CMT ASSOCIATION

Study Guide Overview

CMT Level I: An Introduction to Technical Analysis

CMT Level II: Theory and Analysis

CMT Level III: The Integration of Technical Analysis

"

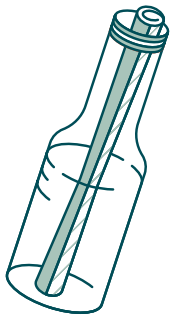
Joining the CMT Association and obtaining my CMT charter has been one of the best decisions for my career, whether it be the credibility associated with the charter, or the friendships I have made within the organization.

Taking the exams reminded me of the deep body of knowledge in our community, and its continued growth. What is most impressive to me is the fact that many of these concepts have been bedrock principles for technicians for well over 100 years, and are as relevant today as they have ever been.

– David Lundgren, CMT Charterholder since 2011

Director of Technical Research at Wellington Management

Dave Lundgren, CMT, CFA



CMT LEVEL I

2024 Exam Information &
Learning Objective Statements

Stanley Dash, CMT
CMT Program Director

Level I. An Introduction to Technical Analysis

The following sample CMT Level I questions offer a glimpse into the style and scope of the exam. Each of the sample questions is followed by a relevant excerpt and citation from the 2024 CMT Level I curriculum. These 15 samples are by no means a study guide; instead, consider them a taste of what a Level I candidate will learn to master this segment of the body of knowledge.

Important points to note

- The CMT Level I exam tests on introductory concepts and definitions in technical analysis.
- The actual exam consists of 132 multiple-choice questions of which 120 are scored items. The remaining 12 questions are under trial for future use.
- Candidates have two hours to complete the 132 questions on the exam.
- The exam is delivered on a computer in Prometric testing facilities, or through Prometric's ProProctor remote-proctoring service. Please be sure to schedule your exam well in advance.
- Questions on the Code of Ethics and Standards of Professional Conduct appear on all three levels of the CMT exams. The Standards of Practice Handbook is a valuable study guide for the Code and Standards. Please use those documents as ethics are not otherwise included in the CMT Program textbooks.
- The CMT Association maintains a discussion forum for CMT candidates. Candidates are encouraged to utilize this resource to discuss and clarify their understanding of the subject matter.

Level I. An Introduction to Technical Analysis

Section One: Theory and History of Technical Analysis

1 The Basic Principle of Technical Analysis - The Trend

Define what is meant by a trend in technical analysis
Explain why determining the trend is important to analysts
Identify primary, secondary, short-term, and intraday trends
Describe the basic beliefs behind the art of technical analysis
Define "fractal" as used in describing price action

2 Dow Theory

Describe the history of Dow Theory
Discuss the basic principles of Dow Theory
Identify the three basic types of trends identified in Dow Theory as defined by time: primary, secondary and minor
Identify the three basic trend patterns of all prices: upward, downward and sideways
Describe the "ideal market picture" according to Dow Theory
Express the concept of confirmation in Dow Theory
Explain the role of volume in Dow Theory

3 Introduction to Charts, Part 1

Explain how a technical analyst uses charts to summarize price action
Discuss the advantages of reviewing price information in chart format
Identify the four basic price points represented in charting
Describe how to construct line, bar, and candlestick charts
Identify the components of individual candles - real body and shadows
Review the information available in line, bar, and candlestick charts
Describe what is meant by "data interval"
Define "range" as it applies to prices on a bar or candlestick
Define "fractal" and how it relates to chart construction

4 Introduction to Charts, Part 2

Identify the variables plotted on the axes in a conventional price chart
Explain the differences between arithmetic and logarithmic scales and their uses
Describe typical methods for displaying volume in a price chart
Discuss volume as an alternative to time on the x-axis of a chart

Section Two: Charts, Trends and Patterns

5 Trends - The Basics

Explain why trend identification is important to achieve profits
Recognize an uptrend, a downtrend, and a trading range
Describe the concept of support and resistance, and the underlying psychology
Identify trends using most common methods
Recall how significant reversal points are identified
List general rules for trendlines

6 Breakouts, Stops and Retracements

Describe and identify breakouts
List methods for confirming and filtering breakouts
Explain the purpose of entry and exit stops
Describe methods for setting entry and exit stops
Define retracements, pullbacks, and throwbacks

7 Moving Averages

Describe the basic principle of moving averages
Explain how to calculate simple, linearly weighted and exponentially smoothed moving averages
Identify trends and signals with moving averages
Describe and interpret Directional Movement Indicators
List common envelope, channel, and band indicators and their characteristics

8 Bar Chart Patterns

Define what is meant by “chart patterns”
List common characteristics of patterns
Discuss opposing viewpoints over whether patterns exist
Describe the influence of computer technology on price-pattern study
Identify classic chart patterns such as triangles, and double and triple tops and bottoms
Identify rounding chart patterns such as head-and-shoulders
Identify “half-mast” chart patterns such as flags and pennants

9 Short-Term Patterns

Locate reversals in longer-term trends using short-term price patterns
Describe the types of gaps that occur on price charts and their significance
Recognize wide-range and narrow-range bars and their implications for volatility
Identify one and two-bar reversal patterns
Identify common candlestick patterns and their significance within a trend

10 Introduction to Volume Analysis

Define volume
Define open interest
Define the terms related to volume as discussed in this chapter
Describe how volume provides information on liquidity and participation
Describe how volume adds perspective to price action

11 Volume: The Technician's Decryption Device

State the implications of volume changes for price trends
Identify trends in price and volume in a chart
Describe how volume is displayed in a Volume-at-Price chart
Define VWAP
Describe Equivolume charts
Explain how open interest rises and falls
State the implications of open interest changes for price trends

12 An Introduction to Volume Indicators

List the seven types of volume indicators
Describe the types of data used in the different types of volume indicators

13 Confirmation

Define terms including overbought, oversold, failure swings, divergence, and reversal
List the major indexes and oscillators designed to use volume as confirmation
Describe open interest and how it might be used for confirmation
Explain the concept of momentum in price action
Identify characteristics and applications of indexes and oscillators such as MACD, RSI, and stochastics

14 Candlestick Charting Essentials

Describe strengths and limitations of candle charts
Identify the components of individual candle lines – real bodies and shadows
Explain how candles depict the high, low, open, and close of a trading period
Identify candle confirmations of support and resistance

15 Point-and-Figure Charting

List three important characteristics of point-and-figure charts
Define “box size” and “reversal”
Describe how point-and-figure charts are constructed
Explain the importance of box size to the sensitivity of point-and-figure charts
Review the construction of various box size and reversal point-and-figure charts
Identify common point-and-figure patterns
Explain how trendlines are drawn on point-and-figure charts
Locate basic signals on a point-and-figure chart
Describe how price targets are obtained using a horizontal or vertical count on a point-and-figure chart

Section Three: Advanced Concepts in Charting and Trend Analysis

16 Introduction to the Wave Principle

Describe the basic operating theory of the Wave Principle
Define motive waves and corrective waves
Identify types of motive waves such as impulse, extension and diagonal
Identify types of corrective waves such as zigzag, flat and triangle
Label waves using standard Elliott Wave notation
Describe Fibonacci relationships as applied to Elliott Wave analysis

17 The Anatomy of Elliott Wave Trading

Match the waves as labeled on a chart to the description in the text
List the waves considered the most advantageous to trade
Describe trade signals associated with various wave patterns

18 Measuring Market Strength

Explain the concept of divergence
Define market breadth
Identify signals of change in market breadth using the advance-decline line
Describe other measures of internal stock-market strength such as McClellan's calculations
Explain the use of volume in measuring stock-market strength
Identify measures of stock-market strength from new high and new low data
Describe measures of stock-market strength based on the number of stocks priced above their moving average

19 Foundations of Cycle Theory

Name the two types of cycles
Identify the three defining characteristics of a cycle
List and define Hurst's seven Principles of Commonality
Define a composite wave
Identify left and right translation
Describe a dominant cycle
Recall the tools which aid in cycle identification

20 Basics of Cycle Analysis

Explain how the annual cycle conforms to cycle theory
Describe two methods of detrending price data
Restate common seasonal tools
Memorize notable economic cycles and their periods
Recall some sequences/nonlinear cycles

Section Four: Markets and Volatility

21 Markets, Instruments, Data, and the Technical Analyst

Name four asset classes amenable to technical analysis
List five tradeable instruments that a technician is likely to employ
Describe data-handling issues with which a technician should be familiar

22 Equities

Define equity securities and primary data types
Describe the benefits of equities for investors
Identify the effect of corporate actions on price data
Classify sectors, capitalization and other ways to segment the market

23 Indexes

Identify major global equity indexes
Name common non-equity indexes used by technical analysts
Explain weighting methods used in major indexes
Define "survivorship bias"

24 Fixed Income / Bonds

List the major types of issuers of debt securities
Identify the basic terms of a debt instrument: issuer, coupon, maturity
State the ways in which debt prices are expressed
Explain the relationship between price and yield
Define "yield curve"
Describe the importance of US government debt in the pricing of other debt securities: "yield (or credit) spread"

25 Futures

Explain the purpose of futures markets
Classify various futures markets as industrial, agricultural, financial, and so on
List the major terms of a futures contract
Define open interest in futures
Describe challenges technicians face when using futures market data

26 Exchange-Traded Products (ETPs)

Define an exchange-traded product
Review differences between exchange-traded funds (ETFs) and exchange-traded notes (ETNs)
Describe the uses for leveraged ETPs

27 Foreign Exchange (Currencies)

Identify the base and quote currencies in a pair
Classify currency pairs as "major" or "cross"
Discuss the impact on technical analysis of the "dealer market" system of currency trading
Explain the data used in building currency charts
Describe cryptocurrencies

28 Options

Explain the purpose of options markets
List the major terms of an option contract
Describe “the Greeks”
Define implied volatility

29 Understanding Implied Volatility

Explain the difference between historical and implied volatility
Describe the concept of put-call parity
Discuss how implied volatility may be used to estimate price movement
State how to calculate single-day implied volatility

30 About the VIX Index

Describe the VIX index
Explain the implications of a rising or falling VIX index
State how to calculate expected 30-day market movement

Section Five: Behavioral Finance and Other Theories of Market Dynamics

31 What is the Efficient Market Hypothesis

Identify the basic concept of the Efficient Market Hypothesis (EMH)
Describe the three forms of the EMH
Explain the characteristics of stock prices as a martingale
Describe how randomly generated output can appear non-random and how that might relate to asset prices and returns
Identify the three areas in which behavioral finance challenges the EMH

32 The Forerunners to Behavioral Finance

Explain momentum strategies and mean-reversion strategies
Define the general concept of value investing
Describe why value investing is similar to a mean-reversion approach
Explain how value investing (Graham and Dodd) conflicts with the EMH

33 Noise Traders and the Law of One Price

Define "fungibility" in the context of financial markets
Explain "arbitrage"
Describe "noise" vs. "information"
Define "noise trader"

34 Noise Traders as Technical Traders

Explain why technical traders are considered a specific type of noise trader
Describe the actions of technical traders as noise traders in the context of market valuation

35 Academic Approaches to Technical Analysis

Describe how technical analysis remains relevant despite the EMH
Discuss how the Adaptive Market Hypothesis reconciles the EMH with technical and behavioral factors

36 Market Sentiment and Technical Analysis

Define "sentiment" as it relates to financial markets
Identify general categories of informed and uninformed participants
Discuss the importance of the "crowd"
Describe the challenges of using sentiment indicators

37 Sentiment Measures from Market Data

Describe VIX as a sentiment measure
Explain the use of options volume and open interest as sentiment indicators
Describe the use of futures open interest in gauging sentiment
Identify the three primary groups in the Commitments of Traders report
Define short interest
Explain insider activity as a sentiment indicator

38 Sentiment Measures from External Data

Describe the use of news and advisories as sentiment measures
Explain the concept of contrary opinion
Indicate how mutual fund cash and other funds measures are used to gauge sentiment

Section Six: Basic Statistics for the Technical Analyst

39 Introduction to Descriptive Statistics

Describe the three most common measures of central tendency: mean, median and mode
Discuss alternative methods of calculating the mean and their uses
Describe what is meant by "measures of dispersion"
Explain two measures of dispersion: standard deviation and variance
State the value of data visualization as a complement to descriptive statistics

40 Introduction to Probability

Define probability
Explain the impact of the law of large numbers on a series of outcomes
Define random variable and the phrase "independent and identically distributed"
Describe a normal probability distribution
Identify skew and kurtosis

Section Seven: Perspectives on Technical Trading Systems

41 Objective Rules and Their Evaluation

Describe objective and subjective methods in technical analysis
Define "rule" as used in trading systems
Explain binary rules as well as individual and multiple thresholds
Identify traditional rules and inverse rules
Discuss the importance of benchmarking in evaluating trading rules
Describe the value of using detrended prices
Describe the key components of "trading costs"

42 Being Right or Making Money

List the four key characteristics Ned Davis claims are common to successful investors
Describe the importance of having plans to persevere through mistakes and losses
Identify Ned Davis' nine rules to consider when building a timing model
Discuss the theory behind "contrary opinion"

43 The Model Building Process

Describe "internal" and "external" indicators
Explain the use of valuation indicators as sentiment measures
Describe the basic relationships of economic growth, Fed policy, and money supply
Discuss the use of moving average signals based on "crossings" and "slopes"
Explain the use of price momentum and indicator momentum
Identify the problem of curve-fitting, or overoptimization

44 Relative Strength as a Criterion for Investment Selection

Define relative strength
Explain the value of relative strength in analyzing stock price movements
List several relative strength ratios that may be calculated
Identify some of the limitations of relative strength in investment decisions

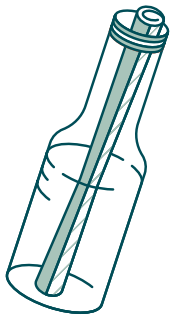
Kelly Kursinsky Colotla, CMT, CFA, CFP

Take calculated risks with your career. Here again, a core piece of the CMT curriculum is risk management, capturing upside while mitigating downside, determining the range of possible outcomes you can live with,

managing volatility and similar concepts that come right out of the CMT text material.

— Kelly Colotla, CMT Charterholder since 2017

Senior Portfolio Manager, Wealth Management at a Community Bank



CMT LEVEL I

2024

Example Questions

Stanley Dash, CMT
CMT Program Director

Knowledge Domain: Theory and History

1. According to the work of Charles Dow and his successors, now referred to as Dow Theory, which of the following is NOT a hypothesis for the nature of markets and technical analysis?

A. The primary trend is inviolate.
B. The averages discount everything.
C. Dow Theory is not infallible.
D. Prices move at random.

"Rhea presented three hypotheses:
1. The primary trend is inviolate.
2. The averages discount everything.
3. Dow Theory is not infallible.

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 2
Learning Objective: Discuss the basic principles of Dow Theory

D. Prices move at random.

2. In relation to the principles of technical analysis, the phrase "patterns are fractal" refers to the assumption that

A. patterns tend to break existing trends.
B. Mandelbrot originated the concept of chart patterns.
C. pattern analysis is universal and independent of time.
D. chart patterns found in an intraday chart can generate signals in a daily chart.

"This ability for trends to act similarly over different periods is called their fractal nature. Fractal patterns or trends exist in nature along shorelines, in snowflakes, and elsewhere. For example, a snowflake is always six-sided—having six branches, if you will. … The trading markets are similar in that any period we look at—long, medium, or very short—produces trends with the same characteristics and patterns as each other. Thus, for analysis purposes, the length of the trend is irrelevant because the technical principles are applicable to all of them. The trend length of interest is determined solely by the investor's or trader's period of interest."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 1
Learning Objective: Define "fractal" as used in describing price action

C. pattern analysis is universal and independent of time.

Knowledge Domain: Market Indicators

3. The TRIN, or Arms Index, is calculated by

A. dividing total specialist short sales by total short sales.
B. subtracting the 26-day simple moving average from the 12-day simple moving average.
C. subtracting the advance/decline ratio from the ratio of advancing volume to declining volume.
D. dividing the advance/decline ratio by the ratio of advancing volume to declining volume.

"One of the most popular up and down volume indicators is the Arms Index, created by Richard W. Arms, Jr. (winner of the MTA 1995 Annual Award). The Arms Index (Arms, 1989), also known by its quote machine symbols of TRIN and MKDS, … measures the relative volume in advancing stocks versus declining stocks. When a large amount of volume in declining stock occurs, the market is likely at or close to a bottom. Conversely, heavy volume in advancing stocks is usually healthy for the market. The Arms Index is actually a ratio of two ratios, as follows:

Arms Index = (Advances / Declines) / (UpVolume / DownVolume)

The numerator is the ratio of the advances to declines, and the denominator is the ratio of the up volume to the down volume."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 18
Learning Objective: Describe other measures of internal stock-market strength such as McClellan's calculations

D. dividing the advance/decline ratio by the ratio of advancing volume to declining volume.

4. If the VIX is quoted at 20, it indicates the market is expecting a movement of about _____ percent over the next 30 days.

A. 3.77
B. 5.77
C. 3.33
D. 5.07

"To determine the anticipated 30-day movement of the stock market as defined by the VIX involves dividing the VIX by the square root of 12. … The square root of 12 is a convenient number as 30 days is the average month and there are 12 months in the year. In a similar manner to breaking down what implied volatility was indicating about movement in Amazon stock, the VIX may be used to determine the anticipated 30-day move for the S&P 500. If the VIX is quoted at 20, the result would be the market expecting movement of about 5.77 percent over the next 30 days. Following the formula for determining 30-day market movement, the math would be:

5.77% = 20/3.46"

-- Rhoads

CMT Level I Curriculum (2023), Chapter 30

Learning Objective: State how to calculate expected 30-day market movement

B. 5.77

Knowledge Domain: Construction

5. When analyzing long term price movements, it could be helpful to use _____ chart.

A. a logarithmic
B. a candlestick
C. an EquiVolume
D. a point and figure

"As a rule of thumb, long-term charts that represent data exceeding a few years should be plotted on logarithmic scales. Also, many analysts find that when a graph depicts a security with price movements of more than 20%, a logarithmic scale is more useful than an arithmetic scale."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 4
Learning Objective: Explain the differences between arithmetic and logarithmic scales and their uses

A. a logarithmic

Knowledge Domain: Trend Analysis

6. An exponential moving average

A. gives more weight to the most recent observation.
B. gives less weight to the most recent observation.
C. gives equal weight to all observations.
D. does not suffer from any lag.

"...in certain situations, the most recent stock price may have more bearing on the future direction of the stock than the ten-day old stock price does. If observations that are more recent contain more relevant information than earlier observations, we want to weight data in favor of the most recent observation. By calculating a weighted moving average, the most recent day's information is weighted more heavily. This weighting scheme gives the most recent observation more importance in the moving average calculation."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 7
Learning Objective: Explain how to calculate simple, linearly weighted and exponentially smoothed moving averages

A. gives more weight to the most recent observation.

7. Violated support levels typically

A. lose importance after three weeks.
B. indicate an imminent price reversal.
C. lose importance after three months.
D. become resistance.

"The concept of support and resistance presumes that in the future prices will stop at these recorded levels or zones and that they represent a remembered psychological barrier for prices. The zones will carry through time and become barriers to future price action. Not only will the zones carry through time, but once they are broken through, they will switch functions. Previous support will become resistance, and previous resistance will become support."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum ('2023), Chapter 5
Learning Objective: Describe the concept of support and resistance, and the underlying psychology

D. become resistance.

8. A narrowing of Bollinger Bands normally indicates that

A. a stock is ready for a rally.
B. a stock is ready for a decline.
C. a stock's volatility has increased.
D. a stock's volatility has decreased.

"Bands are also envelopes around a moving average but, rather than being fixed in size, are calculated to adjust for the price volatility around the moving average. They, thus, shrink when prices become calm and expand when prices become volatile. The most widely used band is the Bollinger Band, named after John Bollinger (2002)."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 7
Learning Objective: List common envelope, channel, and band indicators and their characteristics

D. a stock's volatility has decreased.

Knowledge Domain: Chart and Patterns

9. A breakaway gap usually

A. provides a major divergence signal.
B. signals the beginning of a new trend.
C. occurs at the end of an important price move.
D. occurs during the accumulation phase of the market cycle.

"... prices suddenly break through a formation boundary and a major change in trend direction begins. Breakaway gaps signal that a pattern is completed and a boundary penetrated."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 9
Learning Objective: Describe the types of gaps that occur on price charts and their significance

B. signals the beginning of a new trend.

10. A flag is generally formed by a_____in a bull market or a_____in a bear market.

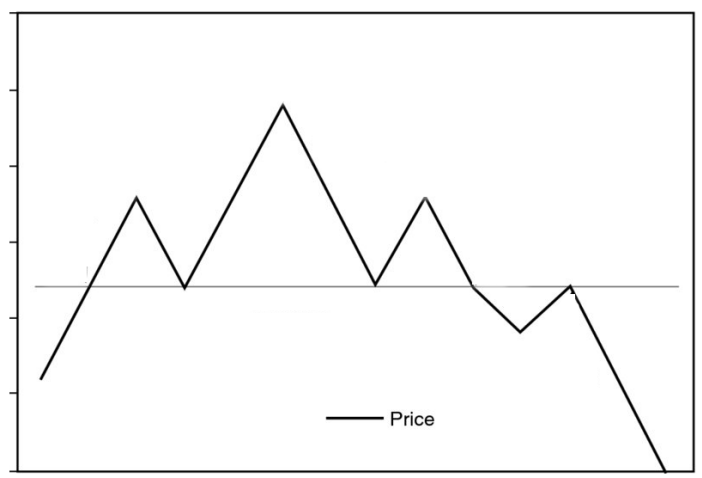
A. rally, pullback
B. rally, correction
C. correction, rally
D. correction, throwback

"Flags and pennants are really variations of the same formation. The flag is a short channel that usually slopes in the opposite direction from the trend."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 8
Learning Objective: Identify "half-mast" chart patterns such as flags and pennants

C. correction, rally

11. Identify the chart formation below.



A. triple top
B. rising wedge
C. rounding top
D. head and shoulders top

"The head-and-shoulders pattern is probably the most famous technical pattern. Its name is often used when ridiculing technical analysis, yet its profitability is high, relative to other patterns, and it is one of the few that the Lo, Mamaysky, and Wang (2000) study showed had statistical significance.

The head-and-shoulders top pattern is a series of three well-defined peaks, either sharp or rounded. The second peak is higher than the first and third peak. This middle, higher peak is called the head. The first peak is called the left shoulder, and the third peak is called the right shoulder. Both the left and right shoulders must be lower than the head, but the two shoulders do not have to be the same height."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 8
Learning Objective: Identify rounding chart patterns such as head-and-shoulders

D. head and shoulders top

Knowledge Domain: Confirmation

12. The basis of On-Balance-Volume (OBV) is the belief that

A. price precedes volume.
B. volume precedes price.
C. volume matters most during breakouts.
D. volume and price are typically coincident indicators.

"How can the OBV be used in prices that are in a consolidation pattern or trading range rather than trending? When prices are in a trading range and the OBV breaks its own support or resistance, the break often indicates the direction in which the price breakout will occur. Therefore, it gives an early warning of breakout direction from a price pattern."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 13
Learning Objective: List the major indexes and oscillators designed to use volume as confirmation

B. volume precedes price.

13. The stochastics indicator measures

A. where today's typical price fits into the recent trading range.
B. the distance in percentage between the first and last values over n-days.
C. the relative position of the closing price within a past high-low range.
D. the relative strength of the current price movement as it increases from 0 to 100.

"The stochastic ... looks at the most recent close price as a percentage of the price range (high to low) over a specified past "window" of time. This makes it sensitive to recent action."

-- Kirkpatrick and Dahlquist
CMT Level I Curriculum (2023), Chapter 13
Learning Objective: Identify characteristics and applications of indexes and oscillators such as MACD, RSI, and stochastics

C. the relative position of the closing price within a past high-low range.

Knowledge Domain: Selection and Decision

14. A rising relative strength line for a stock in a falling market indicates that

A. price and volume are diverging.
B. the stock is performing worse than the market.
C. the stock is performing better than the market.
D. it may be moving into an overbought state.

"By using ranks that measure relative strength, the co-movement of stocks is filtered out."

-- Levy
CMT Level I Curriculum (2023), Chapter 44
Learning Objective: Explain the value of relative strength in analyzing stock price movements

C. the stock is performing better than the market.

Knowledge Domain: Systems Testing

15. Objective technical analysis methods

A. normally witness less drawdown.
B. normally witness high drawdown.
C. require a disciplined approach for success.
D. are well-defined procedures that issue unambiguous signals.

"In contrast, objective methods are clearly defined. When an objective analysis method is applied to market data, its signals or predictions are unambiguous. This makes it possible to simulate the method on historical data and determine its precise level of performance. This is called back testing. The back testing of an objective method is, therefore, a repeatable experiment which allows claims of profitability to be tested and possibly refuted with statistical evidence. This makes it possible to find out which objective methods are effective and which are not."

-- Aronson
CMT Level I Curriculum (2023), Chapter 41
Learning Objective: Describe objective and subjective methods in technical analysis

D. Are well-defined procedures that issue unambiguous signals.

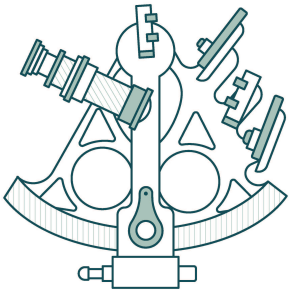
A lot of what I am today is because of the CMT designation. The CMT program is the gold standard in its field, without a doubt.

People associated with me trust my work a lot more because I have CMT next to my name ... Qualification, and using the marks of a recognized global organization, is extremely important in today's world.

— Gautam Shah, CMT Charterholder since 2009

Founder & Chief Strategist at Goldilocks Premium Research

Gautam Shah, CMT, CFTe, MSTA



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Level II. Theory and Analysis

Section One: Chart Development and Analysis

1 Charting: Understanding Data Intervals

Employ a sequence of multiple data intervals to identify trends
Compare the typical construction of weekly and monthly interval charts
Review challenges related to consistent data sampling using time-based intraday intervals
Interpret general trend relationships in charts with multiple price-data sets
Interpret the significance of the data points in a scatter plot

2 Additional Charting Methods

Describe the construction of the types of charts in this chapter
Compare the axes and intervals of these charts
Analyze trends and price action using these charts
Demonstrate how point-and-figure charts help minimize "noise"
Distinguish between charts with defined and undefined x-axes
State the basic principles behind Market Profile

3 Moving Averages

Contrast various types of moving averages used in trend analysis
Illustrate four ways moving averages are used by technicians
Analyze trend movement using Directional Movement Indicators
Compare common envelope, channel, and band indicators

4 Time-Based Trend Calculations

Examine methods for forecasting price direction
Calculate a simple approach to momentum
Inventory various weighting methods for moving averages
Explain the drop-off effect and its impact on technical indicators

5 Trend Systems Part 1

Explain three reasons why trend systems work
Demonstrate appropriate asset selections based on trend and forecast
Diagram how buy and sell signals are used with indicators and tools for measuring trend, such as: Moving Averages, Bollinger Bands, Keltner Channels, Percentage Bands, Volatility Bands, and combinations of bands and other indicators
Illustrate use of the 10-day moving average rule in a trading system

6 Trend Systems Part 2

Analyze how a trader or investor would go about selecting the right moving average, trend method, and speed
Compare the role of each moving average in a two-trend or three-trend method of trading
Contrast two general rules for generating an exit signal when using moving averages, and explain which one of the two is considered better than the other
Describe the "Golden Cross" and the "Death Cross"

7 Momentum and Oscillators

Differentiate between momentum and rate of change studies in technical analysis
Distinguish among various calculations of momentum
Demonstrate use of momentum for trend indication and associated signals
Demonstrate use of momentum for finding price extremes and associated signals
Illustrate the use of MACD to generate trading signals
Compare various oscillators and their trading signals including RSI, stochastics, and TRIX

8 Price Trends and Volume

Describe the four phases of price-volume trends
Interpret volume in the context of price trends
Interpret price and volume to identify the current phase

9 Volume and Breadth

Compare various volume indicators such as On-Balance Volume, Accumulation Distribution, and VWAP
Analyze changes in breadth in the context of price trends
Interpret breadth indicators such as the McClellan Oscillator
Interpret indicators that combine breadth with volume such as Arms Index and Thrust Oscillator
Examine approaches to incorporating volume and breadth into systematic methods

10 Bar Chart Patterns

Critique the controversy over whether tradeable patterns exist in technical analysis
Discuss the influence that computer technology has had on the study of patterns
Diagram classic chart patterns such as triangles, and double and triple tops and bottoms
Draw rounding chart patterns such as head-and-shoulders
Illustrate "half-mast" chart patterns such as flags and pennants
Demonstrate methods for determining price objectives from patterns

11 Short Term Patterns

Analyze reversals in longer-term trends using short-term price patterns
Interpret the significance of various types of gaps that occur on price charts
Compare and analyze wide-range and narrow-range bars and their implications for volatility
Diagram one- and two-bar reversal patterns
Draw common candlestick patterns and analyze their significance within a trend

12 Single Candle Lines

Interpret market psychology from candle shapes
Diagram and interpret notable individual candles: hammer, hanging man, doji and others in this chapter
Demonstrate the importance of such candles in the context of trends
Differentiate between the buying and selling activity represented by real bodies and shadows in these candles

13 Multi-Candle Patterns

Diagram and interpret notable patterns formed by multiple candles: engulfing, stars, windows and others in this chapter
Demonstrate the importance of the prevailing trend when interpreting candle patterns
Differentiate between the buying and selling activity represented by real bodies and shadows in these candle patterns
Interpret candle patterns for support and resistance

14 Candle Pattern Forecasting and Trading Techniques

Analyze candle patterns on charts for indications of trend reversal and continuation
Interpret candle patterns for support and resistance indications and confirmation
Illustrate how to combine Western technical indicators with candles
Employ candlestick analysis for risk management
Demonstrate using candles in multiple time frames

15 Concepts in Cycle Theory

Illustrate the causes of the "mid-cycle dip" and "3/4 cycle high"
Analyze the implications of an inversion
Examine the cyclical explanation for rounded tops and "V-bottoms"
Interpret the implications of left and right translation
Calculate a centered moving average (CMA) envelope
Demonstrate the use of a valid trend line (VTL)

16 Applied Cycle Analysis

Diagram the steps to a comprehensive cycle analysis
Differentiate tools that find cycles from tools that phase cycles
Illustrate how to identify a dominant cycle with a spectrogram
Compare the phasing of smaller harmonics to larger harmonics

Section Two: Volatility Measures in Today's Financial Markets

17 Options

Explain the purpose of options markets
List the major terms of an option contract
Describe "the Greeks"
Define implied volatility

18 Understanding Implied Volatility

Contrast historical and implied volatility when used in price analysis and forecasting
Interpret implied volatility as the market's estimate of possible future asset prices
Calculate single-day implied volatility
List the inputs to an option pricing model

19 About the VIX Index

Explain how the VIX is impacted by put-call parity and options supply
Interpret the VIX as an indication of market sentiment
Interpret changes in the VIX as part of a market forecast
Calculate expected 30-day movement of an index or a stock

Section Three: Topics in Behavioral Finance

20 Prospect Theory

Compare utility theory and prospect theory
Describe loss aversion
Describe the single greatest limitation of prospect theory

21 Perception Biases

Describe each of the four perception biases covered in this chapter
Illustrate how each of these biases might affect investor behavior

22 Inertial Effects

Describe each of the three inertial effects covered in this chapter
Illustrate how each of these might affect investor behavior

23 Analyzing Sentiment in the Stock Market

Appraise the impact of insider activity on a security's price action
Compare insider buying vs insider selling
Analyze short interest and the short interest ratio
Interpret sentiment as drawn from surveys of investors and professionals

24 Analyzing Sentiment in Derivatives Markets

Interpret changes in futures open interest in the context of price action
Analyze the Commitments of Traders report
Employ options put/call ratios as sentiment indicators
Interpret volatility data drawn from the options market

Section Four: Statistical Applications for Technical Analysts

25 Inferential Statistics

Compare descriptive and inferential statistics
Demonstrate the use of hypothesis testing to frame statistical tests
Explain confidence intervals, statistical significance and the base rate fallacy
Compare coefficients of correlation and determination
Differentiate between correlation and causation
Examine the use of regression analysis in technical studies

26 Correlation

Compare Pearson's and Spearman's methods
Describe the importance of linearity and normality to useful correlation studies
Analyze the effect of outliers on a regression study

27 Regression

Interpret values generated by regression, multiple regression and tolerance calculations
Demonstrate the process of selecting meaningful predictor variables for multiple regression studies

28 Regression Analysis

Analyze the concept behind the ARIMA method
Describe the ARIMA process
Employ the results of the ARIMA forecast to generate trading signals
Demonstrate use of linear regression to generate trading signals
Illustrate the use of linear regression for relative strength studies

Section Five: Technical Methods and Market Selection

29 Selection of Markets and Issues

Differentiate between buy-and-hold, position, swing and day trading, and the use of technical analysis in each
Compare significant factors in trading stocks versus futures
Distinguish between bottom-up and top-down approaches
Contrast secular and cyclical emphasis
Explain the basic concepts of intermarket analysis
Explain the principles behind relative strength analysis
Compare four methods for calculating relative strength

30 Intermarket Analysis

Interpret the rotation of stocks, bonds, and commodities in the typical business cycle
Describe methods of determining intermarket relationships
Illustrate the importance of measuring correlation for portfolio diversification and asset selection

31 Relative Strength Strategies for Investing

Illustrate a general approach to a momentum strategy using relative strength
Analyze the use of hedging and non-correlated assets in a long-only relative strength model

32 A Stock Market Model

Define an environmental model
Contrast internal and external indicators
Sketch the basic components of Davis' Fab Five model

33 A Simple Model for Bonds

Categorize each of the four indicators in Zweig's original model as internal or external
Categorize the additional indicator in the modified version as internal or external, trend following or mean reversion

34 Perspectives on Active and Passive Money Management

Differentiate between alpha and beta
Compare the Efficient Market Hypothesis with general concepts in behavioral finance and with the Adaptive Markets Hypothesis

Section Six: Designing and Testing Technical Trading Systems

35 The Statistics of Backtesting

Explain the statistical challenges faced when backtesting
Appraise four important statistical features of time-series price data
Illustrate why log returns are often used in backtesting
Analyze three statistical concerns in backtesting
Differentiate between signal testing and backtesting

36 The Scientific Method and Technical Analysis

Examine the possibilities and challenges of applying the scientific method to traditional technical analysis
Analyze the three forms of the EMH as to their information content
Explain "null hypothesis" as used in the scientific method
State the five stages of the hypothetico-deductive method
Critique the three consequences, articulated in this chapter, of adopting the scientific method in technical analysis

37 Theories of Nonrandom Price Motion

Analyze why the existence of nonrandom price motion is a premise of technical analysis
Describe an "efficient market"
Analyze behavioral finance as a theory of nonrandom price motion
Illustrate the two foundations of behavioral finance
Interpret feedback loops in price action

38 Case Study of Rule Data Mining for the S&P 500

Examine data mining and data-mining bias in testing trading rules
Define and examine data-snooping bias in testing trading rules

39 System Design and Testing

Differentiate between discretionary and nondiscretionary systems
Illustrate the advantages and disadvantages of nondiscretionary trading systems
Inventory the five initial decisions for constructing a trading system per the authors of this chapter
Distinguish between four types of technical trading systems
Compare various metrics for evaluating trading systems such as profit factor, percent profitable, and average trade net profit
Differentiate between methods of optimization
Define "robustness" as it applies to trading systems
Examine risk-adjusted performance metrics such as Sharpe, Sterling, and Sortino ratios

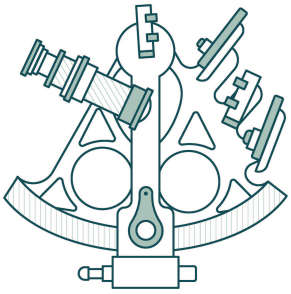
Vernon Bice, CMT

Studying for and taking the CMT exams provided another turning point in my career, and allowed for an enhancement of an existing technical process.

Earning the CMT designation has allowed me to develop technical analysis techniques that are easy to understand, that are objective and rules-based, and that work well with fundamental analysis.

— Vernon Bice, CMT Charterholder since 2016

Portfolio Manager and Technical Analyst on Lord Abbett's Innovation Growth team



CMT LEVEL II
2024 Example Questions

Stanley Dash, CMT
CMT Program Director

Knowledge Domain: Theory and History

1. The bias under which an event which has not occurred recently is perceived as having zero or negligible probability of occurring in the future is categorized as

A. saliency bias.
B. framing bias.
C. sunk-cost bias.
D. anchoring bias.

"When we have not encountered something recently, we have a tendency to ignore that thing even if it is important to an upcoming decision. No one seems interested in buying flood insurance unless there has been a recent flood. Airplane accident insurance is almost never purchased except in airports just prior to boarding a flight, though it is available to be purchased from the moment travel plans are made. When the economy has been strong and vigorous for a long time, fears of an economic slowdown recede almost to the point of being completely ignored."

-- Burton and Shah
CMT Level II Curriculum (2023), Chapter 21
Learning Objective: Describe each of the four perception biases covered in this chapter

A. saliency bias.

Knowledge Domain: Market Indicators

2. The _____ tracks the breadth of participation in rallies and declines.

A. MACD line
B. RSI
C. relative strength line
D. advance/decline ratio

"Market breadth measures the imbalance between the number of advancing and declining stocks on a given day. It is the percentage of rising stocks to the total number of stocks traded."

-- Kaufman
CMT Level II Curriculum (2023, Chapter 9
Learning Objective: Analyze changes in breadth in the context of price trends

"Market breadth refers to the spread or difference between the number of stocks advancing and the number declining on a given day, week, or other defined time interval. Breadth has been measured in a variety of ways ... For [these] purposes ... breadth is defined as the daily advance-decline ratio; that is, it is the difference between a day's advancing and declining issues divided by the total number of issues traded."

-- Aronson
CMT Level II Curriculum (2023), Chapter 38

D. advance/decline ratio

3. When ADX rallies above both directional lines, it identifies

A. less directional market.
B. flat and sleepy market.
C. a trending market.
D. a dull market.

"The ADX is the smoothed value of the DX …. When the ADX is rising, the market is increasingly trending in either direction.
The ADX indicator is valuable in determining when to apply a moving average trend-following system. A rising ADX indicates an increasing tendency to trend in the corresponding prices."

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 3

C. a trending market.

4. Which of the following instances marks a valid buy signal using a 20-bar simple moving average (blue) and a 50-bar simple moving average (green)?

A. A
B. B
C. C
D. D

"Fourth, some technical analysts use moving averages to give specific signals. These can occur when prices cross a moving average, when a shorter moving average crosses a longer moving average, and in some cases, when a third, even shorter, moving average crosses two longer ones."

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 3
Learning Objective: Illustrate four ways moving averages are used by technicians

C. C

Knowledge Domain: Chart and Pattern Analysis

5. Which of the following patterns describe the price action highlighted within the green rectangles marked 'A' & 'B'?

A. piercing line and hammer
B. piercing line and evening star
C. bullish engulfing and shooting star
D. bullish engulfing and hanging man

"The bullish piercing pattern consists of a black body forming in the downtrend; the next real body culminates in a white real body that closes within the prior black body, preferably more than one-half of the black body's length. The white real body "pierces" the recent downtrend, with the bulls overwhelming the bears. Subsequent price action should confirm this pattern ..."

-- Nison
CMT Level II Curriculum (2023), Chapter 13

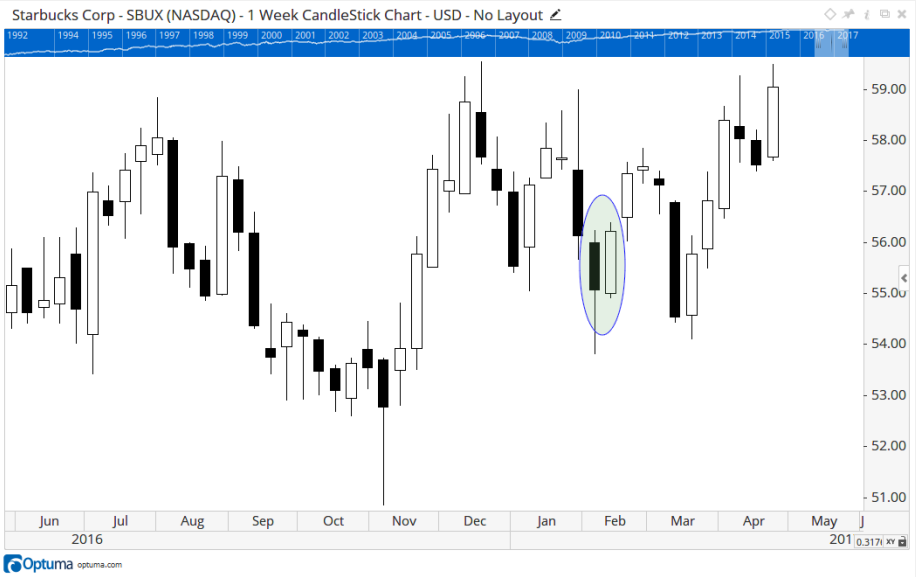
"The star is the middle portion of two candle patterns called the morning star and evening star ... The morning star's bearish counterpart is the evening star. Three candle lines make up this top reversal signal. In the context of an uptrend, a long white candle appears, convincing the bulls that the rally will continue. Then the star appears in the form of a small real body that classically gaps up from the white candle's closing price. The star's real body (black or white) remains isolated as the next candle confirms the trend top by gapping away from the star and producing a long, black real body that pushes into the white candle's real body. The final candle seals the fate of the bulls as the bears grab control and push the market downward."

-- Nison

CMT Level II Curriculum (2023), Chapter 13
Learning Objective: Diagram and interpret notable patterns formed by multiple candles: engulfing, stars, windows and others in this chapter

B. piercing line and evening star

6. Identify the candlestick pattern highlighted by the circle in the chart below.



A. harami
B. bullish engulfing
C. hammer
D. marubozu

"...like a piercing pattern, the bullish engulfing pattern typically appears at the culmination of a decline or a downtrend ... The market falls, and a black candle forms. Next, a candle line develops with a real body that wraps around the prior session's black body. ... As the white real body opens under the prior black real body's close and closes above that session's open, it shows that buying pressure has overpowered selling pressure (i.e., the bulls have taken charge!) If the market is solid, the lows of the bullish engulfing pattern should be support."

-- Nison

CMT Level II Curriculum (2023), Chapter 13
Learning Objective: Diagram and interpret notable patterns formed by multiple candles: engulfing, stars, windows and others in this chapter

B. bullish engulfing

7. Based on the chart given below, identify the chart pattern and the best course of action.

A. Head and shoulders top; go long and use current pullback as shares are retesting an important support level at point B.
B. Double top; go short at point A as shares have violated an uptrend support line.
C. Triple top; wait for a close below point C and execute shorts when prices are 2% below the neckline.
D. Head and shoulders top; wait for a close below point B to execute shorts below the neckline.

"Once a pattern has been observed using the preceding descriptive features, the neckline becomes the most important factor. The neckline is where the breakout level resides. Never should one act in anticipation of a break through the neckline."

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 10
Learning Objective: Draw rounding chart patterns such as head-and-shoulders

D. Head and shoulders top; wait for a close below point B to execute shorts below the neckline.

Knowledge Domain: Cycles

8. Phase refers to

A. the height of the wave from its horizontal midpoint (the X-axis).
B. the number of time units necessary to complete one wavelength.
C. the number of wavelengths that repeat every 360°.
D. a measurement of the starting point or offset of the cycle relative to a benchmark or theoretical wave.

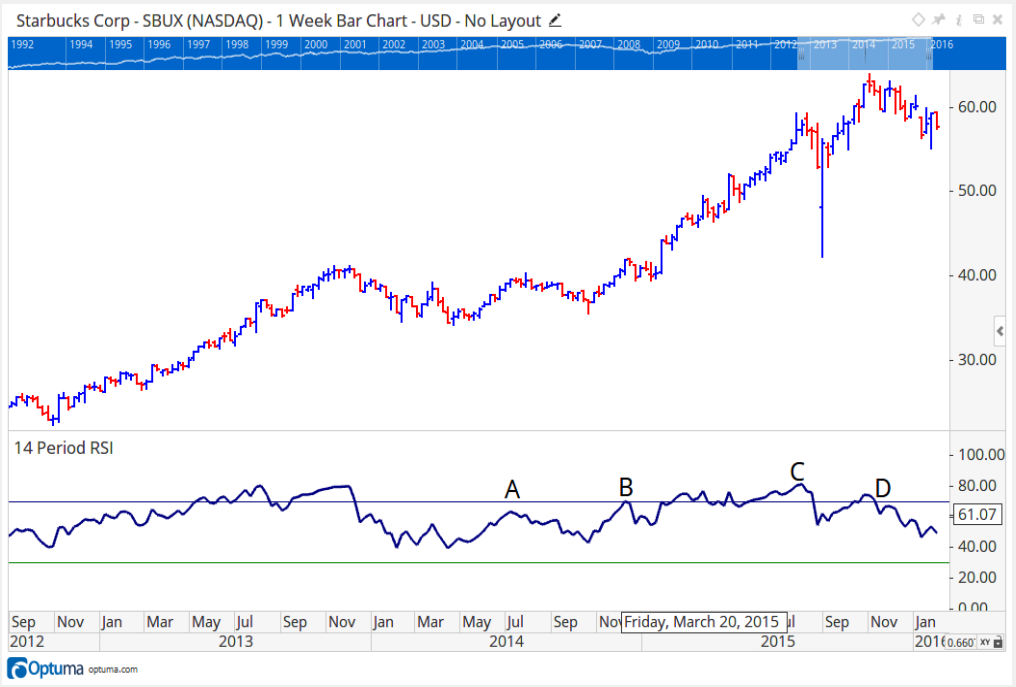
"After identifying the cycle(s) operating within a market and verifying the dominant cycle, an analyst can begin to "phase" the chart. This is the process of matching actual price lows to theoretical cycle troughs."

-- Crystal
CMT Level II Curriculum (2023), Chapter 15

-- Crystal
CMT Level II Curriculum (2023)
Learning Objective: Differentiate tools that find cycles from tools that phase cycles

D. a measurement of the starting point or offset of the cycle relative to a benchmark or theoretical wave.

9. In the following chart, where is a negative divergence in RSI observed?



A. A
B. B
C. C
D. D

"Subjective divergence analysis typically involves comparing the peaks and troughs of the two time series under consideration. A negative or bearish divergence is said to occur if one series continues to register peaks at successively higher levels while the other series begins forming peaks at lower levels. The failure by the second series to form peaks at successively higher levels is also termed a bearish nonconfirmation."

-- Aronson

CMT Level II Curriculum (2023), Chapter 38

D. D

Knowledge Domain: Selection and Decision

10. Because relative strength is so_____ it is used as the primary _____ Random Walk and EMH.

A. successful, defense of
B. successful, argument against
C. weak, defense of
D. weak, argument against

"Not until 1993 was another major paper published on the subject of relative price strength, or momentum as it is commonly called. This paper, "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," was also published in the Journal of Finance. The authors, Professors Narishimhan Jegadeesh and Sheridan Titman, … stated that the t-test statistical evidence forced them "to conclude that the hypothesis of market efficiency can be rejected at even the most conservative levels of significance."

…by the time of Conrad and Kaul's paper, other doubts about market efficiency had also been demonstrated, and the evidence was not rejected immediately as it had been … Since then, the basis of their paper has been proven correct not only in foreign countries but also in the period following the original paper in the United States, … In 1998, Professor K. G. Rouwenhorst showed that momentum was successful in 12 European stock markets, and in 1999, he demonstrated that momentum was most strong in emerging markets. Other studies confirm the existence of profitability from relative strength in China, Germany, eight different Asian markets (without Japan), and Switzerland. Even Professor Eugene Fama, one of the originators of the EMH, found that momentum was the only anomaly to survive a multitude of tests (Fama and French, 1996). Academia has, thus, concluded that the theory of relative price strength shows success not only in producing profits but also in debunking part of the EMH."

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 29
Learning Objective: Explain the principles behind relative strength analysis

B. successful, argument against

Knowledge Domain: System Testing

11. When using out-of-sample testing, the "out-of-sample" refers to

A. a small subset of data that was used to optimize the system.
B. the unexpected set of parameters that gives the best system results.
C. a set of data not used in the system-building process.
D. none of the above.

"... a large portion of the data, called out-of-sample data, must be kept aside to use later when testing the system for robustness. Once a viable system has been adequately optimized, the resulting parameters are then tested against the out-of-sample data to see if the system works with unknown data and was not the result of curve-fitting or data mining."

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 39
Learning Objective: Differentiate methods of optimization

C. a set of data not used in the system-building process.

12. The measurement that tells the system designer how far a trade was in loss before it came back to close in profit is called

A. maximum favorable excursion.
B. maximum adverse excursion.
C. return retracement ratio.
D. none of the above.

"Maximum favorable and adverse excursions ... inform the system's designer of how much dispersion exists in trades. It can be used to measure the smoothness of the equity curve but also give hints as to where and how often losing trades occur. Its primary use is to give hints as to where trailing stops should be placed to take advantage of favorable excursions and reduce adverse excursions.

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 39
Learning Objective: Compare various metrics for evaluating trading systems such as profit factor, percent profitable, and average trade net profit

B. maximum adverse excursion.

13. _____ captures an increasing part of the profits as price moves in a favorable direction.

A. An initial stop
B. A trailing stop
C. A sell stop
D. A standard deviation stop

"Follow a profitable move with a trailing, nonretreating stop based on fixed points or a percentage."

-- Kaufman
CMT Level II Curriculum (2023), Chapter 7

"...place trailing stops as the price progresses upward."

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 11

"... devise a stop-loss strategy ... This strategy should include protective and trailing stops, price targets, and adjustments for volatility, type of market, and any other state that the market might be in."

"On the exit side of a trend, specific trailing stops or such can be used to receive better prices..."

-- Kirkpatrick and Dahlquist
CMT Level II Curriculum (2023), Chapter 39

B. A trailing stop

Knowledge Domain: Risk Management

14. The only effective method of diversifying a portfolio is by including asset classes with _____ correlation to stocks such as cash, foreign exchange or commodities.

A. positive
B. meaningful
C. low/negative
D. moderately positive

"The only effective method of diversifying one's portfolio is by including asset classes with low or negative correlation to stocks such as cash, foreign exchange, or commodities. Whatever the relationship is—leading, lagging, or divergent responses to economic conditions—a strong negative correlation coefficient between two markets is a suggestion that these markets will move against each other sometime in the future. And, of course, the higher the absolute value of the coefficient of correlation, the higher the diversity of their performances."

-- Katsanos
CMT Level II Curriculum (2023), Chapter 30
Learning Objective: Illustrate the importance of measuring correlation for portfolio diversification and asset selection

C. low/negative

15. _____ as a risk measure results in an estimation of a price move in either direction.

A. Put/Call parity
B. Plurality index
C. Implied volatility
D. Standard deviation

"What the implied volatility of an option projects onto the underlying security is the expected range of price movement over a certain period of time. This estimation of price movement is based on statistics and the bell curve. The implied volatility of an option is the projection of an annualized one standard deviation move in the underlying stock over the life of the option. According to statistics and using implied volatility as a guide, the price of a stock should land between up and down one standard deviation

at option expiration. The closing price should land in this range 68.2 percent of the time."

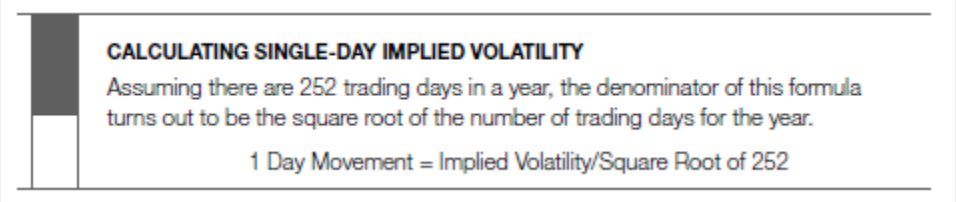
-- Rhoads
CMT Level II Curriculum (2023), Chapter 18
Learning Objective: Interpret implied volatility as the market's estimate of possible future asset prices

C. Implied volatility

16. What would be the implied volatility if you were told the one day expected movement was 2%?

A. 0.317%
B. 31.7%
C. 6.93%
D. 5.04%

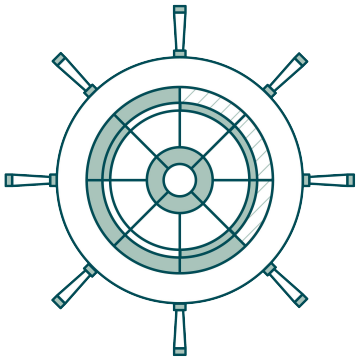
"This single-day implied volatility can be interpreted as being a single standard deviation range of expected price movement of the stock on that day.



"

-- Rhoads
CMT Level II Curriculum (2023), Chapter 18
Learning Objective: Calculate single-day implied volatility

B. 31.7%



CMT LEVEL III

2024 Exam Information &

Learning Objective Statements

Stanley Dash, CMT
CMT Program Director

Level III. The Integration of Technical Analysis

The following sample CMT Level III questions offer a glimpse into the style and scope of the exam. These samples are by no means a study guide; instead, consider them a taste of what a Level III candidate may be asked to show mastery of the body of knowledge.

Important points to note

- The CMT Level III exam tests the candidate's ability to integrate a wide range of concepts and tools into the application of technical analysis.

- The Level III exam is organized into groups, most of which weave together two or more knowledge domains. In turn, each of those groups contains from three to seven items requiring a response. Some items will be multiple choice; most will be short answer and require that you make a list, state and justify your analysis, or supply a similar written response.

- Candidates have four hours to complete the exam.

- The exam is delivered on a computer in Prometric testing facilities, or through Prometric's ProProctor remote-proctoring service. Please be sure to schedule your exam well in advance.

- Questions on the Code of Ethics and Standards of Professional Conduct appear on all three levels of the CMT exams. The Standards of Practice Handbook is a valuable study guide for the Code and Standards. Please use those documents as ethics are not otherwise included in the CMT Program textbooks.

- The CMT Association maintains a discussion forum for CMT candidates. Candidates are encouraged to utilize this resource to discuss and clarify their understanding of the subject matter.

Level III. The Integration of Technical Analysis

Section One: Risk Management

1 System Design and Testing

Assess the value and challenges of using a system for trading or investing
Compare and analyze differences between discretionary and nondiscretionary systems
Evaluate the mind-set and discipline required to develop and trade with a system
Organize the basic procedures for designing a system
Inventory types of technical trading systems
Defend the necessity of risk management protocols in a trading system
Examine critical aspects of performing system tests
Compare and evaluate standard measures of system profitability and risk
Differentiate between various methods of optimization

2 Money and Portfolio Risk Management

Distinguish between trading strategies and money-management strategies
Evaluate the significance of the theory of runs and a martingale strategy
Model position size using risk of ruin and optimal f methods
Differentiate between diversifiable and correlated risk
Compare and analyze the various types of stops used to manage risk
Assess the minimum capital needed for trading a system

3 System Evaluation and Testing

Choose factors for system testing including objectives, parameters and test data
Assess the use of in-sample and out-of-sample data
Evaluate optimized test results for continuity and significance using a variety of visualization methods
Explain the basics of using genetic algorithms
Illustrate the concept of robustness in a trading system
Critique the use of performance and risk metrics based on a given objective

4 Practical Considerations

Plan for system development and testing: data, techniques, and initial evaluation of results
Assess the potential impact of price shocks and formulate plans for managing them
Assess the impact of runs and martingales on a trading system
Evaluate the trade-offs between trend-following and mean-reverting systems

5 Risk Control

Compare risk and performance metrics derived from the following: Sharpe Ratio, Information Ratio, Treynor Ratio, Calmar Ratio, Sortino Ratio
Interpret calculations of Value at Risk (VaR)
Model position size using various capital and volatility approaches in this chapter
Compare various methods for setting stops and profit targets
Compare approaches to compounding positions
Calculate the risk of ruin
Calculate optimal f

6 Statistical Analysis

Assess random and nonrandom trends in trading system performance
Examine sampling and sample statistics in trading
Calculate relative frequency
Organize six elements of a statistical inference problem
Differentiate between theoretical and empirical probabilities
Derive a sampling distribution

7 Hypothesis Tests and Confidence Intervals

Differentiate between necessary and sufficient conditions
Compare the assertions of the null and alternative hypotheses
Defend why the null hypothesis should be framed as the target of a test
Prepare the data and arrange the steps for a Monte Carlo simulation

Section Two: Asset Relationships

8 Regression
Assess values generated by regression, multiple regression and tolerance calculations
Select meaningful predictor variables for multiple regression studies based on correlation values among them and with the dependent variable

9 International Indices and Commodities
Inventory the various indexes and markets discussed
Evaluate the intermarket relationships among the indexes and markets discussed

10 The S&P 500
Compare general correlations among the S&P 500, international indexes, and other markets discussed

11 European Indices
Compare general correlations among international indexes, stocks, and other markets discussed

12 Gold
Compare general correlations among gold, dollar, stocks and indexes

13 Intraday Correlations
Evaluate correlation characteristics in various timeframes among the index futures discussed

14 Intermarket Indicators
Construct relative strength studies and evaluate the results
Compare intermarket indicators described in this chapter
Prepare recommendations based on asset correlation data

15 A Unique Way to Visualize Relative Strength
Evaluate the trend and momentum of relative strength using Relative Rotation Graphs (RRG)
Assess relative strength using the indicators derived from the RRG concept

Section Three: Portfolio Management

16 Fact, Fiction and Momentum Investing

Defend the use of momentum strategies using historical data
Argue against common myths about momentum strategies

17 Analyzing the Macro-Finance Environment

Assess the business cycle, the financial cycle, and their relationship
Manage a sector rotation model based on the business and financial cycles
Use leading, coincident, and lagging indicators of economic activity

18 Portfolio Risk and Performance Attribution

Assess the statement "total risk = volatility = standard deviation of returns"
Compare the three formulations of total risk
Defend the assertion that "diversification reduces only firm-specific risk"
Defend beta and its role in assessing portfolio risk
Employ the Sharpe and Treynor ratios for individual stocks and portfolios

Section Four: Behavioral Finance

19 Behavioral Biases

Distinguish between two types of biases: cognitive and emotional
Examine the specific behavioral biases in each of those categories
Formulate plans to counter behavioral biases in making investment decisions
Propose methods to capitalize on the behavioral biases of other market participants

20 Investor Psychology

Inventory general behavioral aspects that impact price action
Evaluate behavioral elements that contribute to the development of chart patterns
Evaluate behavioral elements that contribute to the persistence of trends
Evaluate behavioral elements that contribute to periods of consolidation
Evaluate behavioral elements that contribute to trend reversals

21 Are Two Heads Better than One?

Assess the negative consequences of group/committee decision making
Organize approaches to mitigating the effects of group biases

22 The Anatomy of a Bubble

Diagram the five stages of a bubble
Assess the characteristics of each of the five stages
Assess hypothetical market environments to identify what stage they indicate

23 De-Bubbling: Alpha Generation

Assess the three cross-section strategies that should benefit from a de-bubbling/deflationary period

24 Behavioral Techniques

Evaluate market reactions to events: planned news releases versus price shocks
Estimate reactions to events using the volatility ratio
Assemble a COT Index and a COT Sentiment Index from Commitments of Traders (COT) data

Section Five: Volatility Analysis

25 The VIX as a Stock Market Indicator

Compare movement in the VIX and the S&P 500
Evaluate VIX and VIX futures price relationships for signals
Formulate market forecasts that include volatility as an input

26 Hedging with VIX Derivatives

Defend the rationale behind hedging with VIX products
Propose hedge strategies using VIX options and futures

27 Advanced Techniques

Assess the relationship between price and volatility
Compare several measures of volatility
Calculate profit targets and stop-loss levels using volatility
Evaluate methods for filtering a system's signals based on volatility
Assess how fractal, chaos, and entropy concepts may be applied to trading
Explain the basics of using neural networks
Explain the basics of using genetic algorithms

Section Six: Classical Methods

28 Pattern Recognition
Compare and evaluate pivot points and DeMark's calculations for price ranges
Examine intraday data for idiosyncratic patterns in various markets
Assess the use of opening gaps as trading signals

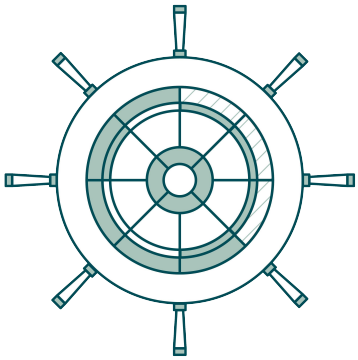
29 Multiple Time Frames
Evaluate chart data using Elder's and Pring's multiple time-frame methods
Defend Krausz's six rules for multiple time frames

30 Candlestick Analysis
Evaluate the strengths and weaknesses of candlestick charts
Categorize reversal and continuation candlestick patterns
Interpret the nine important price action guidelines
Assess the significance of various Japanese candlestick patterns to pinpoint reversals and breakouts
Integrate candlestick charts with other technical studies

31 Progressive Charting
Evaluate candle patterns as they develop in a chart
Compose responses to the four questions posed at the outset of the chapter

32 Bringing it All Together: Real-World Charts
Predict likely price action based on candlestick patterns and the overall context of the price action
Propose entry and exit points based on patterns, price action, and risk
Assess trend persistence based on candlestick patterns and the overall context of the price action

33 Conclusions
Assess the validity of the 12 major conclusions about technical indicators the authors present
Defend the use of technical indicators when properly employed in a variety of market environments



CMT LEVEL III

2024 Example Questions

Stanley Dash, CMT
CMT Program Director

Managing the CMT Level III exam

- Supply the answer that the question calls for. Your grade will be based on answering the question, not on showing off or trying to distract the graders.

- Resist the temptation to over-answer. If the question asks for "three reasons," then supply three reasons. Graders are instructed to look only at the first "three reasons" (or however many the question calls for). Your time is best spent thinking and checking, rather than simply cramming more into the response.

- If you cannot fully answer a question, supply at least the part you know. That is, if the question calls for supplying "three reasons" but you can supply only two, then write those two reasons. Graders have leeway to grant partial credit.

- Spelling and grammar and sentence structure are NOT graded. Please do your best to communicate the information. The Association and the graders do not grade for presentation or style, and we know that English is not the first language for many candidates. We work to keep the language in the questions direct and consistent and it is best for you to do the same in your responses.

- The exam is marked on a scale of 240 points. The point value of each section and item is given. The point values are also meant to reflect the time it might take to supply an answer. That is, a section worth 30 points is estimated to require 30 minutes to complete. Of course, you may be faster or slower on various sections but the point values are still a useful guide in your time management.

Classical Methods, Risk Management, Volatility – 40 points

You are an investment adviser helping a client understand the construction of their portfolio. This client is interested in getting your technical perspective on two stocks: Facebook (FB) and ExxonMobil (XOM).

Examine the charts of both stocks. Each chart is a long-term daily candle chart with 50- and 200-day moving averages (blue and red, respectively), as well as the stock's relative strength versus the S&P 500.

Chart 1 - FB

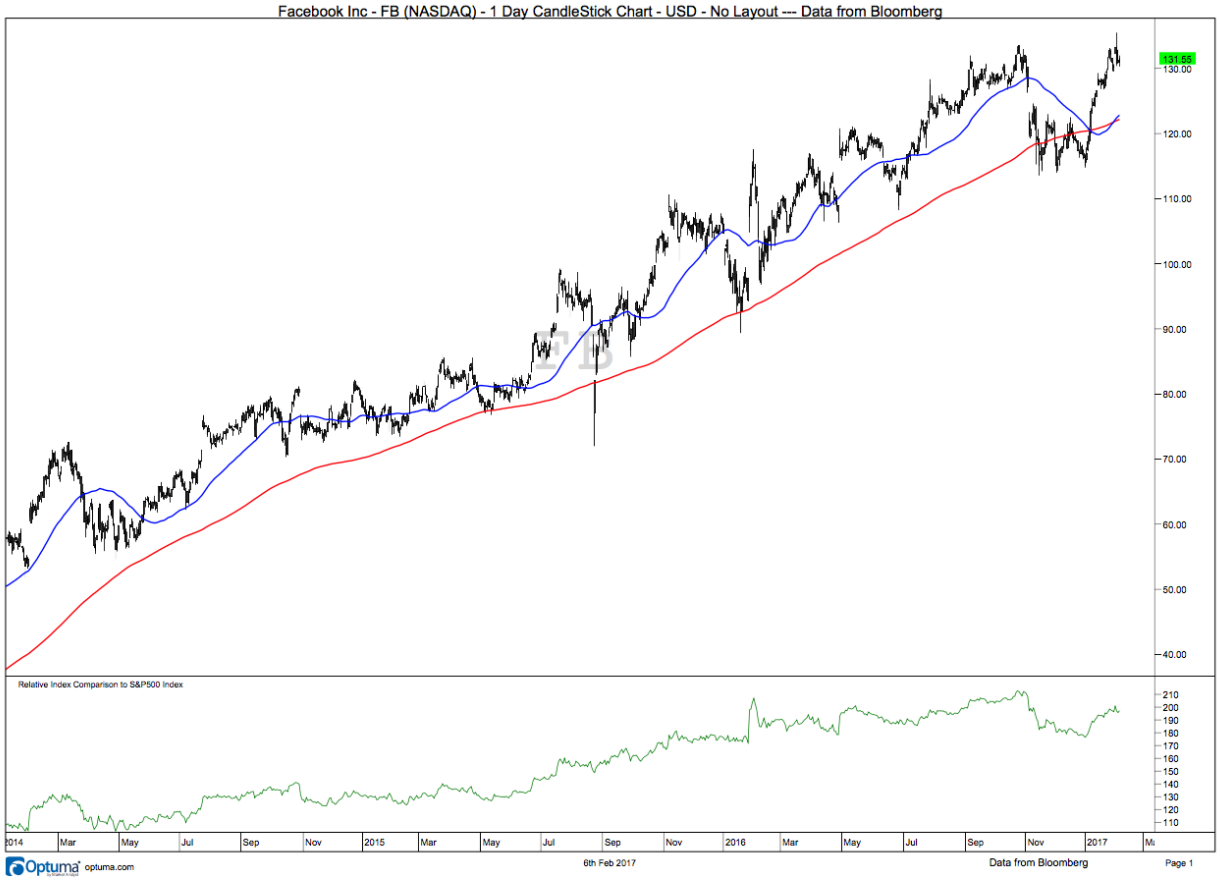


Chart 2 - XOM

1. Review charts 1 and 2 and identify which stock is the most attractive from a classical technical standpoint? (5 points)

    A. Facebook
    B. ExxonMobil

2. Using the chart of the stock you selected in question 1, describe three pieces of technical evidence that justify your answer. (6 points)

3. From a risk-management standpoint, think about how you would recommend entering this trade. Describe what buy condition and what stop loss appears warranted based on the chart. (6 points)

4. Your client wants to risk no more than 2% of his $100,000 portfolio on this trade. Assuming your client is determined to use a stop 7% below the stock's current price, calculate the maximum dollar value he should allocate to this first position (round to the nearest dollar). (8 points)

Rather than buy a single stock, your client has decided to invest his entire portfolio into both Facebook and ExxonMobil, equally weighted. You begin to tabulate the following data to help him understand and manage the investment risks involved:

Stock	Mean (Expected Return)	Standard Deviation (σ)
FB	41.084	35
XOM	12.88	10.8

50% FB/ 50% XOM Portfolio	26.982	19.003

Correlations		
	FB	**XOM**
FB	1.00	0.0979
XOM	0.0979	1.00

5. What does standard deviation (σ) represent in the table above? (3 points)

6. How is it different from popular indicators like the VIX? (6 points)

7. While the expected return of the 50/50 portfolio is simply the average of the expected return of the two stocks, the standard deviation doesn't keep that same relationship. Explain why not? (6 points)

Answers

1.

A. Facebook

2.

- Shares are testing new highs.
- Shares are above both moving averages.
- The 50-day moving average has crossed back above the 200-day moving average.
- Facebook just broke out of an inverse head and shoulders pattern.
- Shares have made a series of higher lows over the course of the chart.
- Facebook's long-term uptrend is still intact.
- Facebook's relative strength line is in an uptrend.
- Both moving averages are in an uptrend.

3.

It makes sense to either:

- Buy a breakout above Facebook's recent highs (at ~$134)
- Or, wait for a retracement to trendline support.

Logical stops include:

- Violation of most recent swing low/uptrend at ~$115.
- 200-day moving average

4.

$100,000 * 0.02 = $2,000 risk per position.
$2,000 ÷ 7% stop loss = $28,571 position size.

5.

Volatility of returns, or risk.

6.

Standard deviation is different from the VIX because it is a statistical measure of observed volatility, while the VIX Volatility Index is a statistical measure of implied volatility.

7.

Because the correlations between FB and XOM are low. The lower the correlations (and covariances), the greater the opportunity to reduce portfolio volatility – in this case, standard deviation. This is an example of the risk-reducing benefits of diversification.

Portfolio Management, Behavioral Finance, Asset Relationships - 25 points

A popular asset allocation newsletter, called Alpha-Edge, warns of the probability of a stock market bubble. In the article, the author offers the following advice: "Investors looking to reduce volatility and add downside protection should begin to shift equity holdings to more defensive assets, like fixed income and gold."

1. The newsletter is recommending going long bonds. Which type of inflation would likely cause the author's expected correlation of equities to bonds to be the least accurate? (2 points)

A. Deflation
B. Stagflation
C. Disinflation
D. Hyperinflation

2. Should the type of inflation in the prior question occur, and is forecast to last for a period greater than a year, would you recommend being LONG gold? Why or why not? Your answer must include two distinct points from the assigned readings. (7 points)

3. Examine Table 1 below. As part of its evidence, the Alpha-Edge newsletter calls attention to US corporate financials. Based on the trends in US corporate GDP and liabilities, what market stage are we likely in? (2 points)

A. Euphoria
B. Critical stage
C. Displacement
D. Credit creation

Table 1

Period of Study	US Corporate Real GDP % Change from Preceding Quarter	US Corporate Liabilities % Change from Preceding Quarter
Oct 2016 - Dec 2016	1.8	2.0
Jan 2017 - Mar 2017	1.6	2.5
Apr 2017 - Jun 2017	1.9	2.4
Jul 2017 - Sep 2017	2.0	3.4
Oct 2017 - Dec 2017	1.7	4.1

4. One of the main premises of the newsletter is that a buy and hold, value-oriented investing approach typically outperforms momentum trading strategies over the long run. Part of the author's rationale is due to the tax issues incurred from higher portfolio turnover. Cite two specific reasons why momentum investing may not be as tax disadvantageous as the newsletter states. (4 points)

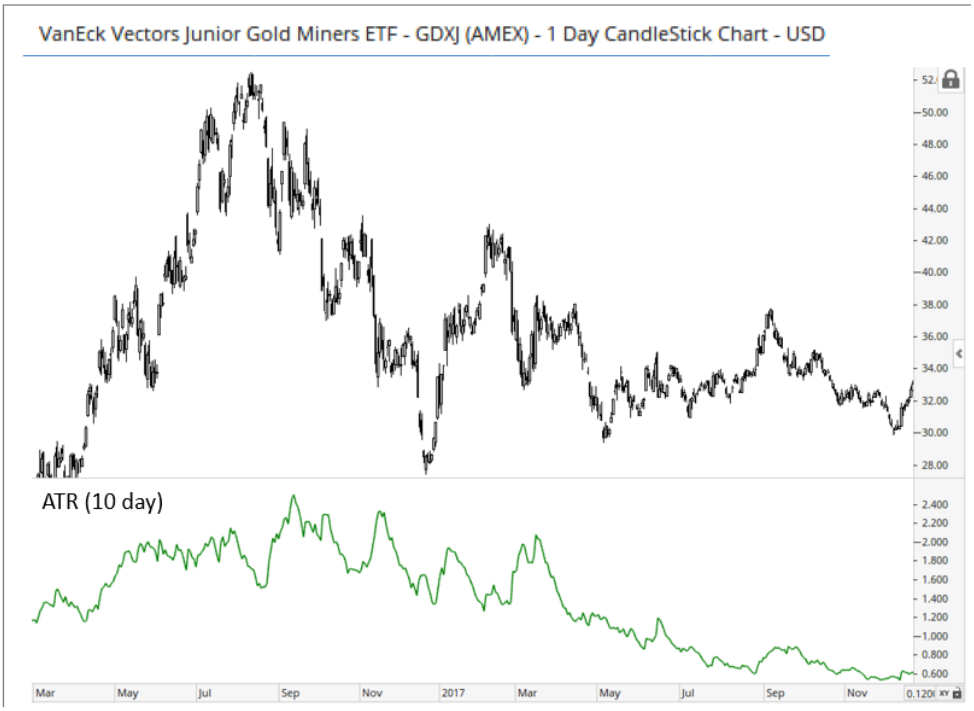
For questions 5 and 6: Consult the following two exhibits:

- Table 2 provides data on a 3-position portfolio (20% Gold mining ETF, 30% Gold commodity, and 50% in the S&P 500).
- Chart 1 of GDXJ (Junior Gold Mining ETF).

The Alpha-Edge newsletter cites: "Consider adding gold mining stocks to your portfolio to diversify our gold commodity investment recommendation. The included chart (GDXJ) shows an ETF that holds a variety of mining companies, which are traditionally very volatile. However, in the past six months, notice that prices have traded in a narrower band. This indicates that adding this security to your US Equity portfolio would help to increase the Sharpe Ratio, a key metric used for evaluating risk and reward."

5. Consult the chart of GDXJ. The newsletter is using Average True Range on the GDXJ chart as a measurement for future implied volatility. Do you agree with this and why? How is ATR typically used by technical analysts? (4 points)

Chart 1



6. Examine the table of the three-position portfolio. Discuss one benefit and one disadvantage when using the Sharpe Ratio as the means of determining risk and reward in the recommended portfolio? (6 points)

Table 2

	Standard Deviation	Expected Return	Sharpe Ratio
GDXJ	8	12.0	1.15
GOLD	7	9	1.02
SPX	13	6.4	.98
20/30/50 Portfolio	10.4	9.7	1.29

Answers

1.

A. Deflation

2.

- No
- While a weakening dollar can strengthen gold prices, recent data shows that gold has been more positively correlated to the equity markets.
- While being long gold can provide defense for the short-term (the fear trade) it is typically not a good longer-term investment (compared to equities).
- The seasonality of gold, due to the varying holiday demand by jewelers, causes price changes (supply/demand).

3.

A. Euphoria

4.

- Momentum trading tends to hold winners longer than losers.
- Momentum tends to have lower divided yield exposure vs value (or tax optimization is easier to control through capital gains/losses vs dividend income).

5.

- No
- ATR is a measure of a security's volatility against itself, BUT it doesn't predict future volatility.
- Typically, ATR is used to help establish risk levels (stop prices).

6.

- One of the following negative rationales. The Sharpe Ratio does not account for:
  - consecutive small losses/gains
  - the order in which gains or losses occur
  - large surges of profits and losses
- One of the following positive rationales. The Sharpe Ratio helps:
  - to quantify reward for a unit of risk
  - to show the value of diversifying different positions, vs holding just one.
  - risk-averse investors, who will prefer to own a portfolio with a higher Sharpe ratio than owning individual securities.

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