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LUND UNIVERSITY FINANCE SOCIETY EST 1991

TRADING & QUANTITATIVE RESEARCH REPORT

DOUBLE TOPS & DOUBLE BOTTOMS

Finding and utilizing the occurrence of double tops and double bottoms

In collaboration with:

VALID ALPHA

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INTRODUCTION, THEORY AND DATA

Introduction

The project aims towards finding a profitable trading strategy based on the double top and bottom pattern. Based on historical data it is analyzed whether the implemented strategies can generate positive returns. The patterns are recognized and the trades will be executed using our own code. To analyze these patterns, we use technical trade theory to decide how to trade currencies when the patterns is recognized. Fundamental data is not considered as the approach is based on price data. Intuitively, a double top would indicates a future downward trend, while a double bottom is expected to lead to a future upward movement. Therefore, in order to gain positive returns, a long position is entered when a double bottom is recognized and a short position is entered whenever a double top is recognized. In collaboration with Valid Alpha, and based on last years "Analysing the occurrence and after effect of reversal chart patterns"- report[1], we will analyze whether this theory holds, and if there are trading strategies that can exploit it.

Theory

For many technical analysts the trade price is the most important indicator when it comes to finding trading opportunities. Fundamental analysts examine the value of a security by looking at firms' individual factors for stocks as well as macroeconomic factors like inflation. In contrast to that, a technical analyst is called a technical analyst because the price fluctuation is the most important factor he or she considers for their trading. A rising stock price could for example imply that many people are expecting the stock to increase in value. One of the areas of technical analysis is recognizing patterns in the price chart. On the one hand, candlesticks can form triangles, rectangles and pennants. These patterns indicate a pause in trend movements while the previous trend is expected to continue after a confirmatory breakout of the pattern. On the other hand, candlesticks can form formations like Shoulder-Head-Shoulder and Double Tops or Double Bottoms which are expected to indicate the end of a trend. All these patterns are based on the hypothesis that trends exist and oppose the efficient market theory which assume that all asset prices are rationally valued based on the available information. In addition, the weak form of the market efficiency hypothesis would imply that there is no way to predict the future price of an asset using historical prices. Thus, if this project would show significant positive or negative returns, it would contradict the market efficiency hypothesis and imply that price movements in financial assets are at least partly predictable.

Data

For the research, we use bid/ask prices of the seven most traded currency pairs from 17/10/2017 until 17/10/2020, in one-minute resolution. These pairs are USD/AUD, USD/EUR, USD/GBP, USD/NZD, USD/CAD, USD/JPY, and USD/CHF. Because of decimal places of currency exchange characteristics, 0.01 is used as one pip in USD/JPY, and 0.0001 is one pip for other currency pairs. Besides, the Forex market is closed from 21:00 Friday GMT to 21:00 Sunday GMT every week. During the time, the trade volume is zero, and the price is kept as the last close price. All the price fluctuation created by impacts during the weekend will be aggregated and emerged at the beginning of the next open period. Thus, the close time was removed from the dataset, and Friday end price is linked to Monday start.

[1] Lundh, M. & Portela E. (2020): DOUBLE TOPS AND DOUBLE BOTTOMS, available at: https://linclund.com/2020/04/01/analysing-the-occurrence-and-after-effect-of-reversal-chart-patterns/ [Accessed: 10 March 2021]

DEFINITION AND METHOD

Definition

The double top and double bottom pattern is recognized by using a definition provided by ValidAlpha. The definition is applied to the minute-close-prices in the dataset. Bid-close prices are used to recognize double bottoms, while ask-close prices are used for double tops. Below is a description of a double top. For double bottoms, it is exactly the same but in reversed direction.

1. First top
- Highest price for at least last 7 hours (it is the highest point looking at the past 6 hours and 59 minutes),
- Highest price for at least next 4 hours (it is the highest point looking at the 4 hours after the first top),
- Since the last time the price was equal to the potential first top, the lowest price is at least 25 pips lower than the potential first top. If the potential first top is historically high point, the time period expand from the beginning of the dataset to the potential first top.

2. Second top
- Highest price in the period 4 hours to 48 hours after the first top,
- If the price remains below 2 pips lower than the first top for 4 hours or more. The second top occurs the moment the price is equal to or above 2 pips lower than the first top.
- If the price comes up to 2 pips below the first top within 4 hours (point A), the second top is formed when the price either takes out the first top within 4 hours after point A, or hits 2 pips below the first top after 4 hours after point A,
- Friday end price is linked to Monday start, i.e. the first top and second top can be separated in two weeks.

Method

The double top and double bottom pattern is identified based on the flowchart in the Appendix (see Exhibit 4, Appendix). The double top pattern is used as an example to explain the code. The recognition of the double top pattern starts by recognizing the local extrema throughout the whole dataset. Then, the local extrema that fulfill the requirements for being a extrema for a seven-hour interval before and a four-hour interval after its occurrence, and the price increasing at least 25 pips to the point are recognized as the potential first tops.

If the first top has been identified, the double top pattern is formed when the second top needs to fulfill certain conditions. If the price goes up to two pips below the first top within the first four hours (point A), the second top will be recognized if the price takes out the first top within the four hours after point A, or hits two pips below the first top after 4 hours after point A. The recognition of the second top completes the double top pattern, and initiates the trade.

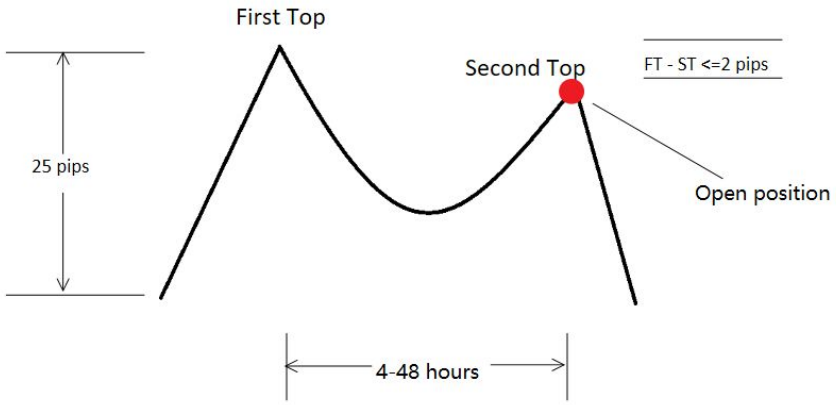

Exhibit 1: A simplified illustration of the definition of a double top. FT refers to 'First top', and ST refers to 'Second top'.

TRADING STRATEGIES

When the second top or bottom is formed, a long position is initiated at the double bottom value , and a short position is initiated at the double top value. The trade is mainly closed based on the strategies defined in the table below. Besides these strategies, a trade will always be closed 5 minutes before the market closes on Friday (20:55 PM CET). We will therefore also exclude double bottoms or double tops which occur after that time. In other words, no position will be initiated or kept between 20:55 Friday GMT and 21:00 Sunday GMT. Similar to the pattern recognition, we use bid close prices to open and close positions for double bottoms, and ask close prices for double tops.

With these strategies we want to test whether a strategy with large targets and narrow stop-loss values (strategy 5) gives better returns than more narrow targets and stop-loss values (strategy 1, 2, 3). Strategy 1 is a simple test used to check whether the pattern can forecast the future trend of the market prices. Strategy 2 and 3 are applied to see whether the results of strategy 1, also applies if we magnify the magnitude of the stop-loss and target values. Lastly, strategy 4 takes into account market volatility to find a suitable target value.

Strategy 1:	The stop-loss value is 10 pips above (below) the double top (bottom) value. The target value is 10 pips below (above) the double top (bottom) value.
Strategy 2:	The stop-loss value is 20 pips above (below) the double top (bottom) value. The target value is 20 pips below (above) the double top (bottom) value.
Strategy 3:	The stop-loss value is 30 pips above (below) the double top (bottom) value. The target value is 30 pips below (above) the double top (bottom) value.
Strategy 4:	For double top (bottom), the stop-loss value is 20 pips above (below) the double top (bottom) value. The target value is 1 pip above (below) the lowest (highest) value between first and second top (bottom).
Strategy 5:	For double top (bottom), the stop-loss value is 20 pips above (below) the second top (bottom). The target value is 80 pips below (above) the second top (bottom).

RESULTS AND ANALYSIS

Results

Strategy	Accumulated ROI overall	Average ROI per trade	Median ROI per trade	Standard deviation per trade	Winrate	Trades stopped before weekend	Average nr. Trades
DB1	−3,00%	−0,0040%	−0,0538%	0,1197%	48,87%	1,44%	697
DB2	−7,60%	−0,0100%	−0,1367%	0,2228%	47,88%	4,36%	697
DB3	−11,86%	−0,0158%	−0,0836%	0,3174%	47,74%	10,54%	697
DB4	−11,67%	−0,0155%	−0,2024%	0,2758%	41,67%	6,87%	697
DB5	−12,16%	−0,0167%	−0,2113%	0,3762%	26,23%	17,19%	697
DT1	0,60%	0,0014%	0,0418%	0,1215%	51,27%	1,42%	600
DT2	−3,02%	−0,0052%	−0,0534%	0,2211%	49,09%	4,43%	600
DT3	−3,28%	−0,0048%	−0,0292%	0,3156%	49,21%	9,79%	600
DT4	−2,44%	−0,0033%	−0,1765%	0,2763%	42,57%	6,23%	600
DT5	0,90%	0,0020%	−0,2083%	0,3930%	27,60%	16,08%	600

Exhibit 2: Table with strategy results based on average results across currency pairs, i.e., the average ROI per trade, is based on the average ROI per trade for all the currency pairs for each of the strategies. DB1 refers to double bottom strategy 1, while DT1 refers to double top strategy 1. 'Trades stopped before weekend' shows the percentage of trades stopped 5 minutes before the market closes on Friday. The column colors show how the values vary for each of the strategies, i.e., the darkest blue cell under the column 'Average ROI per trade', reflects that the cell contains the highest value for 'Average ROI per trade'.

Analysis

The trading results gained for the different strategies vary a lot as it can be seen in Exhibit 2. For double bottom (i.e. going long, buying the currency), one would have made losses, on average across all tested currency pairs, no matter what strategy one used. The lowest loss of 3% was reported by strategy one which used a 10 pip target and a 10 pip stop-loss. In contrast to that, one would have lost about 12% by using either strategy 3, 4 or 5. These strategies have wider targets and wider stop-losses. Thus, there is a correlation between the Return on Investment (ROI) and the distance of the stop-loss or target. To find out of there is causality between ROI, stop-loss and target, more research is crucial. Further, double bottom strategy 5 has a much higher standard deviation, meaning that the average ROI on a trade differs more than for other strategies. This could be explained by the large target of 80 pips for this trade which is by far the largest target used. On the individual level, USD/CAD showed the best results for all double bottom strategies (see Exhibit 5-9, Appendix) while selling the NZD (i.e. buying the USD) lead to losses of up to 25%. Interestingly, the wider the target and stop-loss for strategies 1-3, the worse the ROI. This could be due to the wider stop-loss which increases the potential losses from a trade.

RESULTS AND ANALYSIS

Looking at double tops (going short), the findings are less clear. Both strategy one and strategy five resulted in a slightly positive ROI on average across the currency pairs. Strategies 2-4 showed an ROI of -3%, -3.3% and -2.4% respectively. While this is quite a low number, the results among the unique currency pairs showed interesting results. For example, all five strategies worked well for the AUD/USD which led to more or less small gains across all strategies. In contrast to that, GBP/USD led to a negative ROI of up to -20% no matter which strategy was applied in the trading. Another interesting finding is that trading most of the examined currency pairs did not result in positive or negative returns, which could support academic theories like the weak form of the efficient market hypothesis.
Looking at the results for double bottoms again, one could ask if the negative ROI could be turned into a positive ROI just by going short instead of long. This would contradict with the double bottom theory used in this report and could be an interesting topic for further research. In addition, further research could involve checking the different winning or losing trades for common features which would allow excluding some of the losing trades for example. Lastly, the strategies could be adopted by using less static targets and stop-losses or by using different values for each of them respectively.

Besides analyzing the overall return, it was identified interesting findings when the average return for each strategy was categorized based on different stop-times of the trades (see Exhibit 3). We may observe that trades stopped on Monday on average lead to negative return, while the trades were forced to close on Friday on average lead to positive returns. The positive returns for trades forced to closed on Fridays are observed for both the double top and double bottom pattern. Similarly, the negative returns for trades stopped on Mondays apply to trading strategies with both of the patterns.

The trades closed on Monday, are, contrary to those stopped before the market closes, trades that have reached either the stop-loss or target value. An analysis of the historical prices used for the project shows that the prices, for most currency pairs, are slightly more volatile on Mondays (see Exhibit 16 and 17, Appendix). Moreover, by plotting the return for different strategies against the start time of the trades show that not only trades closed on Mondays, but also trades opened on Mondays give particularly negative returns relative to the rest of the week. One could suggest that the volatility of the market on Mondays may give misleading signals, and therefore explain the negative returns for both strategies on Mondays. However, the differences in volatility are minor, and can therefore not explain these results.

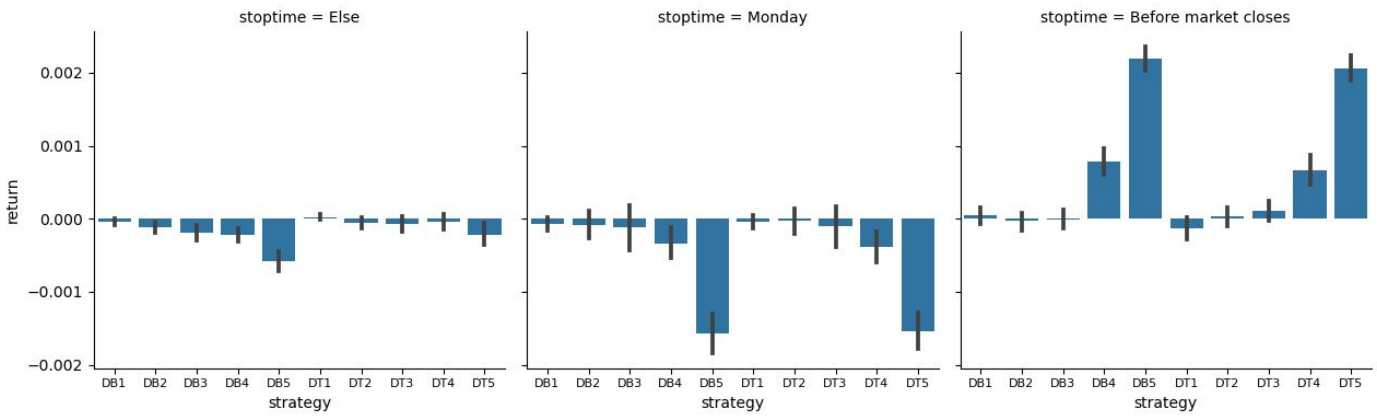

Exhibit 3: The barcharts show the estimated average return (with confidence intervals illustrated with the vertical lines) for the different strategies at a given stop-time . Stop-time equal to 'Before market closes' shows the average return for trades stopped five minutes before the market closes on Friday (i.e., trades that are not stopped due to stop-loss or target values). top-time equal to 'Else' shows the average return for trades stopped during the rest of the week (i.e., all other times that are not Monday or five minutes before the market closes).

CONCLUSION

Concluding, we do not observe any significant gains with the double top and double bottom pattern and the applied trading strategies. Nevertheless, we do observe outliers, for instance, strategy five shows a positive ROI when used for double tops, which could mean that using a wide take-profit and a tight stop-loss could lead to better results. However, to confirm or reject this hypothesis more research is required. In addition, strategies one to four do not generate any significant positive results among the analyzed currency pairs and with both double bottoms and double tops considered.

Moreover, we analyzed the stop-time of the trades and the average returns associated with these stop-times. The results showed that trades stopped five minutes before the market closes (those that did not reach target or stop-loss values), on average gave positive returns for most strategies. Contrary, trades stopped on Monday gave on average negative returns for most strategies.

Looking at the results for double bottoms again, one could ask if the negative ROI could be turned into a positive ROI just by going short instead of long for all double bottom strategies. This would contradict with the double bottom theory used in this report and could be an interesting topic for further research. In addition, further research could involve checking the different winning or losing trades for common features which would, for instance, allow excluding some of the losing trades. Research could also check the correlations between currencies and analyze the unique behavior of each currency pair. Lastly, we suggest using both ask and bid prices for opening and closing positions. For the double bottom pattern we suggest using ask prices for opening the long positions, and bid prices for closing the positions. For the double top pattern we suggest using bid prices for opening a short positions, and ask prices for closing the positions.

APPENDIX

Exhibit 4: A flowchart illustrating the algorithm used to recognize double tops and double bottoms.

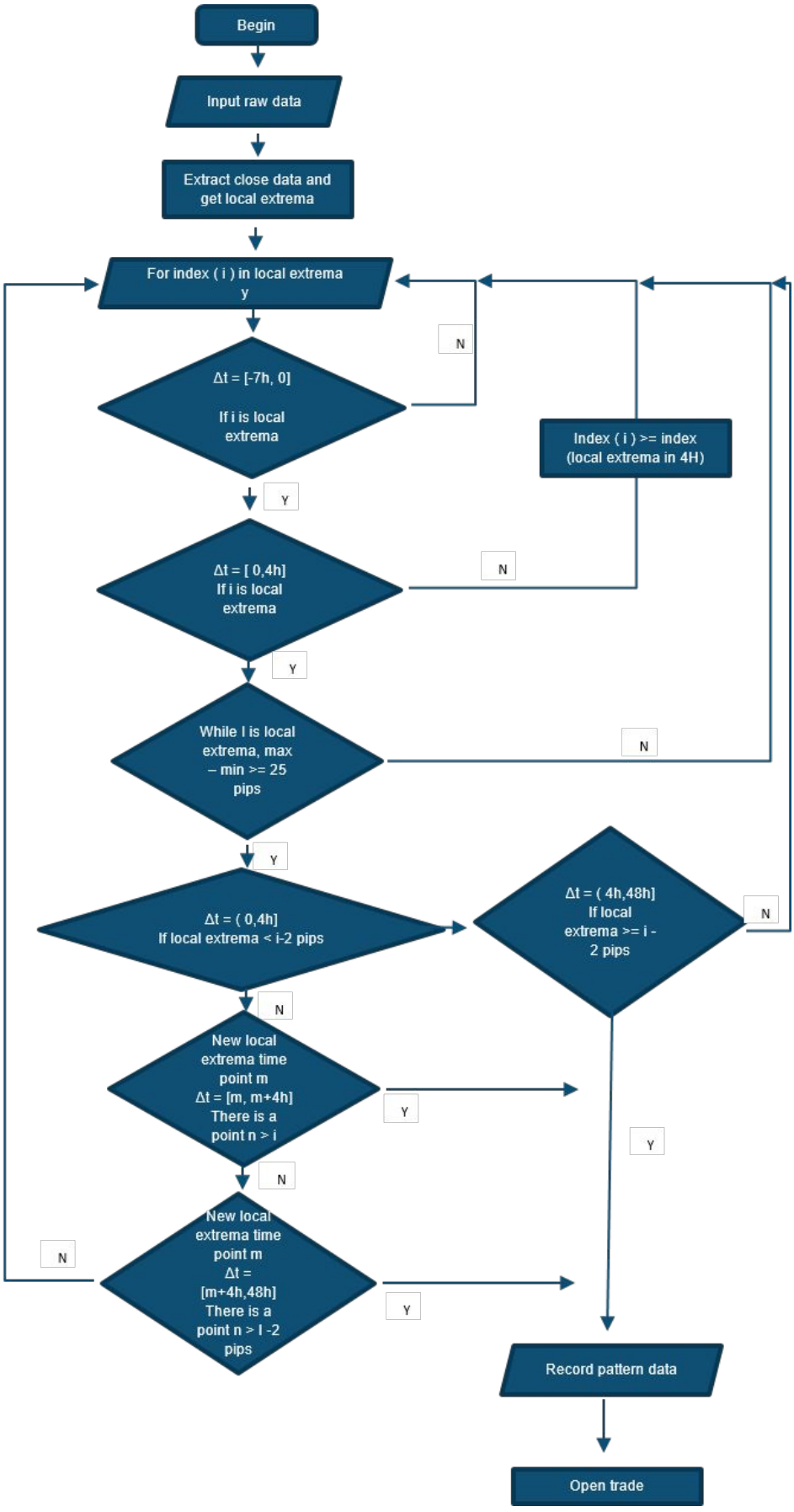

Exhibit 5-9: Cumulative return on investment for Double Bottom.

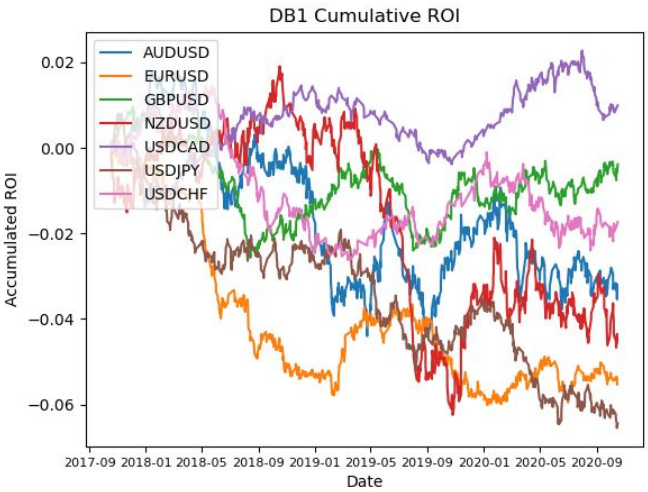

Exhibit 5: Cumulative ROI for Double Bottom strategy 1.

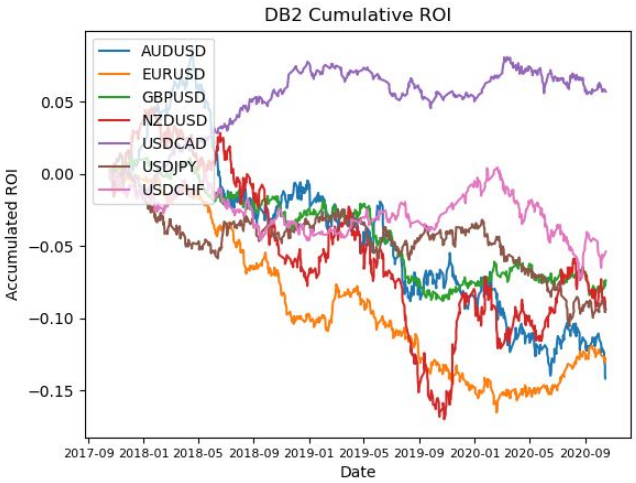

Exhibit 6: Cumulative ROI for Double Bottom strategy 2.

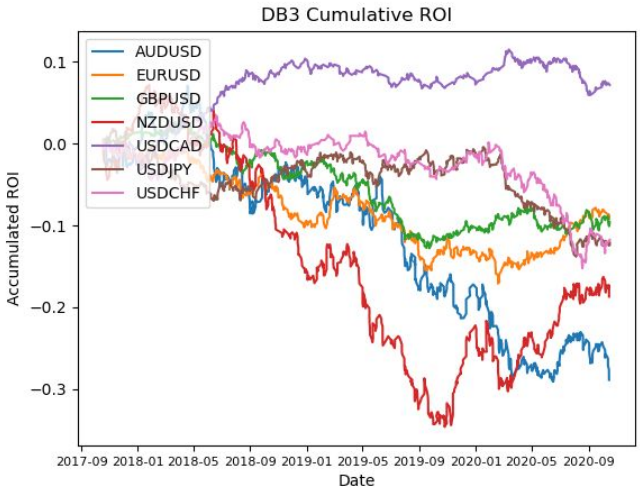

Exhibit 7: Cumulative ROI for Double Bottom strategy 3.

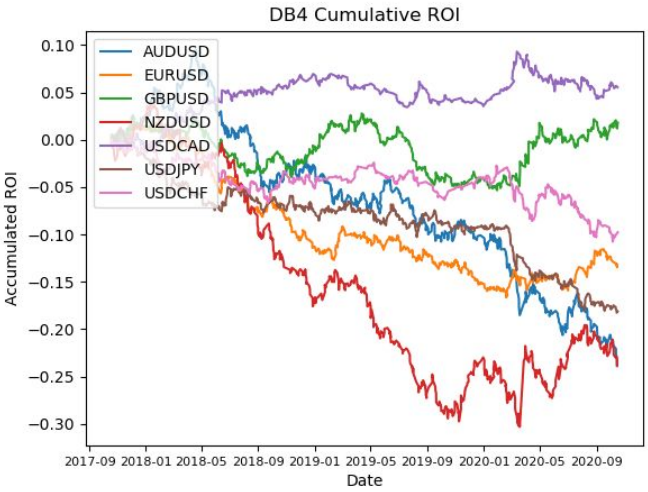

Exhibit 8: Cumulative ROI for Double Bottom strategy 4.

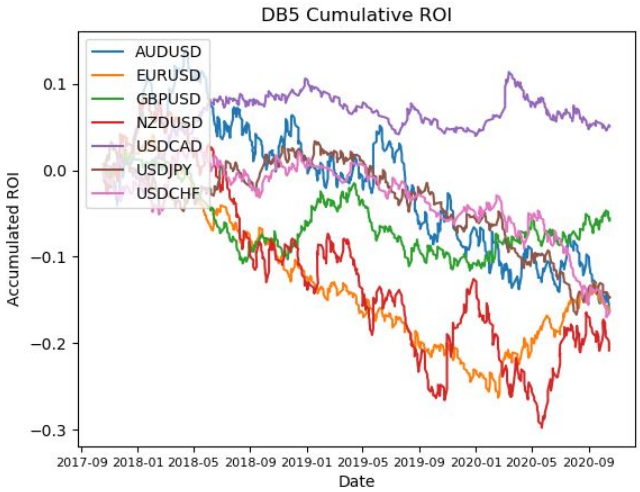

Exhibit 9: Cumulative ROI for Double Bottom strategy 5.

Exhibit 10-15: Cumulative return on investment for Double Top.

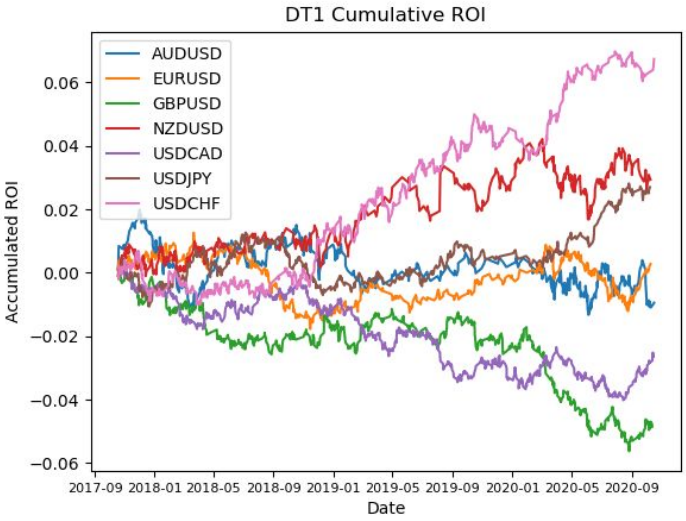

Exhibit 10: Cumulative ROI for Double Top strategy 1.

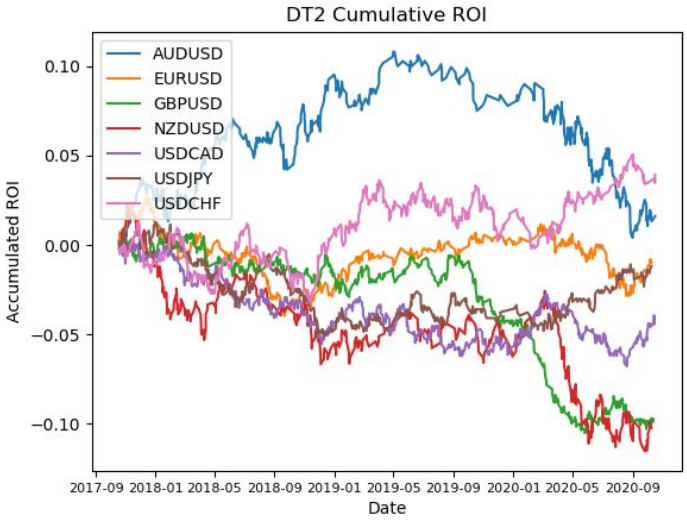

Exhibit 11: Cumulative ROI for Double Top strategy 2.

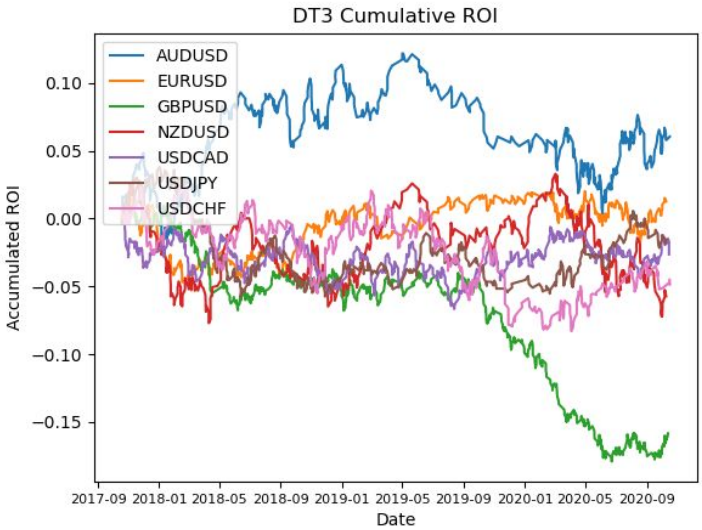

Exhibit 12: Cumulative ROI for Double Top strategy 3.

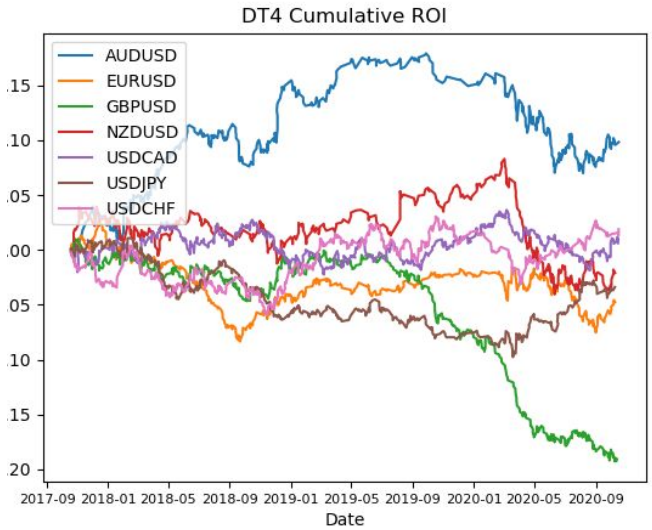

Exhibit 13: Cumulative ROI for Double Top strategy 4.

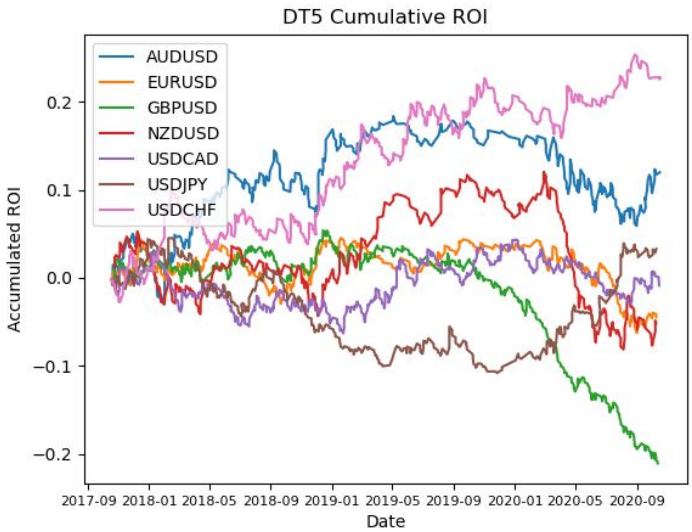

Exhibit 14: Cumulative ROI for Double Top strategy 5.

Exhibit 15: Barcharts with the estimated average return (with confidence intervals illustrated with the vertical lines) for the different strategies at a given start-time. 'Else' refers to all other days in the week that are not Monday.

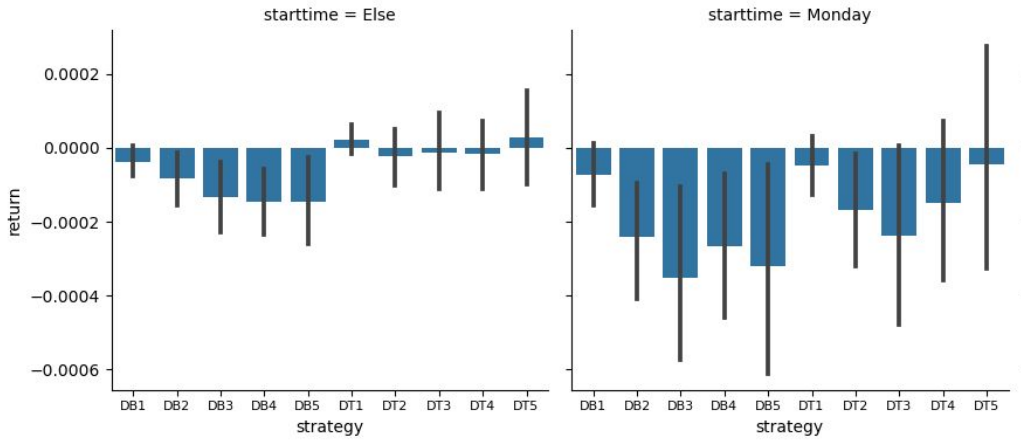

Exhibit 16 and 17: Tables with average relative standard deviation for each currency pair on different days in the original data set. In the bottom line is the average relative standard deviation *across* the currency pairs.

Currency	Friday	Monday	Rest of the week
AUDUSD	5.77%	5.80%	5.79%
EURUSD	3.47%	3.40%	3.42%
GBPUSD	3.71%	3.75%	3.74%
NZDUSD	4.79%	4.83%	4.83%
USDCAD	2.73%	2.75%	2.74%
USDJPY	2.21%	2.23%	2.18%
USDCHF	2.74%	2.69%	2.69%
Average	3.6310%	3.6372%	3.6292%

Exhibit 16: Relative standard deviation for bid close prices.

Currency	Friday	Monday	Rest of the Week
AUDUSD	5.76%	5.80%	5.78%
EURUSD	3.47%	3.40%	3.42%
GBPUSD	3.71%	3.75%	3.73%
NZDUSD	4.79%	4.83%	4.82%
USDCAD	2.73%	2.75%	2.75%
USDJPY	2.21%	2.23%	2.18%
USDCHF	2.74%	2.69%	2.69%
Average	3.6288%	3.6375%	3.6252%

Exhibit 17: Relative standard deviation for ask close prices.

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