877028
NoMemory absolute error	0.982053	0.993104	0.940665	0.979587	0.920294	0.999554	1.000000	0.999794	0.918783	0.994873	0.027313	0.994404	0.833218	0.861212	0.667175	0.778546	0.773518	0.870480
Memory absolute error	0.982849	0.993340	0.937520	0.981567	0.917275	0.999842	0.999794	1.000000	0.915370	0.994753	0.035221	0.994909	0.833530	0.862882	0.669217	0.782151	0.777382	0.872846
Focus absolute error	0.878228	0.920793	0.926633	0.892225	0.963495	0.911356	0.918783	0.915370	1.000000	0.914544	-0.063873	0.910262	0.702629	0.755829	0.665779	0.700347	0.591173	0.751256
Anchor absolute error	0.967329	0.983014	0.942741	0.967180	0.923040	0.994327	0.994873	0.994753	0.914544	1.000000	0.056520	0.993606	0.811640	0.837127	0.635544	0.764827	0.752932	0.845978
Correcting absolute error	0.054019	0.043673	-0.057524	0.004451	-0.067956	0.038417	0.027313	0.035221	-0.063873	0.056520	1.000000	0.072376	0.107108	0.029128	0.067996	-0.072407	0.055867	0.053714
Correcting Memory absolute error	0.969309	0.988562	0.935442	0.974340	0.908204	0.993847	0.994404	0.994909	0.910262	0.993606	0.072376	1.000000	0.803558	0.838540	0.650122	0.766514	0.766491	0.849927
LSTM disagreement score	0.910768	0.827500	0.734994	0.812864	0.682523	0.838619	0.833218	0.833530	0.702629	0.811640	0.107108	0.803558	1.000000	0.889117	0.610233	0.704192	0.817639	0.916837
CNN disagreement score	0.907563	0.864083	0.760377	0.902575	0.724571	0.866715	0.861212	0.862882	0.755829	0.837127	0.029128	0.838540	0.889117	1.000000	0.800119	0.900638	0.906293	0.990666
MLP disagreement score	0.687235	0.712537	0.569030	0.704271	0.628291	0.669158	0.667175	0.669217	0.665779	0.635544	0.067996	0.650122	0.610233	0.800119	1.000000	0.652398	0.563753	0.775197
BI-LSTM disagreement score	0.785409	0.760654	0.734964	0.864869	0.706988	0.785270	0.778546	0.782151	0.700347	0.764827	-0.072407	0.766514	0.704192	0.900638	0.652398	1.000000	0.898676	0.902052
CNN-LSTM disagreement score	0.819510	0.759198	0.689558	0.833308	0.582339	0.782807	0.773518	0.777382	0.591173	0.752932	0.055867	0.766491	0.817639	0.906293	0.563753	0.898676	1.000000	0.930231
System Disagreement	0.919860	0.870832	0.774950	0.907625	0.731748	0.877028	0.870480	0.872846	0.751256	0.845978	0.053714	0.849927	0.916837	0.990666	0.775197	0.902052	0.930231	1.000000



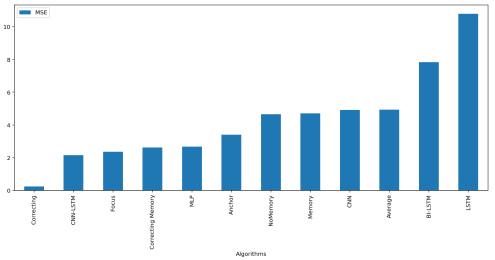
In [ ]:
```
correlation_.to_csv(dir_ + run_id + '_Error_Correlation.csv')
```

MSE, MSE log and MAE scores

In [13]:
```
mse = mse_score(all_forecasts, True)
mse
```

Out[13]:

	Algorithms	MSE
0	Average	4.934070
1	NoMemory	4.649479
2	Memory	4.699642
3	Focus	2.370033
4	Anchor	3.401336
5	Correcting	0.242160
6	Correcting Memory	2.619783
7	LSTM	10.788967
8	CNN	4.920770
9	MLP	2.668088
10	BI-LSTM	7.840129
11	CNN-LSTM	2.156903

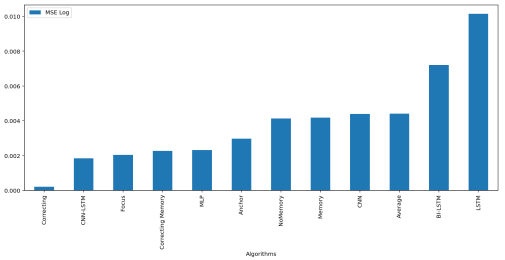


In [ ]:
```
mse.to_csv(dir_ + run_id + '_MSE_score.csv')
```

In [14]:
```
mse_log = mse_log_score(all_forecasts, True)
mse_log
```

Out[14]:

	Algorithms	MSE Log
0	Average	0.004408
1	NoMemory	0.004139
2	Memory	0.004186
3	Focus	0.002043
4	Anchor	0.002981
5	Correcting	0.000213
6	Correcting Memory	0.002271
7	LSTM	0.010153
8	CNN	0.004395
9	MLP	0.002314
10	BI-LSTM	0.007209
11	CNN-LSTM	0.001849

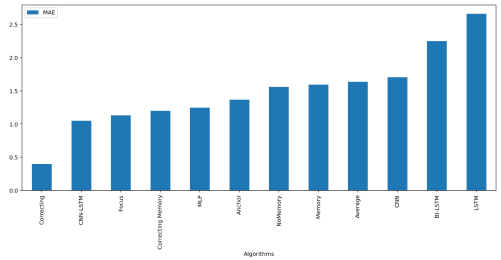


In [ ]:
```
mse_log.to_csv(dir_ + run_id + '_MSE_log_score.csv')
```

In [15]:
```
mae = mae_score(all_forecasts, True)
mae
```

Out[15]:

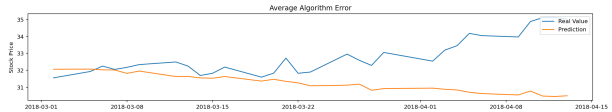
	Algorithms	MAE
0	Average	1.635736
1	NoMemory	1.558133
2	Memory	1.594873
3	Focus	1.128684
4	Anchor	1.366685
5	Correcting	0.399358
6	Correcting Memory	1.197028
7	LSTM	2.660135
8	CNN	1.705221
9	MLP	1.246561
10	BI-LSTM	2.249527
11	CNN-LSTM	1.047987

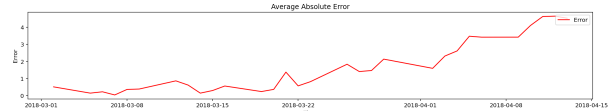


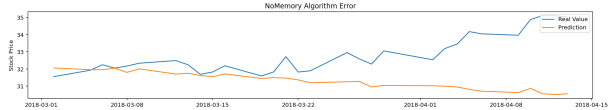
In [ ]:
```
mae.to_csv(dir_ + run_id + '_MAE_score.csv')
```

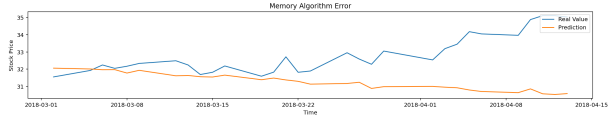
Performance plotting of all forecasting algorithms

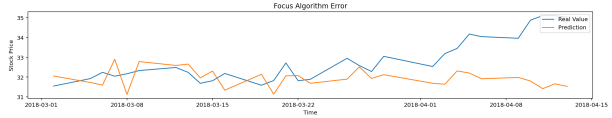
In [16]:
```
plot_performance(all_forecasts)
```

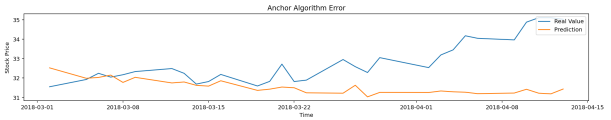


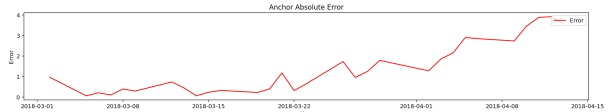


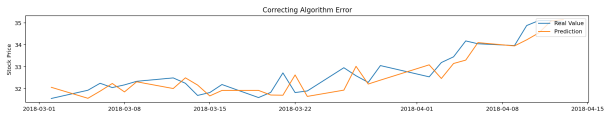


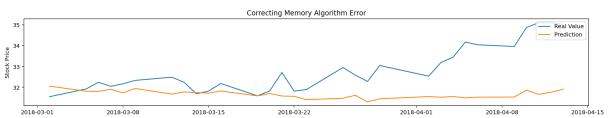


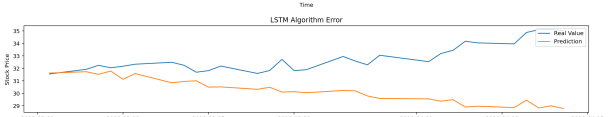


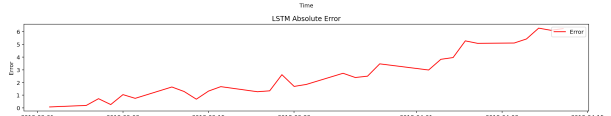


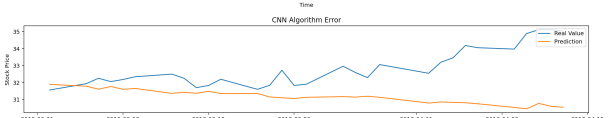


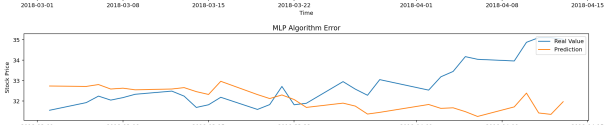


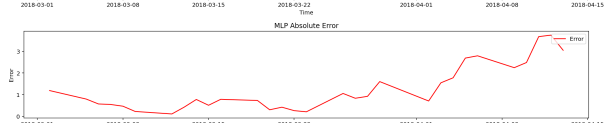


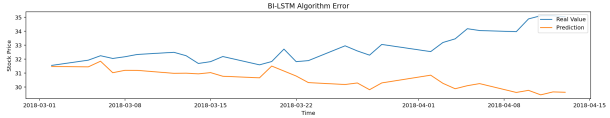


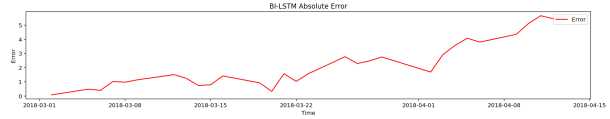


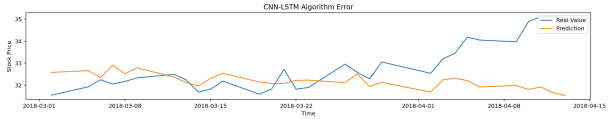


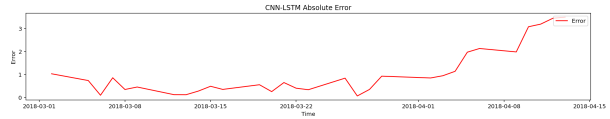





Bi-LSTM Algorithm Error
Real Value
Prediction
Stock Price
Time


Bi-LSTM Absolute Error
Error
Error
Time


CNN-LSTM Algorithm Error
Real Value
Prediction
Stock Price
Time


CNN-LSTM Absolute Error
Error
Error
Time