

CAPSTONE PROJECT 2020 PUBLIC PROJECT SUMMARY

TITLE Backtesting the Pullback Strategy on US Futures

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DESCRIPTION OF THE TASK

The project consists of the analysis of the hypothetical, historical performance of the pullback strategy. The methodology used is Backtesting. This technique allows one to measure the performance of the strategy on the US futures market, through the application of trading actions defined by the strategy for a lookback period of 3 years. The testing is conducted on 4 instruments, the E-mini S&P 500 futures (ES), the E-mini Nasdaq-100 futures (NQ), the EUR/USD futures (6E) and the GBP/USD futures (6B). Four timeframes are used, in particular, 5, 15, 60 and 240 minute charts. Instead of a wider scope, the emphasis is on checking the robustness of the methodology and the results. Therefore, three different variants of the strategy are tested, not just a single specification. This allows one to explore the robustness of the methodology and the results. A strategy is generally made up of two components, entry signals and trade management rules. The first variant is Test 1. It follows the 1R method, where the profit target and the stop loss are set at equal distances from the entry price. Test 2 utilizes the open target method which includes a trailing stop, so that winning trades are allowed to run. Finally, in Test 3 a counter is added to the strategy to reduce the number of unprofitable market entries. For a given run of the strategy, performance is measured by the expectancy, defined as the probability of a winning trade multiplied by the size of the average winning trade minus the probability of a losing trade multiplied by the absolute value of the size of the average losing trade. There are three questions of interest. First, on what instrument does the pullback strategy perform best? Second, on what timeframe does it perform best? Third, how much capital is needed to trade the strategy profitably with a sufficiently high probability? The findings provide possible answers for the first two, while the data also indicates how the last one could be further investigated.

BENEFITS TO THE CLIENT

The client is interested in measuring the performance pullback strategy. The analysis completed in the project is a useful initial step in the evaluation of the strategy. It gives an indication, whether it is worthwhile to invest in further testing of the strategy. The results do not prove that a strategy will be profitable in the future or not if it is traded. They rather provide some areas of interest, which future work should focus on. The findings offer two recommendations that are mentioned in the coming paragraph.

KEY OUTCOMES

The report on the project presents two important findings. Table 1 shows the expectancies for the case of index futures as a heatmap. The first finding is that the strategy performs well on a high timeframe in the case of index futures. In particular, tests on the ES and the NQ result in positive, large expectancies in the range of 50-650 on the 250 minute timeframe. The robustness of the results are checked by testing on a 120 minute timeframe and by increasing the lookback period to 10 years. In both cases, the results weaken. However, the values remain positive and reasonably high, confirming the importance of the first finding. Based on this, the first recommendation to the client is to focus on high timeframes and index futures in any future research of the pullback strategy.

Strategy variants		Indices	5 min		15 min		60 min		120 min		240 min		240 min (10yr)	
Test 1	1R=1ATR	ES	\$	(9,02)	\$	(11,74)	\$	(52,68)	\$	(153,50)	\$	52,52	\$	47,85
		NQ	\$	(2,74)	\$	(5,52)	\$	(41,91)	\$	64,97	\$	292,40	\$	156,34
	1R=2ATR	ES	\$	(5,45)	\$	(18,45)	\$	(85,53)	\$	(56,30)	\$	262,69	\$	70,55
		NQ	\$	0,51	\$	20,01	\$	(278,95)	\$	179,17	\$	237,33	\$	122,24
	1R=3ATR	ES	\$	0,95	\$	(6,56)	\$	(89,61)	\$	129,28	\$	402,22	\$	92,20
		NQ	\$	(6,71)	\$	(17,09)	\$	(288,08)	\$	323,92	\$	220,89	\$	86,86
Test 2	Traling Stop	ES	\$	(2,84)	\$	14,77	\$	66,92	\$	178,75	\$	230,49	\$	(33,82)
		NQ	\$	1,01	\$	7,16	\$	(149,35)	\$	45,75	\$	449,47	\$	96,51
Test 3	3 entries per trend	ES	\$	(11,98)	\$	3,35	\$	(40,89)	\$	(12,01)	\$	551,30	\$	164,79
		NQ	\$	2,01	\$	31,08	\$	(33,19)	\$	36,64	\$	476,40	\$	148,45
	2 entries per trend	ES	\$	(8,64)	\$	9,61	\$	(39,02)	\$	8,42	\$	497,26	\$	145,81
		NQ	\$	2,84	\$	44,95	\$	(84,50)	\$	35,52	\$	415,91	\$	124,42
	1 entry per trend	ES	\$	(12,08)	\$	7,63	\$	(86,94)	\$	(20,24)	\$	614,67	\$	174,20
		NQ	\$	0,69	\$	58,69	\$	(106,94)	\$	103,49	\$	641,75	\$	178,91

Table 1: Expanded expectancy heatmap for index futures

Table 2 presents the analogous results for currency futures. The two heatmaps together confirm the second finding. That is, Test 3, which the inclusion of the signal counter, improves the results. For indices, on the 15 and 240 minute timeframes, expectancies tend to increase towards the bottom. On the other timeframes, the values are either fluctuating around zero or they are negative. In either case, the addition of the counter doesn't significantly worsen the results. For currencies, on the 60 minute timeframe, the addition of the counter greatly improves the results, while on other timeframes, the values remain negative, even with the signal counter. Therefore, the second recommendation is to trade the pullback strategy with a signal counter implemented. This confirms the intuition that trends tend to weaken over time and later pullback entries in a trend are less profitable.

Sti	rategy variants	Currencies	5 min	15 min	60 min	240 min	
Test 1	1 A TD	6E	\$(3,51)	\$ (3,39)	\$ (6,15)	\$ (46,51)	
	IAIK	6B	\$(4,03)	\$ (2,93)	\$ (1,73)	\$ (30,13)	
	2 A T D	6E	\$(1,35)	\$ (3,60)	\$ 16,67	\$ (70,96)	
	ZATK	6B	\$(2,92)	\$(82,92)	\$(16,16)	\$ (88,71)	
	3ATR	6E	\$(2,68)	\$ (0,57)	\$ 25,25	\$(198,23)	
		6B	\$(2,35)	\$ (6,97)	\$ (6,64)	\$ (97,34)	
Test 2	Traling Stop	6E	\$(6,99)	\$ (8,38)	\$(14,96)	\$(136,94)	
	Training Stop	6B	\$(1,33)	\$ (4,03)	\$(30,54)	\$(130,48)	
Test 3	3 ontrias par trand	6E	\$(5,55)	\$ (4,68)	\$ 32,89	\$ (95,13)	
	5 entries per tiend	6B	\$(2,07)	\$ (8,91)	\$ 16,00	\$ (16,45)	
	2 antrias nor trand	6E	\$(5,57)	\$ (5,21)	\$ 44,69	\$(136,94)	
	2 entries per tiend	6B	\$(2,40)	\$(11,15)	\$ 22,70	\$ (50,92)	
	1 ontry por trand	6E	\$(2,68)	\$ (1,93)	\$ 25,18	\$ (92,67)	
	i entry per tiend	6B	\$(2,80)	\$(14,55)	\$ 26,07	\$ (81,97)	

Table 2: Expectancy heatmap for currency futures

The results are promising, although it is critical to acknowledge the limitations of the data and the methodology. Backtesting is a simulated environment and it does not perfectly describe what would have happened. The trader's own influence is not seen on the market by other participants. Also, in backtesting, orders always get filled, while this is not true in the real world. The sample size is limited due to data and time constraints with only a couple of hundred trades in case of some specifications. It could be improved by testing the strategy on more US and global futures contracts, and potentially on foreign exchange markets and equity markets.

LEARNING EXPERIENCE AND LESSONS LEARNT

The project allowed me to explore an area of finance that I was unfamiliar with. It taught me very important concepts and techniques in trading, technical analysis and backtesting. Crucially, I also faced the serious limitations and shortcomings of the method, thus I learned that even excellent results are not a guarantee that good performance can be necessarily replicated in the future. The project also allowed me to implement the theoretical concepts studied in some of my courses. The most important aspect I discovered is that critical thinking and expert judgement is vital to be able to correctly evaluate results in the current fast-paced financial world.