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## 9.1. Questions.

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1

According the majority of academic research, price returns in financial markets:

- a) Follow a normal distribution.
- b) Follow a t-student distribution.
- c) Does not follow a normal distribution.
- d) None of the above.

Jonas Elmerraji, CMT. The Statistics of Backtesting.

2

Which of the following is an exhibited by price data in financial markets?

- a) Heteroskedasticity.
- b) Self-correcting data.
- c) Serial correlation.
- d) All of the above.

Jonas Elmerraji, CMT. The Statistics of Backtesting.

3

If the variance of financial price returns changes over time, we can conclude that financial data tends to show:

- a) Heteroskedasticity.
- b) Self-correction.
- c) Serial correlation.
- d) All of the above.

Jonas Elmerraji, CMT. The Statistics of Backtesting.

4

The use of log returns is particularly common in academia, and it has an important advantage over arithmetic returns:

- a) The handling of compounding.
- b) The distribution of log-returns approximate a log-normal distribution.
- c) The weighted average of individual securities in a portfolio.
- d) Both A and B.

Jonas Elmerraji, CMT. The Statistics of Backtesting.

5

The use of log returns is particularly common in academia; however, it has an important disadvantage over arithmetic returns:

- a) The handling of compounding.
- b) The distribution of log-returns approximate a log-normal distribution.
- c) The weighted average of individual securities in a portfolio.
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Jonas Elmerraji, CMT. The Statistics of Backtesting.

6

When dealing with technical analysis and trading systems, backtesting is:

- a) The first step in the trading system process.
- b) An intermediate step in the trading system process.
- c) The last step in the trading system process.
- d) Depends on the market.

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7

Mark the correct sentence:

- a) Signal testing is a validation tool, while backtesting is a research tool.
- b) Signal testing is a research tool, while backtesting is a validation tool.
- c) Both signal testing and backtesting are research tools.
- d) Both signal testing and backtesting are validations tools.

Jonas Elmerraji, CMT. The Statistics of Backtesting.

8

Whenever we have access to data that it would not have been able to see at the time of the historical trade, we suffer from:

- a) The survivorship bias.
- b) The look-ahead bias.
- c) The complexity bias.
- d) None of the above.

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9

According to Charles Kirkpatrick, trading systems can be discretionary, nondiscretionary or a combination of both. Which one of these methods is determined by intuition?

- a) Discretionary methods.
- b) Nondiscretionary methods.
- c) A combination of discretionary and nondiscretionary methods.
- d) Neither A nor B.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

10

According to Charles Kirkpatrick, the majority of successful traders and investors use:

- a) Discretionary methods.
- b) Nondiscretionary methods.
- c) A combination of discretionary and nondiscretionary methods.
- d) Neither A nor B.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

11

When designing a successful trading systems, we have to make some decisions, which one of these decisions is related to when to get out of a losing position?

- a) Markets.
- b) Position Sizing.
- c) Entries.
- d) Exits.
- e) Stops.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

12

Which of the following risk measures is more effective as stated by Charles Kirkpatrick?

- a) Standard deviation or Volatility.
- b) Beta.
- c) Maximum DrawDown.
- d) Monte Carlo Simulation Volatility.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

13

Which of the following will help you from a visual standpoint in the process of selecting the best trading systems?

- a) Beta.
- b) Equity Line.
- c) Maximum DrawDown.
- d) Maximum Favorable Excursion.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

14

With the theory of runs we could determine the probability of a series of losses in a trading system. What do we need to perform this calculation?

- a) The losing percentage of the trading system.
- b) The maximum DrawDown.
- c) The hypothesis of independence of events.
- d) A and B.
- e) A and C.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

15

If the backtesting of your trading system reports a 45% of losing trades and you can consider that trades are independent. What is the chance that the theory of runs will give you for a series of 5 losses in a row?

- a) 1%.
- b) 1.4%.
- c) 1.8%.
- d) 2.2%.
- e) You need more data.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

16

The money management algorithms can be divided into martingale and anti-martingale. Select the correct sentence.

- a) The martingale algorithms employ the double or nothing frame and they are preferred by traders.
- b) The anti-martingale algorithms employ the double or nothing frame and they are preferred by traders.
- c) The martingale algorithms employ the double or nothing frame and the anti-martingale are preferred by traders.
- d) The anti-martingale algorithms employ the double or nothing frame and they martingale are preferred by traders.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

The following 7 questions are based on the backtesting of a trading system, applied to the Dax future continuous during a period of 10 years.

Backtesting	
Gross Profit	750,000€
Gross Loss	540,000€
Winning trades	400
Losing trades	850
Commissions	15,000€
Slippages	35,000€
MaxDD	59,000€
MaxDD	29%
Initial Capital	100,000€

17

The Net Profit of the trading system is:

- a) 210,000 EUR.
- b) 195,000 EUR.
- c) 160,000 EUR.
- d) 151,000 EUR.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

18

The Percentage of losing trades is:

- a) 32%.
- b) 40%.
- c) 68%.
- d) 80%.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

19

The Recovery Ratio is:

- a) 1.39.
- b) 2.71.
- c) 2.95.
- d) 5.52.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

20

The Profit Factor is:

- a) 1.39.
- b) 2.71.
- c) 2.95.
- d) 5.52.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

21

The Payoff Ratio is:

- a) 1.39.
- b) 2.71.
- c) 2.95.
- d) 5.52.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

22

The Sterling Ratio is:

- a) 1.39.
- b) 2.71.
- c) 2.95.
- d) 5.52.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

23

The ROI is:

- a) 32%.
- b) 120%.
- c) 150%.
- d) 160%.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

24

The main drawback when designing a trading systems is the tendency to \_\_\_\_\_.

- a) Curve-fit the system.
- b) Over-fit the system.
- c) Overoptimize the system.
- d) All of the above.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

25

One way to avoid curve-fitting is through the segmentation of the whole sample into two portions:

- a) In-sample data and out-of-sample data.
- b) Clean data and dirty data.
- c) In-sample data and Curve-fit data.
- d) None of the above.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

26

When designing a trading system, the difference between gross profit and gross loss is known as:

- a) Profit factor.
- b) Percent profitable.
- c) Net profit.
- d) Payoff ratio.
- e) Efficiency factor.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

27

When designing a trading system, the absolute value of the ratio of gross profit to gross loss is known as:

- a) Profit factor.
- b) Percent profitable.
- c) Net profit.
- d) Payoff ratio.
- e) Efficiency factor.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

28

When designing a trading system, the percent of all trades that were profitable is known as:

- a) Profit factor.
- b) Percent profitable.
- c) Net profit.
- d) Payoff ratio.
- e) Efficiency factor.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

29

When designing a trading system, the net profit divided by the gross profit is known as:

- a) Profit factor.
- b) Percent profitable.
- c) Net profit.
- d) Payoff ratio.
- e) Efficiency factor.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

30

When designing a trading system, the ratio of the average winning trade to average losing trade is known as:

- a) Profit factor.
- b) Percent profitable.
- c) Net profit.
- d) Payoff ratio.
- e) Efficiency factor.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

31

Which of the following claims of the EMH refers to the weak EMH version?

- a) The market is only efficient with respect to public information.
- b) The market is only efficient with respect to non-public information.
- c) The market is only efficient with respect to past price, volume and other technical data.
- d) All investment strategies, based on public information of a fundamental or technical nature will be useless in earning market-beating (excess) returns.

David Aronson, *Evidence-Based Technical Analysis* (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 3

32

Which of the following statements is an important assumption of the Efficient Market Hypothesis?

- a) Investors as a group will act rationally.
- b) Investors as a group will act irrationally.
- c) Prices typically do not reflect all available information.
- d) Liquidity constraints may sometimes drive prices away from their intrinsic value.

David Aronson, *Evidence-Based Technical Analysis* (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 7

## 9.2. Answers.

	<b>1</b>
	<b>C</b>
<p>It has been shown repeatedly in academic research that price returns do not follow normal distributions. This is problematic because many statistics and statistical methods (such as the properties of linear regression) have a normality assumption in their interpretation.</p>	
Jonas Elmerraji, CMT. The Statistics of Backtesting.	
	<b>2</b>
	<b>D</b>
<p>All of the above are examples of properties exhibited by financial market data.</p>	
Jonas Elmerraji, CMT. The Statistics of Backtesting.	
	<b>3</b>
	<b>A</b>
<p>Price returns tend to be heteroscedastic, which in this context means that their variance changes over time.</p>	
Jonas Elmerraji, CMT. The Statistics of Backtesting.	
	<b>4</b>
	<b>D</b>
<p>One benefit of using log returns that is related to log-scaled charts is time-additivity. Log returns automatically handle compounding. Another key benefit of log returns is their distribution. While we have established that price returns do not follow normal distributions, there is some evidence that some markets' returns approximate log-normal distributions.</p>	
Jonas Elmerraji, CMT. The Statistics of Backtesting.	
	<b>5</b>
	<b>C</b>
<p>One important caveat about log returns is that, unlike simple returns, the weighted average of the individual securities in a portfolio does not equal the portfolio's return.</p>	
Jonas Elmerraji, CMT. The Statistics of Backtesting.	
	<b>6</b>
	<b>C</b>
<p>The backtest is actually the final step in the system development process; the signal research must happen first. Or, as Marcos López de Prado, former head of Guggenheim Partners' quantitative investment strategies business, says in <i>Advances in Financial Machine Learning</i>, "Backtesting while researching is like drinking and driving. Do no research under the influence of a backtest."</p>	
Jonas Elmerraji, CMT. The Statistics of Backtesting.	
	<b>7</b>
	<b>B</b>
<p>According to Jonas Elmerraji, it is important to differentiate between backtesting and signal testing. The latter is a research tool, while the former is more akin to a validation tool.</p>	
Jonas Elmerraji, CMT. The Statistics of Backtesting.	



8

**B**

Traditional look-ahead bias is a well-known issue that can greatly overstate backtest returns. It occurs when the strategy has access to data that it would not have been able to see at the time of the historical trade.

Jonas Elmerraji, CMT. *The Statistics of Backtesting*.

9

**A**

Trading systems can be discretionary, nondiscretionary, or a combination of both. In discretionary systems, entries and exits are determined by intuition; in other words, the trader or investor exercises some discretion in making trades. Nondiscretionary systems are those in which entries and exits are determined mechanically by a computer.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

10

**B**

According to Charles Kirkpatrick, the majority of successful traders and investors use nondiscretionary systems.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

11

**E**

According to a list established by Curtis Faith, decisions required for successful trading are:

- Markets— What to buy or sell.
- Position Sizing— How much to buy or sell.
- Entries— When to buy or sell.
- Stops— When to get out of a losing position.
- Exits— When to get out of a winning position.
- Tactics— How to buy or sell.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

12

**C**

A DrawDown is any difference or distance from a peak to its successive valley in the equity line of a strategy. If we look at all the DrawDowns over a period, the one that has the highest intrapeak equity percentage of loss is called the maximum DrawDown (MaxDD). It is the worst case that occurred in the system and often is used as an estimate of the worst case that can occur in the future.

We must design the money management strategy such that enough capital is always available to withstand a loss in the magnitude of the known MaxDD. Otherwise, the system goes broke.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

13

**B**

An equity line is the graph of a potential account value beginning at any time adjusted for each successive trade profit or loss. It is used to measure the success of a trading system. Ideally, each trade is profitable and adds to the value of the account each time a trade is closed.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

14

E

We can estimate the chances of a series of losses using the theory of runs. This theory states that the probability of a series of independent events is the product of the probability of each event occurring.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

15

C

If a system has a losing percentage of 45%, the odds of a run of five losses in a row are  $(0.45 \times 0.45 \times 0.45 \times 0.45 \times 0.45)$  or 0.018 (1.8%).

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

16

C

A Martingale betting system often is used in a situation where the bet size can be changed but the odds are relatively even, such as gambling at a roulette wheel. The method is to double up on the next bet after a loss, and return to the standard bet after a win. Eventually, a winning bet will cover all the previous losses and return a profit on the original bet. Unfortunately, the system requires substantial capital to withstand an unexpectedly long series of losses in a row.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

17

C

Net Profit = Gross Profit – Gross Loss – Commissions – Slippages

Net Profit = 750,000 – 540,000 – 15,000 – 35,000 = €160,000

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

18

C

Percentage of losing trades =  $\frac{850}{850 + 400} = 68\%$

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

19

B

Recovery Ratio =  $\frac{\text{Net Profit}}{\text{MaxDD}} = \frac{160,000}{59,000} = 2.71$

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

20

A

Profit Factor =  $\frac{\text{Gross Profit}}{\text{Gross Loss}} = \frac{750,000}{540,000} = 1.39$

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

21

C

$$\text{Payoff Ratio} = \frac{\frac{\text{Gross Profit}}{\text{Number of Winning trades}}}{\frac{\text{Gross Loss}}{\text{Number of Losing trades}}} = \frac{\frac{750,000}{400}}{\frac{540,000}{850}} = \frac{1,875}{635.29} = 2.95$$

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

22

B

$$\text{Sterling Ratio} = \frac{\text{ROI}}{\text{MaxDD}} = \frac{\frac{160,000}{100,000}}{\frac{59,000}{100,000}} = 2.71$$

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

23

D

$$\text{ROI} = \frac{\text{Net Profit}}{\text{Initial Capital}} = \frac{160,000}{100,000} = 1.60 \rightarrow 160\%$$

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

24

D

All these terms can be used interchangeably.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

25

A

One method of optimizing is to take the entire price sample and run an optimization of the parameters. This is usually frowned upon because it is the closest to curve-fitting. To avoid curve-fitting, optimization should optimize only a portion of the data, called in-sample (IS) data, and test the resulting parameters on another portion of the data, called out-of-sample (OOS) data, to see if positive results continue in data not seen before by the optimization process.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

26

C

Net profit is the difference between gross profit and gross loss.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

27

A

The profit factor is the absolute value of the ratio of gross profit to gross loss.

Kirkpatrick and Dahlquist, *Technical Analysis*, 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22

	<b>28</b>
	<b>B</b>
Percent profitable is the percent of all trades that were profitable.	
Kirkpatrick and Dahlquist, <i>Technical Analysis</i> , 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22	

	<b>29</b>
	<b>E</b>
The efficiency factor is the net profit divided by the gross profit.	
Kirkpatrick and Dahlquist, <i>Technical Analysis</i> , 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22	

	<b>30</b>
	<b>D</b>
The payoff ratio is a ratio of the average winning trade to average losing trade. For trend-following systems, it should be greater than 2.0.	
Kirkpatrick and Dahlquist, <i>Technical Analysis</i> , 3rd Edition (Old Tappan, New Jersey: Pearson Education, Inc., 2016), Chapter 22	

	<b>31</b>
<b>CMT ASSOCIATION Sample Exam</b>	<b>C</b>
According to the weak EMH version, the market is only efficient with respect to past price, volume and other technical data.	
David Aronson, <i>Evidence-Based Technical Analysis</i> (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 3	

	<b>32</b>
<b>CMT ASSOCIATION Sample Exam</b>	<b>A</b>
Investors as a group will act rationally according to the EMH.	
David Aronson, <i>Evidence-Based Technical Analysis</i> (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 7	

	<b>33</b>
<b>CMT ASSOCIATION Sample Exam</b>	<b>C</b>
Over-leveraging.	
David Aronson, <i>Evidence-Based Technical Analysis</i> (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 7	

	<b>34</b>
<b>CMT ASSOCIATION Sample Exam</b>	<b>A</b>
Small capitalization effect.	
David Aronson, <i>Evidence-Based Technical Analysis</i> (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 7	

	<b>35</b>
<b>CMT ASSOCIATION Sample Exam</b>	<b>A</b>
It is the tendency to give too little weight to new information.	
David Aronson, <i>Evidence-Based Technical Analysis</i> (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 7	

	<b>36</b>
<b>CMT ASSOCIATION Sample Exam</b>	<b>D</b>
Optimization of input data.	
David Aronson, <i>Evidence-Based Technical Analysis</i> (Hoboken, New Jersey: John Wiley & Sons, 2006), Chapter 8	