Predictions in Financial Time Series

Allan Steel

Institute of Technology Blanchardstown

allan@allansteel.com

June 4, 2014

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Data

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- UK, Germany, France, US, Japan, Australia

OHLC Data

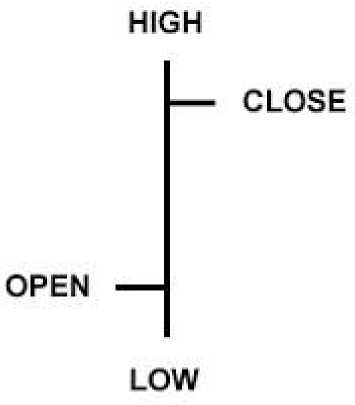

Figure: A schematic representation of open, high, low and closing prices (OHLC)

German Dax

Table: Final 6 rows of the Dax data set

Date	Open	High	Low	Close
13/12/2013	9017	9047	8991	9006
16/12/2013	9005	9188	8998	9164
17/12/2013	9143	9162	9085	9085
18/12/2013	9145	9191	9122	9182
19/12/2013	9280	9352	9257	9336
20/12/2013	9371	9413	9353	9400

German Dax Summary Statistics

Table: Summary statistics of the Dax data set.

Statistic	N	Mean	St. Dev	Min	Max
Open	3,621	5,858.36	1,559.40	2,203.97	9,752.11
High	3,621	5,906.70	1,561.17	2,319.65	9,794.05
Low	3,621	5,804.85	1,557.49	2,188.75	9,714.02
Close	3,621	5,857.74	1,559.39	2,202.96	9,742.96

German Dax 2000 to 2013

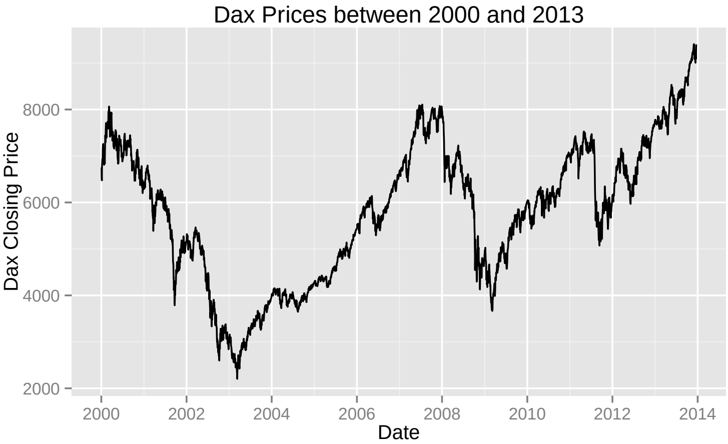

Figure: Graph of German Dax in 2013.

Technical Analysis

Technical Analysis

- Technical analysis is the study of historical prices
- Practitioners of technical analysis in the past were referred to as chartists
- all that was needed to know about a particular market was contained in its pricing chart

“Obviously I am biased against the chartist. This is not only a personal predilection, but a professional one as well. Technical Analysis is anathema to the academic world. We love to pick on it. Our bullying tactics are prompted by two considerations: (1) the method is patently false; and (2) it’s easy to pick on. And while it may seem a bit unfair to pick on such a sorry target, just remember: it is your money we are trying to save.”

Malkiel, B.G. (1999)
A Random Walk Down Wall Street: Including a Life-cycle Guide to Personal Investing

Technical Indicators

- Moving Average Convergence Divergence (MACD)
- Aroon
- Stochastic
- Rate of Change (ROC)
- Candlesticks

Moving Average Convergence Divergence (MACD)

Time Series

Time Series

- ARIMA
- Hybrid ARIMA

ARIMA

- Plot the data to get a general feel for the time series and to establish if it is stationary.
- Stabilize any variance in the data with a transformation process such as the Box-Cox method.
- Arima models work with stationary data, so if necessary, take differences of the data until it is stationary.
- Examine the auto-correlation and partial auto-correlation (ACF/PACF) plots in order to determine if an AR(p) or MA(q) model is appropriate.
- Test the chosen model(s), using the AICc to determine if a better model is available.
- Check the residuals from the best model by plotting the ACF, and doing a portmanteau test on them. If the results from these tests do not look like white noise, a modified model may be required.
- Finally, once the residuals have a similar pattern to white noise, the model can be used to generate forecasts.

Results

Results - Baseline Buy and Hold

Table: Naive Long System changed such that the trading period is the previous close price minus today's close.

Mkt	LongPL	L Win %	Av L PL
Dax	2649	53	1
CAC	-1667	51	0
F100	86	51	0
Dow	5219	53	1
Nik	-2712	51	-1
Oz	2229	53	1

Results - Baseline Daily Reversal

Table: Naive system which reverses the previous day's trade direction.

Mkt	LongPL	ShortPL	L Win %	Av L PL	S Win %	Av S PL
Dax	947	3131	53	1	49	2
CAC	940	7810	53	1	53	4
F100	4284	4115	53	3	50	2
Dow	15799	6047	56	10	49	3
Nik	2324	20486	51	1	54	12
Oz	1264	237	53	1	48	0

Results - Aroon Technical Indicator

Table: Aroon trend indicator.

Mkt	LongPL	ShortPL	L Win %	Av L PL	S Win %	Av S PL
Dax	5308	5257	56	3	51	4
CAC	-1638	4919	50	-1	52	4
F100	3042	5715	52	2	51	5
Dow	12131	3811	55	7	49	3
Nik	-4852	12013	49	-3	52	10
Oz	3735	3540	55	2	50	3

Results - Break-out Indicator

Table: Results from Daily High / Low Breakout System.

Mkt	LongPL	ShortPL	L Win %	Av L PL	S Win %	Av S PL
Dax	21073	21229	58	11	56	13
CAC	14252	20176	58	8	59	12
F100	13239	18614	59	7	59	12
Dow	-19355	-27334	42	-11	38	-17
Nik	74600	81645	64	44	64	49
Oz	19347	21244	67	11	65	14

Results - ARIMA

Table: Auto.arima models passed to the System 1 trading algorithm

Mkt	LongPL	ShortPL	L Win %	Av L PL	S Win %	Av S PL
Dax	-644	-1881	50	-3	41	-7
CAC	1555	850	59	6	51	3
F100	531	-708	53	2	46	-2
Dow	3130	-1766	58	14	48	-6
Nik	41	-1157	48	0	45	-5
Oz	679	-204	55	3	49	-1

Results - Hybrid ARIMA / knn

Table: Predicting Close Price - Arima/knn predictions passed to System 1

Mkt	LongPL	ShortPL	L Win %	Av L PL	S Win %	Av S PL
Dax	8270	9900	56	4	52	6
CAC	6284	12597	54	3	55	7
FTSE	17605	17026	58	9	56	10
Dow	30330	20549	59	17	53	12
Nik	15374	33366	54	9	57	20
AORD	7658	6638	57	4	53	4

Results - Hybrid ARIMA / knn Categorical

Table: Predicting UpDn CAT - Arima/knn predictions passed to System 4

Mkt	LongPL	ShortPL	L Win %	Av L PL	S Win %	Av S PL
Dax	15692	17357	61	8	60	12
CAC	10161	16587	60	6	59	9
FTSE	15553	14960	60	8	60	10
Dow	30347	20624	62	14	60	15
Nik	27206	45031	60	18	60	24
AORD	9711	8751	60	5	59	6

Table: Predicting UpDn 01 - Arima/knn predictions passed to System 3

Mkt	LongPL	ShortPL	L Win %	Av L PL	S Win %	Av S PL
Dax	15692	17357	61	8	60	12
CAC	10161	16587	60	6	59	9
FTSE	15553	14960	60	8	60	10
Dow	30347	20624	62	14	60	15
Nik	27206	45031	60	18	60	24
AORD	9711	8751	60	5	59	6

The End