

FIN323 Midterm 1 Solutions

October 7, 2024

0.1 Question 1: What was the dividend yield of BigInc (as a percentage)?

The formula for the dividend yield is:

$$\text{Dividend Yield} = \frac{\text{Dividend per share}}{\text{Starting share price}} \times 100$$

Substituting the values for BigInc:

$$\text{Dividend Yield} = \frac{2}{20} \times 100 = \boxed{10\%}$$

0.2 Question 2: What is the total return on this portfolio during the year (as a percent)?

The total return for each stock in the portfolio is calculated as:

$$\text{Total Return} = \frac{\text{Ending share price} - \text{Starting share price} + \text{Dividends}}{\text{Starting share price}} \times 100$$

For TinyCo:

$$\text{Total Return} = \frac{14 - 10 + 0}{10} \times 100 = 40\%$$

For BigInc:

$$\text{Total Return} = \frac{18 - 20 + 2}{20} \times 100 = 0\%$$

Since the portfolio is equally weighted, the average return is:

$$\text{Total Portfolio Return} = \frac{40\% + 0\%}{2} = \boxed{20\%}$$

0.3 Question 3: What is your net trading activity when you rebalance at the end of the year?

Assuming an initial portfolio of \$2000 split equally between TinyCo and BigInc (\$1000 each), and rebalancing at the end of the year based on the new prices:

At the start:

$$\text{TinyCo shares} = \frac{1000}{10} = 100 \quad \text{BigInc shares} = \frac{1000}{20} = 50$$

At the end of the year:

$$\text{TinyCo's value} = 100 \times 14 = 1400 \quad \text{BigInc's value} = 50 \times 18 = 900 \quad \text{Dividends} = 50 \times 2 = 100$$

The total portfolio value is \$2400, and to rebalance equally:

$$\text{Each stock should have} = \frac{2400}{2} = 1200$$

Thus, you need to sell \$200 of TinyCo and buy \$300 of BigInc. The net trading activity is:

$$\boxed{100}$$

See Details:

$$\text{TinyConewshares} = \frac{1200}{14} = 85.714 \quad \text{BigIncnewshares} = \frac{1200}{18} = 66.666$$

So you sell TinyCo by 14.286 shares(outflow) and buy BigInc by 16.666 shares(inflow)

$$-14.286 \times 14 = -200 \quad 16.666 \times 18 = 300$$

0.4 Question 4: What is your gross trading activity when you rebalance?

The gross trading activity is the total amount bought and sold:

$$\text{Gross trading activity} = |-200| + |300| = \boxed{500}$$

0.5 Question 5: What is the return on a value-weighted index of the stocks (as a percent)?

The value-weighted index return is based on capital gains only, ignoring dividends. We calculate the market capitalization at the start and end:

At the start:

Market cap of TinyCo = $100m \times 10 = 1000m$ Market cap of BigInc = $200m \times 20 = 4000m$

Total market cap = $1000m + 4000m = 5000m$

1/5 weight of TinyCo and 4/5 weight of BigInc

$$\text{Total Return, if exclude dividends} = \frac{1}{5} \times \left(\frac{14}{10} - 1\right) + \frac{4}{5} \times \left(\frac{18}{20} - 1\right) = \boxed{0\%}$$

0.6 Question 6: Suppose the divisor of the value-weighted index is 1000 at the start of the year. What will it be at the end of the year?

We want to adjust the divisor by multiplying by a ratio. The ratio is the new total market capitalization, divided by a hypothetical market cap that uses the new share prices but the old share counts.

$$\text{New divisor} = 1000 * \frac{150m \times 14 + 200m \times 18}{100m \times 14 + 200m \times 18} = \frac{5700}{5000} = \boxed{1140}$$

0.7 Question 7: In a typical day, approximately what percentage of stocks would you expect to deliver positive returns? Pick the closest number.

from the discussion of the Bessembinder paper in class

0.8 Question 8: Which of the following is not true about a value-weighted strategy?

Some characteristics of Value Weighting(Dollar Allocation based on MktCap Weight). - reflection of a proportional slice of the overall market. (Choice A) - guaranteed to match the average return among all investors(Any performance you gain or lose using different portfolio is matched by the rest of the market in the opposite direction, think about it). (Choice C) - Passive Strategy regarding re-balancing. (Choice D)

Choice B: In a value-weighting strategy, the weights assigned to different stocks in a portfolio are based on the value of the company (e.g., its market capitalization), rather than the price of the stock. This strategy doesn't necessarily force you to buy more of a stock just because its price increases

0.9 Question 9: Which of the strategies that we have looked at would you expect to have the highest turnover ratio?

- Equal weighting must rebalance in response to any price changes.
- Value weighting and price weighting only need to rebalance in response to certain corporate events.

Since price changes happen every day and in very large amounts, equal-weighting will naturally require much more rebalancing activity, which is what we have seen in each of our examples. This will contribute to a high turnover ratio."

0.10 Question 10: Why is the return of the Vanguard 500 index fund much higher than the return of the S&P 500 index?

- The reason the return of the Vanguard 500 Index Fund is typically higher than that of the S&P 500 Index is that the fund's return **includes** the reinvestment of dividends and other distributions.
- The S&P 500 Index itself usually reports a **price return**, which only reflects the changes in the prices of the stocks within the index and does not account for the reinvestment of dividends. The Vanguard 500 Index Fund, on the other hand, often reports a **total return**, which includes both the price return and the additional returns from reinvested dividends.

0.11 Question 11: Why is the return of the Vanguard 500 index fund slightly lower than the return of the S&P 500 total return index?

- The Vanguard 500 Index Fund aims to track the S&P 500 Total Return Index, which includes **both price appreciation and the reinvestment of dividends**. However, the fund's return is slightly lower because it is net of the fees and expenses that the fund charges to its investors.
- While the S&P 500 Total Return Index represents the theoretical performance of the index **without considering management fees**, the Vanguard 500 Index Fund has to account for management fees, trading costs, and other expenses associated with operating the fund.

0.12 Question 12: Which is true of the “Agg” index, but not true of the S&P 500 index?

- The “Agg” index, which refers to the Bloomberg U.S. Aggregate Bond Index, is a broad index that tracks the performance of the U.S. investment-grade bond market, including government bonds, corporate bonds, mortgage-backed securities, and other types of debt instruments.
- The S&P 500 Index, by contrast, tracks the stock market and often reports **price return**, which **does not include reinvested dividends** unless explicitly noted (such as in the S&P 500 Total Return Index).

0.13 Question 13: Blackstone operates a prominent open-end fund that mainly invests in commercial real estate. For over a year, the fund refused or limited investor redemption. What combination of facts would force the fund to be in this position?

- Open-end funds, like the one operated by Blackstone, typically allow investors to redeem their shares at the net asset value (NAV). However, in the case of commercial real estate, there are a few key factors that can impact the liquidity and ability to meet redemption requests:
- Real Estate Prices Down: **When real estate prices drop, the value of the assets held by the fund decreases**. This can lead to a situation where the fund may not want to sell properties at depressed prices, which would result in **locking in losses or realizing the losses**. The NAV would also decline, making redemptions less attractive or less feasible for the fund to meet.

- Transaction Volume Down: When transaction volume is low, it **becomes difficult for the fund to sell real estate assets quickly or at reasonable prices**. Real estate is a relatively **illiquid** asset class compared to stocks or bonds. If transaction volume is down, even if the fund wanted to raise cash to meet redemptions, it might not be able to do so without severely discounting its properties.

0.14 Question 14: All funds make regular distributions to investors of any income they have realized on their investments, such as the capital gains from selling securities. Why?

- Mutual funds (and other regulated investment companies) are generally required to distribute a significant portion of their income, including dividends, interest, and capital gains, to their investors in order to qualify for special tax treatment. This distribution allows the fund to avoid being taxed at the corporate level. Instead, the tax burden is passed on to the individual investors, who are taxed on the distributions they receive. This is known as *pass-through taxation*, which prevents the fund from paying corporate income tax, **thus avoiding double taxation**.

0.15 Question 15: Which type of fund represents the majority of assets in the United States?

- Mutual funds represent the majority of assets under management (AUM) in the United States. Mutual funds pool money from many investors to purchase a diversified portfolio of stocks, bonds, or other securities. They are highly popular with retail investors because of their diversification, liquidity, and professional management. Other types of funds, such as hedge funds or exchange-traded funds (ETFs), do not have the same level of market penetration or total AUM as mutual funds in the U.S.

0.16 Question 16: Which of the following is more important for a mutual fund than an ETF?

Mutual funds and ETFs operate differently when it comes to handling investor redemptions, and maintaining cash balances is more critical for mutual funds than for ETFs:

- Mutual Funds: In an open-end mutual fund, when investors want to redeem their shares, the fund **must** buy back the shares at the net asset value (NAV). To meet these redemption requests, mutual funds **need to keep cash on hand or liquidate assets** to ensure they can fulfill redemption requests promptly. Therefore, maintaining adequate cash balances is crucial for a mutual fund to operate smoothly.
- ETFs: Unlike mutual funds, ETFs are traded on an exchange, and individual investors buy and sell ETF shares on the secondary market. Redemptions and creations of ETF shares typically occur in in-kind transactions between the fund and *authorized participants*, which means the ETF doesn't need to maintain large cash balances for investor redemptions. Instead, the authorized participants exchange baskets of securities for ETF shares.

0.17 Question 17: Suppose the share price of an ETF rises above its NAV, presenting an arbitrage opportunity for an authorized participant (AP). Which of the following things would be part of the AP's strategy to profit from this difference?

- When the share price of an ETF rises above its Net Asset Value (NAV), it creates an arbitrage opportunity for an authorized participant (AP). Here's how the AP would profit from this price difference:
- The ETF trades at a premium to its NAV: This means the market price of the ETF is higher than the value of the underlying assets it represents.
- Arbitrage Strategy: The AP can take advantage of this price difference by following these steps:
- Create new ETF shares: The AP can buy the underlying assets that correspond to the ETF's portfolio (called the creation basket) and deliver these assets to the ETF provider.
- In exchange for the creation basket, the AP receives newly created ETF shares at the NAV price.
- Sell the ETF shares on the open market: Since the ETF shares are trading at a higher price (above NAV), the AP can sell these shares in the open market at the higher price, profiting from the difference between the NAV and the market price.
- Thus, A) Sell shares of the ETF on the exchange where they trade is part of the strategy, as the AP profits by selling the ETF shares at the premium price.

0.18 Question 18: What is the fund's NAV per share at the end of the year?

100 shares of another company's stock at the end of the year, valued at \$30 each:

$$100 \times 30 = 3000$$

Cash held by the fund:\$500

TotalFundValue :

$3000 + 500 = 3500$ \$\$ Shares Outstanding:1000 shares NAV per share:

$$\frac{3500}{1000} = \boxed{3.50}$$

0.19 Question 19: What return did an investor in the fund experience during the year, as a percent?

Beginning NAV:

The share price at the start of the year equals NAV, which is \$3.50.

End of Year NAV:

The fund's NAV is still \$3.50, but it trades at a 10% discount. Thus, the end-of-year share price is:

$$3.50 \times (1 - 0.10) = 3.15$$

Investor's Return:

$$\frac{3.15 - 2.50}{2.50} \times 100 = \boxed{26\%}$$

0.20 Question 20:

Initial NAV: \$10 per share **Redemption:** 20 shares are redeemed for cash. Since the fund uses *cash* to meet the redemption, there is **no impact** on the value of the remaining assets. The NAV per share remains unchanged at:

$$\boxed{10}$$

0.21 Question 21&22:

- **Redemption amount:** The fund meets the \$200 redemption by selling 20 shares of stock, with each share priced at \$10.
- **Capital gain:** The fund realizes a capital gain of:

$$20 \times (10 - 5) = 100$$

- **Distribution of capital gain:** The \$100 capital gain is distributed across the remaining 80 shares .
 - Capital gain per remaining share:

$$\frac{100}{80} = 1.25$$

- This capital gain distribution reduces the NAV by \$1.25 per share.
- **New NAV after redemption:**
 - Initial NAV before capital gain distribution was \$10.
 - After distributing \$1.25 per share, the NAV decreases to:

$$10 - 1.25 = \boxed{8.75}$$

We are also accepting the capital gain is distributed across all 100 shares on exam, which lead to the answer 9 in Q21 and answer A with \$1 in Q22.

0.21.1 No Investor is Worse Off

In this situation:

- The investor who redeems their shares receives **\$10 per share**, which is the NAV before any capital gains distribution.
- The remaining investors, who continue to hold their shares, receive the benefit of the capital gains distribution. Specifically:
 - They receive **\$1.25 per share** from the capital gains distribution.
 - After the distribution, the NAV per share decreases to **\$8.75**, but this is offset by the capital gain payout of \$1.25.

Thus, each remaining investor still holds shares worth a combined total of:

$$\text{NAV per share} + \text{Capital gains} = 8.75 + 1.25 = 10$$

As a result: - The investor who redeemed shares received **\$10 per share**. - The remaining investors still have the equivalent value of **\$10 per share** when accounting for both the new NAV and the distributed capital gains.

0.22 Question 23: What was the geometric average annual return?

- The cumulative value of \$1 invested over 4 years is \$1.31.
- The formula for the geometric average annual return (CAGR) is:

$$\text{Geometric return} = \left(\frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{\text{Number of Years}}} - 1$$

Substituting the given values:

$$\text{Geometric return} = \left(\frac{1.31}{1.00} \right)^{\frac{1}{4}} - 1 \approx 0.0704 = 7\%$$

Answer: 7%

0.23 Question 24: What was the arithmetic average annual return?

Q24 - we have not gone over this formula yet, so first show how to get it from Sharpe ratio 0.35 times volatility 0.2 plus risk-free rate 0.02. Then you can mention the other formula if you want but note that they will see it in Module 2.

- Given:
 - Volatility of excess returns: 20% per year
 - Sharpe ratio: 0.35
 - Risk-free rate: 2%

The formula for calculating arithmetic return using the Sharpe ratio is given by:

Method 1(The one taught in class):

$$\text{Arithmetic Return} = (\text{Sharpe Ratio} \times \text{Volatility}) + \text{Risk-Free Rate} = 0.35 \times 0.20 + 0.02 = 0.09$$

Method 2:

- To calculate the arithmetic average return, we use the formula:

$$\text{Arithmetic return} = \text{Geometric return} + \frac{\sigma^2}{2}$$

Where:

- σ is the volatility (20%)
- Geometric return is 7% (as calculated in Question 23)

Substituting the values:

$$\text{Arithmetic return} \approx 7\% + \frac{(0.20)^2}{2} = 7\% + 0.02 = 9\%$$

Answer: 9%

0.24 Question 25&26: “Performance-chasing” is the behavior of always investing in mutual funds that have recently beaten the market. Remember that we discussed a “cynical” view and a “sympathetic” view of the evidence on mutual fund performance. What would the “cynical” view say about performance-chasing? What would the “sympathetic” view say about performance-chasing?

The “cynical” view on performance-chasing in mutual funds is skeptical of the idea that past performance can predict future success. According to this view:

- Performance-chasing suggests investing in funds that have recently beaten the market, but the cynical perspective argues that past performance is often due to luck rather than skill.
- The view holds that markets are generally efficient, and it is difficult for mutual fund managers to consistently outperform the market based on skill alone. Therefore, chasing past winners is unlikely to yield superior returns.

The “sympathetic” view on performance-chasing acknowledges that some mutual funds might outperform the market due to skill or other factors. However, as these funds grow larger—because more investors chase their performance—it becomes more challenging for them to sustain the same level of outperformance:

- As a fund grows larger, it often has more assets under management (AUM), which makes it harder to invest nimbly, and liquidity constraints can become an issue. (*You cannot beat the market if you become the market*)
- Additionally, large inflows of capital may force the fund to spread its investments across more assets, making it harder to maintain the same returns as before.

0.25 Question 27: Ned Johnson famously critiqued the passive investing industry by saying, “I can’t believe that the great mass of investors are going to be satisfied with an ultimate goal of just achieving average returns on their funds.” What concept that we discussed in class highlights a flaw in his thinking?

The concept that highlights a flaw in Ned Johnson’s thinking is based on the idea that, in aggregate, investors cannot all outperform the market. This is because:

- The market represents the combined performance of all investors. Therefore, the average investor must, by definition, earn the market return.
- This is especially true in passive investing, where the goal is to replicate market performance rather than outperform it.
- Active investors might beat the market in the short term, but as a whole, the average return for all investors (both active and passive) will be the market return. (As I mentioned in Q8, Any performance you gain or lose using different portfolio is matched by the rest of the market in the opposite direction)

0.26 Question 28: What is its market-to-book ratio?

- **Market Value of Equity:**

$$\text{Market Value} = 100\text{m shares} \times 100 \text{ per share} = 10 \text{ billion}$$

- **Book Value of Equity:**

$$\text{Book Value} = 1 \text{ billion in assets} - 500 \text{ million in liabilities} = 500 \text{ million}$$

- **Market-to-book ratio:**

$$\frac{10 \text{ billion}}{500 \text{ million}} = \boxed{20}$$

0.27 Question 29: What annual growth rate is the market pricing for the company's future earnings, according to the dividend discount model?

- **Given:**
 - Price-to-earnings (P/E) ratio = 25
 - Equity cost of capital (r_E) = 10%
- According to the dividend discount model:

$$\frac{1}{P/E} = r_E - g$$

Where (g) is the growth rate. Rearranging the formula for (g):

$$g = r_E - \frac{1}{P/E} = 10\% - \frac{1}{25} = 10\% - 4\% = \boxed{6\%}$$

0.28 Question 30: By how many dollars will the company's share price fall on Tuesday?

- **Given:**
 - Forecasted dividend: \$10
 - Dividend growth rate: 4%
 - Original equity cost of capital: 12%
 - New equity cost of capital: 14%
- Using the dividend discount model (DDM), the price before the rate increase:

$$P = \frac{D_1}{r_E - g} = \frac{10}{0.12 - 0.04} = \frac{10}{0.08} = 125$$

- Price after the rate increase:

$$P = \frac{D_1}{r_E - g} = \frac{10}{0.14 - 0.04} = \frac{10}{0.10} = 100$$

- The fall in price:

$$125 - 100 = \boxed{25}$$