

Performance of candlestick patterns on intraday market data

Intermediate presentation



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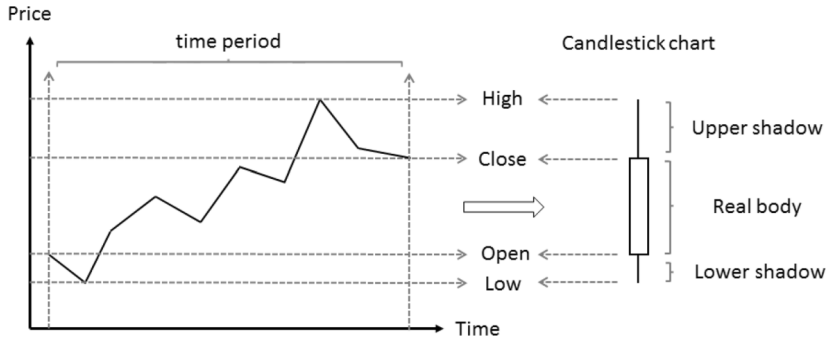
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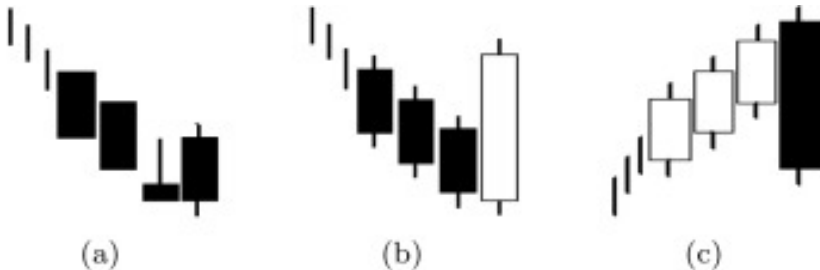
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Candlestick construction



Construction of a candlestick [1].

Candlestick pattern examples



(a) "Concealing Baby Swallow" (b) "Three-Line Strike, Bearish"
(c) "Three-Line Strike, Bullish" [2]

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Data sets

BND	Bonds
GLD	Gold
QQQ	Stocks
SPY	Stocks

Overview of the data sets.

Data handling/preprocessing

- Filtering pre/after-market
- Missing data → interpolation
- Aggregation
- Splitting of the data set

Calibration

	Doji	Short	Normal	Tall	Extremely tall
Real body	[0 – 10)	[10 – 30)	[30 – 70)	[70 – 100]	
Shadow	[0 – 10)	[10 – 30)	[30 – 70)	[70 – 90)	[90 – 100]

Percentiles of real bodies and shadows [3].

Calculated as $|O - C|$, $H - \max\{O, C\}$, $\min\{O, C\} - L$.

Calibration

- Assumes length and color candle independent.
- Has to be checked → Kolmogorov-Smirnov test.

$$H_0 : W = B \quad H_1 : W \neq B.$$

Reject at 5% significance.

Trend

- Simple method to start: $MA(C_i, \dots, C_{i+5})$ monotonically increasing/decreasing 7 times.

Prediction

- Typically classified as buy/sell signal.
- Evaluated according to prediction.

Evaluation

- Buy/sell after pattern is detected.
- Make use of stop loss/take profit margins.
- Binomial test for winning rate.

$$H_0 : \pi = 0.5$$

$$H_1 : \pi > 0.5$$

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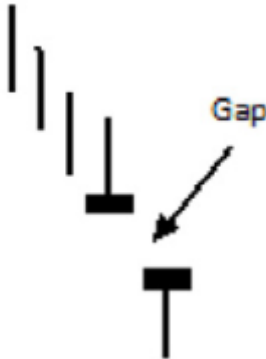
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Detection results

- Not many “gapping” patterns.
- Some are rare due to stringent conditions.
- 103 → 63 patterns.



BND results

- No significant sell signals.
- Almost everything significant buy signal.

GLD results

- Quite similar to BND.
- Some significant sell signals.

QQQ results

- Again no significant sell signals.
- Level of significance lower than previous data sets.
- Some pattern behave the opposite now.

SPY results

- Results similar to QQQ, indicates that results depend on asset type.
- Though not exactly the same, significance lost or gained.

Conclusion

- Candlestick patterns appear to possess some significant predictive power.
- More buy than sell signals.
- Some patterns behave like the theory, some against it.
- Aggregation has little influence.

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- Test different trend definitions, play with parameters.
- New methods of evaluation.
- Combinations with other aspects of technical analysis.
- Fuzzy approach.
- (Machine learning approach)

- [1] Jun-Hao Chen and Yun-Cheng Tsai. “Encoding candlesticks as images for pattern classification using convolutional neural networks”. In: Financial Innovation 6.1 (June 4, 2020). DOI: [10.1186/s40854-020-00187-0](https://doi.org/10.1186/s40854-020-00187-0). URL: <http://dx.doi.org/10.1186/s40854-020-00187-0>.
- [2] Weilong Hu et al. “A formal approach to candlestick pattern classification in financial time series”. In: Applied Soft Computing 84 (Nov. 2019), p. 105700. DOI: [10.1016/j.asoc.2019.105700](https://doi.org/10.1016/j.asoc.2019.105700). URL: <http://dx.doi.org/10.1016/j.asoc.2019.105700>.
- [3] Stefan Etschberger et al. “The classification of candlestick charts: laying the foundation for further empirical research”. In: From Data and Information Analysis to Knowledge Engineering: I Springer. 2006, pp. 526–533.

Questions?