Developing a Trading Strategy

A number of factors have to be considered to execute a trade. To simplify the strategy, only 3 factors are examined:

1) Buy or sell?
2) When to execute a trade?
3) At what price to exit a winning trade?

The AUD/USD currency pair is examined. The strategy is for intraday trading: positions are opened and closed on the same day.

Point 2

A trade is best executed at or close to the day high or day low. This is to fully capture the day movement. Below shows the number of day high and day low occurrences across different time intervals:

	Number of Day High and Day Low Occurrences				
Time Interval	**0000-0400**	**0400-0800**	**0800-1200**	**1200-1600**	**1600-2000**
Observed	643	339	328	273	532
Expected	427.3333	427.3333	427.3333	427.3333	427.3333

2000-0000	**Total**
449	2564
427.3333	2563.9998

The hypothesis is

H_0: Day high and day low occurrences do not differ across time intervals
H_a: Day high and day low occurrences differ across time intervals

A chi-squared goodness-of-fit test is conducted. The p-value is 0. The null hypothesis is rejected at the 5% significance level. It is concluded that day high and day low occurrences differ across time intervals.

It is favourable to enter a trade between 0000 and 0400 because there is a higher probability of a day high or day low occurring compared to the other time intervals.

However, the strategy is to make a trade after 0400 instead of between 0000 and 0400. Refer to point 1 for the motive.

Point 1

As there is a higher probability of a day high or day low occurring between 0000 and 0400 than the other time intervals, after 0400, it is assumed that the high and low made earlier are the day high and day low. A buy/sell order is executed if the price breaks the high/low made during 0000-0400.

Point 3

One of the stylised facts of asset returns is volatility clustering: large changes in asset prices tend to cluster together. Here, day range is used to represent volatility.

$$DayRange = DayHigh - DayLow$$

If yesterday's range is large, today's range is likely to be large. A test for 1st-order autocorrelation is performed by running a regression:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \varepsilon_t$$

The hypothesis is

$$H_0: \beta_1 = 0$$
$$H_a: \beta_1 \neq 0$$

Most asset returns exhibit heteroscedasticity, resulting in wrong estimation of standard errors and hence invalidity of tests. It is assumed that there is presence of heteroscedasticity in day ranges. To overcome the problems of heteroscedasticity, a robust test is conducted by using Newey-West standard errors.

OLS Regression Results

Dep. Variable:	range	R-squared:	0.199
Model:	OLS	Adj. R-squared:	0.198
Method:	Least Squares	F-statistic:	47.56
Date:	Fri, 15 Oct 2021	Prob (F-statistic):	8.33e-12
Time:	21:11:54	Log-Likelihood:	5543.3
No. Observations:	1294	AIC:	-1.108e+04
Df Residuals:	1292	BIC:	-1.107e+04
Df Model:	1		
Covariance Type:	HAC		

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.0037	0.000	9.192	0.000	0.003	0.005
range_ne1	0.4450	0.065	6.896	0.000	0.318	0.572

Omnibus:	847.541	Durbin-Watson:	2.175
Prob(Omnibus):	0.000	Jarque-Bera (JB):	16186.683
Skew:	2.733	Prob(JB):	0.00
Kurtosis:	19.442	Cond. No.	268.

Notes:
[1] Standard Errors are heteroscedasticity and autocorrelation robust (HAC) using 1 lags and without small sample correction

The p-value is 0; the 95% confidence interval for the sample 1st-order autocorrelation coefficient does not include 0. The null hypothesis is rejected at the 5% significance level. It is concluded that the 1st-order autocorrelation coefficient is significantly different from 0 and day ranges exhibit persistence over one period.

Below shows the descriptive statistics of day ranges:

	Day Range
Count	1294
Mean	0.00672
Standard Deviation	0.00373
Min.	0.00165
25%	0.00444
50%	0.00589
75%	0.00793
Max.	0.04576

	Given Yesterday's Range >= 70% Quantile
Count	388
Mean	0.00820
Standard Deviation	0.00467
Min.	0.00183
25%	0.00528
50%	0.00715
75%	0.00984
Max.	0.04576

If yesterday's range is equal to or more than 0.0074 (70% quantile), today's range is expected to be equal to or more than 0.0057 (30% quantile). These figures are selected because the 70% quantile (0.0074) presents a large range and adequate trade opportunities and reduced noise, and the 30% quantile (0.0057) is conservative yet large enough for take-profit.

A condition to enter a trade is yesterday's range is equal to or more than 0.0074 (70% quantile). The take-profit price is set at $0.0057 - (EntryPrice - CurrentDayLow)$ above the entry price given a buy order and $0.0057 - (CurrentDayHigh - EntryPrice)$ below the entry price given a sell order.

<u>The Conditions to Enter a Trade</u>

1) Yesterday's range >= 0.0074
2) Past 0400
3) The price breaks the high/low made during 0000-0400

<u>Order Inputs</u>

1) Buy/sell if the price breaks the high/low made during 0000-0400
2) Fixed lot size
3) The stop-loss price is set at the opening price
4) The take-profit price is set at $0.0057 - (EntryPrice - CurrentDayLow)$ above the entry price given a buy order and $0.0057 - (CurrentDayHigh - EntryPrice)$ below the entry price given a sell order.