

Actuarial Outsourcing Solutions

Integrated EA Specification

Glossary

1. The order of this document is as follows:
 - 1.1. Algorithmic background
 - 1.2. Algorithm purpose
 - 1.3. Algorithm parameters
 - 1.4. Buy trade setup
 - 1.5. Sell trade setup
 - 1.6. Scenarios

Algorithmic background

2. The following algorithms / indicators were developed for trading on the USDZAR:
 - 2.1. Crossover EA
 - 2.2. Scalper EA
 - 2.3. Z-Score Indicator
3. Each EA has been simply explained below.
4. The code for each project is available upon request and will be given to the selected developer as an attached annexure.
5. A visual illustration of the Integrated EA is also available as an attached annexure.

Crossover EA

6. The Crossover EA is a simple EA that uses two EMA's, a Fast EMA (5-EMA) and a Slow EMA (50-EMA). The timeframe used was the 4-hourly.
7. When the Fast EMA crossed above the Slow EMA, a buy signal was triggered. When the Fast EMA crossed below the Slow EMA, a sell signal was triggered.
8. Trades will close whenever a crossover happened that triggered a different trade signal; hence a Sell trade closes when the Fast EMA crosses above the Slow EMA and a Buy trade closes when the Fast EMA crosses below the Slow EMA.

Scalper EA

9. The Scalper EA was created to scalp the USDZAR. It accumulates trades at a parameterized price distance input. The other inputs include a profit target, take profit, scaling factor and base lot size.

10. The EA opens a trade at the base lot size and then places a pending order at the specified price distance with the lots scaled as per the scaling factor. As soon as that pending order opens, another pending order is placed at the distance.
11. The logic is to accumulate and scales the lot sizes of trades in the non-profitable direction and waits for a reversal before beginning to take profit on each trade as per the input take profit.
12. The trade type is determined by checking where the current price is to the 5-EMA on the 1-minute chart.
13. If the price is above the 5-EMA, then the first trade is a buy trade and trades scale as the price decreases.
14. If the price is below the 5-EMA, then the first trade is a sell trade and trades scale as the price increases.
15. The EA has a formulated price target that is calculated dynamically as trades begin to take profits.
16. A trade cycle ends when either all trade has taken profit, the profit target is reached, or a drawdown specified by the user has been reached.

Z-Score Indicator

17. The Z-Score is the ratio of the 5-EMA and 50-EMA minus the ratio mean and then divided by the ratio standard deviation. The ratio mean and standard deviation are calculated using the 5-EMA and 50-EMA data from 2012.
18. The Z-Score is primarily used to identify strong trends in the market and where a possible reversal might occur.
19. For the Integrated EA, the Z-Score is used as an indicator for entry and exit rules.
20. The Z-Score has been coded as an indicator and can be provided upon request for inclusion in the development of the Integrated EA.

Algorithm purpose

21. The Integrated EA is the combination of the Crossover, Scalper, and the Z-Score. It makes use of the Z-Score to enter positions, the Scalper logic to accumulate trades and the Crossover logic to take profit.

Algorithm parameters

22. The Integrated EA will need the following parameters available on the input screen:

<u>Input</u>	<u>Default value</u>	<u>Description</u>
Price movement	1000	The price distance between trades in pips
Take profit	200	The take profit for Scalper trades in pips
Profit target	500	The profit target for Scalper trades in pips
Scaling factor	10%	The scaling factor for trade accumulation
Start Sell Z-Score	1	The entry Z-Score for sell trade accumulation
Start Buy Z-Score	-1	The entry Z-Score for buy trade accumulation
Crossover lots	2	The minimum lots to be open at a crossover
Drawdown	20	The allotted drawdown to close all trades
Fast EMA	5	The period of the Fast EMA
Slow EMA	50	The period of the Slow EMA
Mean	100.09	The ratio mean for the Z-Score
Standard Deviation	1.17	The ratio standard deviation for the Z-Score

Buy trade setup

23. The 5-EMA needs to be below the 50-EMA to indicate a sell cycle. When the live Z-Score reaches -1, the first buy trade of the input *base lot size* is entered.
24. The Scalper logic is then applied and buy trades will accumulate, at input *scaling factor* lot sizes, as the price drops by the input *trade distance* value. Each buy trade entered will have a *take profit* that is input in the parameter screen. The logic works the same way as the original Scalper by accumulating in the reverse direction, taking profit when applicable and closing all trades at the weighted average profit target.
25. Whilst trades accumulate in the reverse direction, the EA will constantly be checking at the end of the candle if the 5-EMA has crossed above the 50-EMA, indicating a buy cycle. If there is a verified crossover, all buy trades that are open will see their take profits removed and the EA will check that the input *minimum lots* is met at the crossover. If not, one last buy trade will be entered **immediately, at the close of the candle**, with the necessary lot size to make up for the *minimum lots* input value.

26. The crossover logic then applies to all buy trades that have been carried into the official buy cycle. When the live Z-Score reaches +1, the first sell trade will be entered. Having at least one sell trade open whilst buy trades are open indicates that all the open buy trades can close when the 5-EMA crosses below the 50-EMA to enter an official sell cycle. A crossover and new cycle is only confirmed once the candle has closed.
27. If the Z-Score does not reach +1 (hence no sell trade is entered) and the 5-EMA crosses below the 50-EMA to go back into a sell cycle, then the buy trades will remain open, and the Scalper logic will re-apply by applying the input *take profit* on each trade again and closing out trades at the weighted average price. Steps 4-6 will then repeat until a buy cycle reaches a Z-Score of +1 and the cycle ends.
28. Note: If the Scalper activates at the -1 Z-Score and reaches its weighted average price take profit, the Scalper will reactive regardless of the Z-Score at the time.

Sell trade setup

29. The 5-EMA needs to be above the 50-EMA to indicate a buy cycle. When the live Z-Score reaches +1, the first sell trade of the input *base lot size* is entered.
30. The Scalper logic is then applied and ~~buy~~sell trades will accumulate, at input *scaling factor* lot sizes, as the price rises by the input *trade distance* value. Each sell trade entered will have a *take profit* that is input in the parameter screen. The logic works the same way as the original Scalper by accumulating in the reverse direction, taking profit when applicable and closing all trades at the weighted average profit target.
31. Whilst trades accumulate in the reverse direction, the EA will constantly be checking at the end of the candle if the 5-EMA has crossed below the 50-EMA, indicating a sell cycle. If there is a verified crossover, all sell trades that are open will see their take profits removed and the EA will check that the input *minimum lots* is met at the crossover. If not, one last sell trade will be entered with the necessary lot size to make up for the *minimum lots* input value.
32. The crossover logic then applies to all sell trades that have been carried into the official sell cycle. When the live Z-Score reaches -1, the first buy trade will be entered. Having at least one buy trade open whilst sell trades are open indicates that all the open sell trades can close when the 5-EMA crosses above the 50-EMA to enter an official buy cycle.
33. If the Z-Score does not reach -1 (hence no buy trade is entered) and the 5-EMA crosses above

the 50-EMA to go back into a buy cycle, then the sell trades will remain open, and the Scalper logic will re-apply by applying the input *take profit* on each trade again and closing out trades at the weighted average price. Steps ~~4-6~~10 to 12 will then repeat until a sell cycle reaches a Z-Score of -1 and the cycle ends.

34. Note: If the Scalper activates at the +1 Z-Score and reaches its weighted average price take profit, the Scalper will reactive regardless of the Z-Score at the time.

Scenarios

35. Input parameters used:
- 35.1. Base lot size: 0.1
 - 35.2. Scaling factor: 20%
 - 35.3. Trade distance: 10 cents
 - 35.4. Take profit: 20 cents
 - 35.5. Minimum lots: 2 lots

Starting scenario

36. The 5-EMA is below the 50-EMA and the live Z-Score has -1. A buy trade (1) is entered at 15.50 with 0.1 lots and a take profit of 15.70. The scalper buy logic now applies and a pending buy order (2) of 0.12 lots is placed at 15.40 with a take profit of 15.60.
37. Price action drops to 15.40 and pending buy order (2) is now opened. A pending buy order (3) of 0.14 lots is placed at 15.30 with a take profit of 15.50.
38. Price action drops to 15.30 and pending buy order (3) is now opened. A pending buy order (4) of 0.17 lots is placed at 15.20 with a take profit of 15.40.
39. Price action drops to 15.20 and pending buy order (4) is now opened. A pending buy order (5) of 0.2 lots is placed at 15.10 with a take profit of 15.30.
40. Price action rises to 15.40 and buy trade 4 takes profit. A pending buy order (4) of 0.17 lots is placed at 15.20 with a take profit of 15.40.
41. Price begins to rise rapidly, and a verified crossover into a buy cycle occurs at 15.45. Buy trades 1, 2 and 3 will have their take profits removed. Since there are only 0.43 lots across the three trades and the minimum lots required at the crossover is 2 lots, a 4th buy trade is entered at the price at crossover with 1.57 lots.

42. The crossover logic is now applied, and the buy trades will wait for the buy cycle to end and a sell trade to accumulate.
43. The following scenarios could then occur:

Continued scenario 1 – long cycle occurs

44. Price action still rises rapidly, and the live Z-Score has reached +1. A sell trade (1) is entered at 15.80 with 0.1 lots and a take profit of 15.60. The scalper sell logic now applies and a pending sell order (2) of 0.12 lots is placed at 15.90 with a take profit of 15.70.
45. Price action rises to 15.90 and pending sell order (2) is now opened. A pending sell order (3) of 0.14 lots is placed at 16.00 with a take profit of 15.80.
46. Price action rises to 16.00 and pending sell order (3) is now opened. A pending sell order (4) of 0.17 lots is placed at 16.10 with a take profit of 15.90.
47. Price action rises to 16.10 and pending sell order (4) is now opened. A pending sell order (5) of 0.2 lots is placed at 16.20 with a take profit of 16.00.
48. Price action drops to 15.90 and sell trade 4 takes profit. A pending sell order (4) of 0.17 lots is placed at 16.10 with a take profit of 15.90.
49. Price action drops to 15.80 and sell trade 3 takes profit. A pending sell order (3) of 0.14 lots is placed at 16.00 with a take profit of 15.80.
50. The 5-EMA crosses below the 50-EMA at 15.75 and a verified sell cycle has begun. All open buy trades will close out and the crossover logic will apply to the open sell trades. The open sell trades 1 and 2 will have their take profits removed. The EA will wait to reaccumulate buy trades at a -1 Z-Score.

Continue scenario 2 – short cycle occurs

51. Price rises and the Z-Score increases and gets near to +1 but does not reach it.
52. Price rapidly drop and the 5-EMA crosses below the 50-EMA again into a verified sell cycle. No sell trades were entered during the buy cycle as the Z-Score did not touch +1.
53. All the open buy trades will have their take profits put back on and the scalper logic will kick in again.

- 54. The 5-EMA later crosses above the 50-EMA into a verified buy cycle. Trade take profits are removed.
- 55. The buy cycle reaches a Z-Score of +1 and sell trades begin to accumulate.
- 56. The 5-EMA later crosses below the 50-EMA into a verified sell cycle. All buy trades are then closed out since sell trades were opened during the buy cycle.

Key points

- 57. Trades will only close under three conditions:
 - 57.1. The Scalper Weighted Average Take Profit has been reached.
 - 57.2. A Crossover occurs and both buy and sell trades are open and the relevant trade type will close, depending on the type of cycle that has ended.
 - 57.3. An account draw down is met.