QTSHW2

May 25, 2025

1 Section A

1.0.1 Question 1

Answer: 35 bps per year (according to a paper by economists at the American Economic Association)

Explanation - Basis points (bps): Basis points are used to measure the percentage change in a financial rate, where 1 bps is equal to 0.01% or 1/100th of a percent. - General collateral stocks: These are stocks that are readily available for borrowing, meaning there's no shortage of shares available for short selling. - Reasonable cost: The American Economic Association paper suggests that for general collateral stocks, the borrowing fee is 25 basis points annualized or lower, but the paper also notes that some fees can be higher.

Why other options are less likely - 35 bps per day: This would equate to over 12,000 bps annually, which is extremely high and not typical for general collateral stocks. - 3.5% per year: This would be 350 bps, which is still a reasonable cost for some stocks but not for general collateral stocks, which are easier to borrow. - 3.5% per day: This would be over 1,200% per year, which is extremely high and unlikely for any stock.

1.0.2 Question 3

Answer: C

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# Trading costs for each strategy
booksize = 100_000_000  # $100 million
cost_seasonality = 0.005  # 50 bps = 0.5%
cost_asset_expansion = 0.004  # 40 bps = 0.4%

# Annual trading cost per strategy
cost1 = booksize * cost_seasonality  # Seasonality
cost2 = booksize * cost_asset_expansion  # Asset expansion

# Portfolio: equal weight, total booksize = $200 million
# PNL correlation = 0, so no internal crossing, costs are additive
total_cost = cost1 + cost2
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Short calculation process - Seasonality: 0.5% * $$$100M = $$$500,000 - Asset expansion: 0.4% * $$$100M = $$$400,000 - Total = $$$500,000 + $$$400,000 = $$$900,000

1.0.3 Question 5

Answer: A

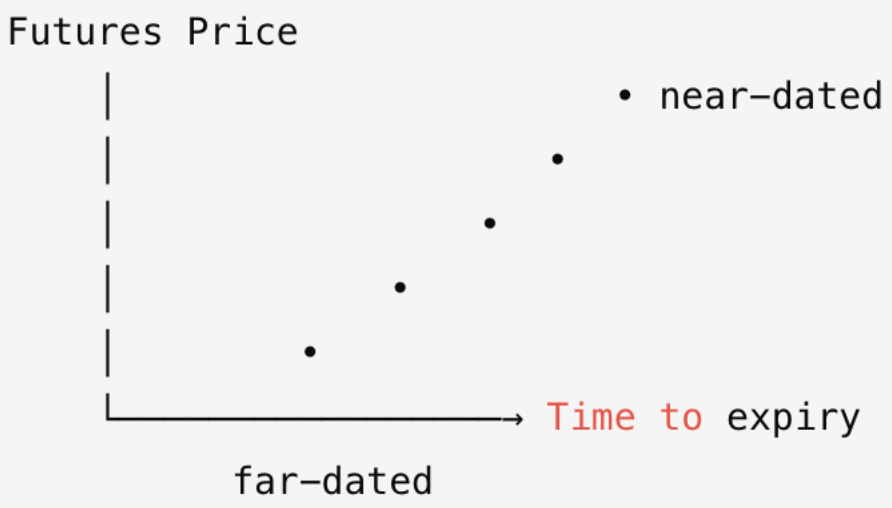
Technical analysis relies heavily on interpreting visual patterns on charts, which can be subjective and open to individual interpretation. This makes it difficult to create testable hypotheses that can be objectively evaluated and verified, as the same pattern might be seen differently by different traders.

Why other options are incorrect - b: While shorting can involve additional costs, this is not a fundamental objection to technical analysis itself. Short interest costs are related to the mechanics of short selling, not the analysis method used to identify potential trading opportunities. - c: While some technical analysis strategies can involve high-frequency trading, this is not always the case. Many technical analysis strategies can be implemented with varying levels of frequency and complexity, requiring different levels of infrastructure investment. - d: Alpha decay refers to the decline in performance over time relative to a benchmark. While technical analysis strategies can experience alpha decay, this is not a universal criticism and is more related to the specific strategy's effectiveness rather than technical analysis as a whole.

2 Section B

2.0.1 Question 1

Backwardation means the futures curve slopes down:



- Strategy: Go long the front-month contract, roll it into the next month as it nears expiry.
- Source of PnL: Because far-dated futures are cheaper, each roll "buys low, sells high" as the near contract converges up toward spot. That roll-yield accrues as positive carry.

2.0.2 Question 2

- VIX gap: Implied volatility (via VIX or VIX futures) tends to exceed realized volatility.
- Strategy: Sell (short) VIX futures or variance swaps and hedge delta in the underlying S&P 500.

- PnL: We earn the volatility risk premium — the "gap" between what we sold (implied) and what actually materializes (realized). Over time, realized vol usually comes in lower, so we pocket the difference.

2.0.3 Question 3

For each: **(i)** economic intuition, **(ii)** implementation steps.

Strategy	(i) Intuition	(ii) Process
(a) Seasonality	Certain calendar effects recur (e.g. January, turn-of-month).	Calculate average monthly (or daily) returns over many years; go long in historically strong periods, flat or short otherwise.
(b) Asset-expansion spread	Firms issuing new equity tend to be overvalued; their peers (non-issuers) outperform around issues.	Identify companies announcing large-cap raises; form a long/short portfolio: short issuers, long matched non-issuers in same sector.
(c) Analyst-revisions momentum	Upward earnings revisions signal information flow and attract buying; downward revisers underperform.	At each rebalancing, rank stocks by change in consensus EPS forecasts over the last month; go long top decile, short bottom decile.
(d) Post-earnings-announcement drift	Markets underreact to earnings surprises, returns drift in the surprise direction over days/weeks.	After each earnings release compute surprise = (actual – consensus)/price; rank and go long top surprises, short bottom, holding ~1–4 weeks.

2.0.4 Question 4

Day	% PnL	Cumulative equity	Peak	Drawdown
1	+19.5%	1.195	1.195	(1.195 - 1.195)/1.195 = 0%
2	+1.0%	1.20695	1.20695	(1.20695 - 1.20695)/1.20695 = 0%
3	–0.6%	1.1997083	1.20695	(1.20695 - 1.1997083)/1.20695 0.60%
4	+0.1%	1.2009080082999999	1.20695	(1.20695 - 1.2009080082999999)/1.20695 0.50%
5	–6.0%	1.1288535278019998	1.20695	(1.20695 - 1.1288535278019998)/1.20695 6.47%
6	+1.0%	1.1401420630800199	1.20695	(1.20695 - 1.1401420630800199)/1.20695 5.54%
7	–3.0%	1.1059378011876193	1.20695	**(1.20695 - 1.1059378011876193)/1.20695 8.37%**

Maximum drawdown: 8.37% *Note:* We measure drawdown as the largest peak-to-trough % decline in cumulative returns.