CFRM 522 Midterm Exam, Spring 2021

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Part I: TRUE/FALSE

2 points each

Directions: Indicate whether each of the following statements is true or false by circling *either* TRUE *or* FALSE. Circling both will result in an incorrect response.

1. Liquidity on an exchange can be created by encouraging limit orders.
   TRUE FALSE

2. The primary goals of an order execution algorithm are to get the desired amount of a trade done as completely as possible and as cheaply as possible.
   TRUE FALSE

3. Exchanges can be categorized as being *lit* or *woke*.
   TRUE FALSE

4. Quant strategies that are sensitive to latency utilize the colocation option as a way of improving their communication speeds.
   TRUE FALSE

5. The FIX protocol is a messaging standard for the real time electronic exchange of fake news on Twitter.
   TRUE FALSE

6. The abbreviation TWAP stands for *Time Weighted Average Profit*.
   TRUE FALSE

7. There is a full spectrum between *fully discretionary* strategies and *fully systematic* (or *fully automated*) strategies. With fully discretionary strategies, human emotion and judgment are removed from trading decisions.
   TRUE FALSE

8. Algorithms perform exactly as they are specified, which is nice when the trading environment is what has been expected. However, in the case that unplanned events occur, sub-par performance and higher costs may result.
   TRUE FALSE

9. While the term *alpha* has a specific meaning in the CAPM model, it is also generally used as a way to quantify the skill of an investor.
   TRUE FALSE

10. The theory behind mean reversion strategies is that markets sometimes move for long enough in a given direction, and that one can identify a trend and ride it.
    TRUE FALSE

11. Futures traders can control large positions with a fraction of their value maintained in a margin account with a broker or exchange.
    TRUE FALSE

12. Systematic risks are those that cannot be diversified away.
    TRUE FALSE

13. Observed sell orders that lead market participants to the perception that a stock is undervalued, and thus adjusting their bid prices downward, is an example of temporary market impact.
    TRUE FALSE

14. The HFT world breaks down into gradations ranging from low latency (very fast connections and trading speeds) to ultra-low latency (trading dependent on being at the physical limits of sending orders through time and space).
    TRUE FALSE

15. Statistical arbitrage relies on statistical properties of mispricing dynamics around a stable, long-run level.
    TRUE FALSE

16. The physical or emotional state of a systematic trader will likely influence performance more than that of a discretionary trader.
    TRUE FALSE

17. If one can show a trading strategy has positive returns over a time series of market prices, then it's a sure bet the strategy will be profitable in live trading.
    TRUE FALSE

18. If your strategy has a very strong run up, you may have excellent returns but your Sharpe Ratio might not look so great.
    TRUE FALSE

19. Clenow says in his book that his trend following strategy would be significantly improved by adding ten different oscillators and multiple neural-network predictive models.
    TRUE FALSE

20. Mean-reverting trading strategies tend to suffer more from slippage than trend-following strategies.
    TRUE FALSE

Part II: Multiple Choice

6 points each

Directions: Indicate the one correct response to each of following questions by circling it. Circling more than one will be considered an incorrect response.

1. `49` is the key integer indicating the sender of a FIX message. If a message is being sent by Merrill Lynch (`ML`), the proper format of the key-value pair would be

    a) `49=ML`
    b) `"49=ML"`
    c) `ML=49`
    d) `"ML=49"`
    e) None of the above

2. The Checksum in a FIX message provides

    a) A minty alternative to chewing gum
    b) Supplemental messaging the sender forgot the first time
    c) Protection from viruses
    d) A simple message integrity check
    e) None of the above

3. The UDP protocol would be used for which type of message?

    a) Trade order
    b) Live quote
    c) Execution confirmation
    d) A Donald Trump tweet
    e) None of the above

4. A *dark pool*...

   a) Does not display or disseminate order information
   b) Provides transparent order information to other traders
   c) Is Hillary Clinton's favorite place to trade cattle futures
   d) Is illegal per SEC regulations
   e) None of the above

5. A *Marketable Limit Order*...

   a) Can only be a limit order
   b) Could be a limit order or a market order
   c) Can only be a market order
   d) Can only be placed for more than 1000 shares
   e) None of the above

6. *Market Impact* is...

   a) The change in price caused by a particular trade or order
   b) The change in the price between the time a trader or trading system decides to place an order and the time when the order arrives at the exchange for execution
   c) A result of backwardation
   d) The difference between the NBBO price and the next best bid or offer price
   e) None of the above

7. *Slippage* is...

   a) A hazard of ice fishing
   b) The change in price caused by a particular trade or order
   c) The change in the price between the time a trader or trading system decides to place an order and the time when the order arrives at the exchange for execution
   d) The difference between the NBBO price and the next best bid or offer price
   e) None of the above

8. Slippage...

   a) Can either increase or decrease trading costs
   b) Will always increase trading costs
   c) Will always decrease trading costs
   d) Causes market sweep orders
   e) None of the above

9. In which type of strategy would one expect to find more negative effects of slippage?

    a) Pick and roll
    b) Trend following
    c) Run-Pass Option
    d) Mean reverting
    e) None of the above

10. NBBO does not apply in the case of...

    a) Any trade order on an ECN
    b) A marketable limit order
    c) An order being placed on an exchange that penalizes liquidity
    d) Co-located servers
    e) None of the above

11. Market Impact...

    a) Is always permanent
    b) Can be temporary or permanent
    c) Is always temporary
    d) Does not apply to a market sweep order
    e) None of the above

12. TWAP, VWAP, and POV are...

    a) Impact-driven order algorithms designed to mitigate the effects of market impact
    b) Order algorithms that can only be placed in dark pools
    c) Old subjective technical analysis indicators similar to "head and shoulders"
    d) New regulations in the Dodd-Frank legislation
    e) None of the above

13. POV stands for

    a) Perfume or Vase
    b) Percentage of Volume
    c) Persistence of Vehemence
    d) Percentage of Volatility
    e) None of the above

14. The difference between VWAP and POV is

    a) POV is dependent on a historical volume profile, while VWAP trading schedules are dynamically determined solely by observed market volume
    b) POV guarantees the same number of shares will be bought or sold in each time period, while VWAP masks a trader's intent
    c) VWAP guarantees the same number of shares will be bought or sold in each time period, while POV masks a trader's intent
    d) VWAP is dependent on a historical volume profile, while POV trading schedules are dynamically determined solely by observed market volume
    e) None of the above

15. Live high frequency data is irregularly spaced in time; one consequence of this is...

    a) Durations between data arrival carry no market information
    b) Durations between data arrival also carry market information and are often modeled with lognormal processes
    c) Durations between data arrival also carry market information and are often modeled with Poisson processes
    d) Durations between data arrival can be predicted using the Bolzano-Weierstrass Theorem
    e) None of the above

16. Given an asset S_t, a replicating portfolio $R(S_t)$, and trading costs TC, where t is the present time, *arbitrage* is a condition where

    a) $|S_t - R(S_t)| \leq TC$
    b) $|S_t - R(S_t)| < TC$
    c) $|S_t - R(S_t)| = TC$
    d) $|S_t - R(S_t)| > TC$
    e) None of the above

17. Given the same situation as in question 17, and a future time $\tau > t$, and a target profit α, *statistical arbitrage* is described mathematically as

    a) $E_t(|S_\tau - R(S_\tau)|) > TC + \alpha$
    b) $E_t(|S_\tau - R(S_\tau)|) \leq TC + \alpha$
    c) $E_t(|S_\tau - R(S_\tau)|) < TC + \alpha$
    d) $E_t(|S_\tau - R(S_\tau)|) = TC + \alpha$
    e) None of the above

18. You are given two assets ν and m with the same same trend η_t:
$\nu_t = \eta_{t-1} + \epsilon_t^\eta + \epsilon_t^\nu$
$m_t = \eta_{t-1} + \epsilon_t^\eta + \epsilon_t^m$
where $\epsilon_t^\eta, \epsilon_t^\nu$ are stationary error processes (mean = 0), but are ν_t and m_t are nonstationary due to the trend term η_t. The time series $\nu_t - m_t = \epsilon_t^\nu - \epsilon_t^m$

    a) is nonstationary, and is said to be *autoregressive*
    b) is stationary, and is said to be *autoregressive*
    c) is stationary, and is said to be *cointegrated*
    d) is nonstationary, and is said to be *cointegrated*
    e) None of the above

19. Referring to the time series
$\nu_t - m_t = \epsilon_t^\nu - \epsilon_t^m$
in question 19, if we have a situation where $\nu_t < m_t$ or $\nu_t > m_t$,

    a) There are no arbitrage opportunities as this process is governed by the *risk-neutral measure*
    b) The model can be exploited for statistical arbitrage only on the efficient frontier
    c) The model can be exploited for statistical arbitrage as we would expect the difference to revert to its mean of zero
    d) Arbitrage is only possible if the conditions of the Fama-French model are assumed
    e) None of the above

20. If we have two assets i and j and assume they follow the dynamics of the Capital Asset Pricing Model (CAPM), and based on statistical tests we find with a reasonable level of significance that $\beta_i - \beta_j = 0$ and $\alpha_i - \alpha_j \neq 0$ then, given the difference in the alpha values is greater than the absolute value of the trading costs, then we could exploit the arbitrage opportunity by...

    a) Going long in the asset with the higher α value and shorting the other, and reversing the positions as the difference approaches zero
    b) Hedging both assets with gold futures
    c) Going short in the asset with the higher α value and buying the other, and reversing the positions as the difference approaches zero
    d) Hedging both assets with options on the S&P 500 Index
    e) None of the above

21. Futures markets went a long way in removing two types of risk in forward transactions. This/these were...

    a) Operational and regulatory risk
    b) Systematic and indiosyncratic risk
    c) Regulatory and liquidity risk
    d) Counterparty and liquidity risk
    e) None of the above

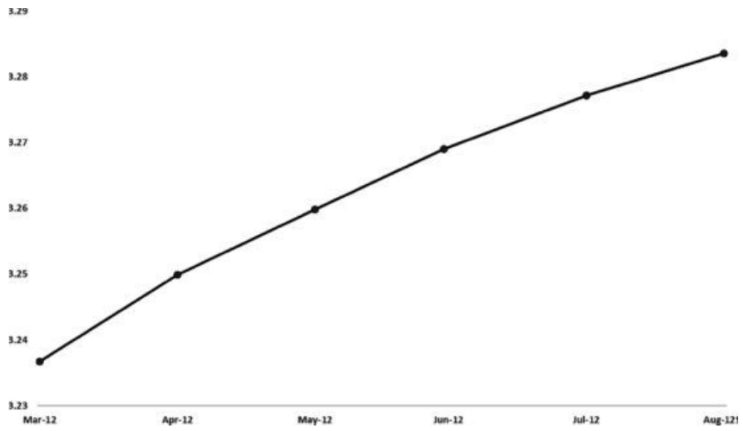

Figure 1: Successive Futures Prices by Contract Date

22. The plot in *Figure 1* above shows futures prices as a function of time, with the points indicating new contract dates. This plot represents...

    a) The implied volatility surface
    b) Term structure of interest rates
    c) Term structure of futures prices
    d) The constant maturity swap curve
    e) None of the above

23. Referring again to *Figure 1*, we would say that futures prices are„,

    a) in continuo
    b) in contango
    c) in backwardation
    d) at a Queen concert
    e) None of the above

24. In general, when referring to plots of futures prices vs time, which of the following is true?

    a) Only continuo can be present in commodity futures prices
    b) Only fandango can be present in commodity futures prices
    c) Both contango and backwardation can be present
    d) Both contango and forwardation can be present
    e) None of the above

25. Prices of futures on commodities with high storage costs typically exhibit...

    a) Fandango
    b) Backwardation
    c) Forwardation
    d) Contango
    e) None of the above

26. Prices of futures on commodities irrespective of storage costs may exhibit...

    a) Seasonality
    b) Varying implied volatility
    c) Constant maturities
    d) Robust medians
    e) None of the above

27. The *Sharpe Ratio* is a measure of...

    a) Expected Shortfall
    b) Beta
    c) Alpha
    d) Risk-adjusted return
    e) None of the above

28. *Drawdown* is a measure of...

    a) Historical and potential loss
    b) Expected Shortfall
    c) Alpha
    d) Risk-adjusted return
    e) None of the above

29. *Maximum Adverse Excursion* is...

    a) the highest gain that a trade enjoys while it is open
    b) a ride on the Lunar Rover
    c) the largest loss that a trade suffers while it is open
    d) a measure of market impact
    e) None of the above

30. The key processes of systematic trading are implemented in which order below?

    a) Prototyping, backtesting, paper trading, transition to production
    b) Backtesting, prototyping, paper trading, transition to production
    c) Paper trading, Backtesting, prototyping, transition to production
    d) Prototyping, Paper trading, Backtesting, transition to production
    e) None of the above

31. Which of the following can be used as a measure of an asset's liquidity?

    a) Average daily slippage
    b) Average daily market impact
    c) Average daily volatility
    d) Average daily volume
    e) None of the above

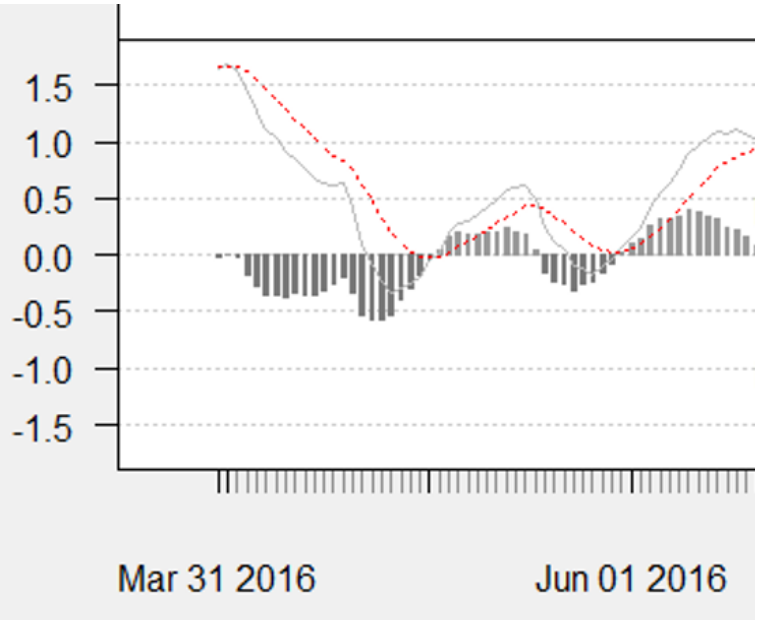

Figure 2: Technical Indicator Example 1

32. The technical indicator shown in the plot in *Figure 2* above is...

    a) Simple moving average(s)
    b) Bollinger Bands
    c) Moving Average Convergence-Divergence
    d) TWAP
    e) None of the above

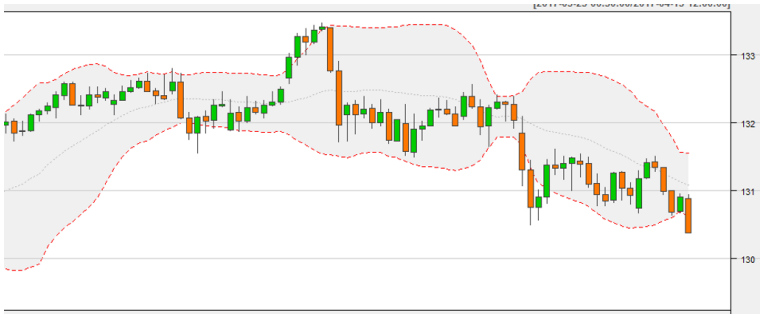

Figure 3: Technical Indicator Example 2

33. The technical indicator shown in the plot in *Figure 3* above is...

    a) Simple moving average(s)
    b) Bollinger Bands
    c) Moving Average Convergence-Divergence
    d) TWAP
    e) None of the above

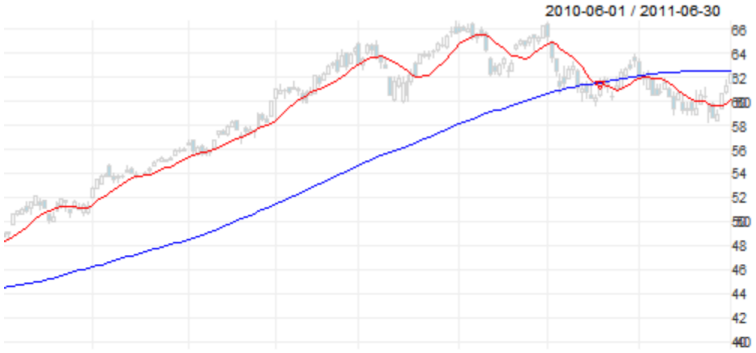

Figure 4: Technical Indicator Example 3

34. The technical indicator shown in the plot in *Figure 4* above is...

    a) Simple moving average(s)
    b) Bollinger Bands
    c) Moving Average Convergence-Divergence
    d) TWAP
    e) None of the above

35. You backtest a strategy that gains 10% in the first year with no dips, falls 6% in the second year from its initial gain, and then rebounds on an uninterrupted path to an 18% gain since inception by the end of the third year. What is was the maximum drawdown over the three-year period?

    a) 23%
    b) 12%
    c) 10%
    d) 6%
    e) None of the above