## Question 1

National Investment Analysis (NIA) is determining the NPV of a venture capital investment with a 5-year horizon. If the project is successful the original $10 million investment is expected to be worth $100 million in an IPO. Based on its analysis, NIA has determined that the probability of failure starts at 25% and falls 5% per year (25% to start, 20% the next year, and so forth) for the entire period. For projects of this type, the cost of equity is typically 20%. What is the NPV of this venture?

**a.** $7.52 million
**b.** $12.66 million
**c.** $13.16 million
**d.** $30.19 million

## Question 2

An investor is evaluating a venture capital project that will require an investment of $1.4 million. The investor estimates that she will be able to exit the venture successfully in eight years. She also estimates that there is an 80 percent chance that the venture will not survive until the end of the eight year. If the venture does survive until then, it is equally likely that the payoff at the time of exit will be either $25 million or $35 million. The investor is considering an equity investment in the project, and her cost of equity for a project with similar risk is 20 percent.

**a.** Compute the NPV of the venture capital project.
**b.** Recommend whether to accept or reject the project.

## Question 3

VenCap, Inc is a venture capital financier. It estimates that investing $4.5 million in a particular venture capital project can return $60 million at the end of six years if it succeeds; however, it realizes that the project may fail at any time between now and the end of six years. The following table has Vencap's estimates of probabilities of failure for the project. First, 0.28 is the probability of failure in year 1. The probability that the projects fails in second year, given that it has survived through yaer 1, is 0.25. The probability that the projects fails in the third year, given that it has survived through yaer 2, is 0.22, and so forth. VenCap is considering an equity investment in the project, and its cost of equity for a project with this level of risk is 22 percent.

| Year | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Failure Probability | 0.28 | 0.25 | 0.22 | 0.18 | 0.18 | 0.10 |

## Question 4

Which of the following is an advantage of equity and bond index exchange traded funds (ETFs)?

**a.** Diversification
**b.** tax-free dividends
**c.** Cost and tax efficiencies for large investors.
**d.** tracking a narrow based-based market index, including only stocks with large capitalization.

## Question 5

A commodity market currently in contango will likely result in:

**a.** Producers willing to sell at prices below expected future prices.
**b.** Futures prices below current spot prices.
**c.** Consumers going long commodities futures contracts.
**d.** Consumers going short commodities futures contracts

## Question 6

Which of the following statements represent the correct ending for the following sentence: “If the expected return on FTSE All Share Index is 12% and the benchmark error of MYZ Index tracking fund is 1.5% per year, it means that…”

**a.** 95% of the fund’s annual returns fall within -1.5% and +1.5% of the benchmark and 99% of its returns within -3% and +3% of the benchmark.
**b.** The fund underperforms the benchmark by 1.5%.
**c.** 67% of the fund’s annual returns fall within 10.5% and 13.5% and 95% of its returns within 9.0% and 15.0%.
**d.** 99% of the fund’s annual returns fall within 10.5% and 13.5% and 95% of its returns within 9.0% and 15.0%.

# Solutions

## Question 1

Choice „a" is correct. The first step in the calculation is to determine the probability that the venture will survive until the IPO.

| | Probability of Failure | Probability of Success | Cumulative Probability |
|---|---|---|---|
| Year 1 | 25% | 75% | 75,00% |
| Year 2 | 20% | 80% | 60,00% |
| Year 3 | 15% | 85% | 51,00% |
| Year 4 | 10% | 90% | 45,90% |
| Year 5 | 5% | 95% | 43,61% |
| Year 1 | 25% | 75% | 75,00% |

Based on the above table the venture has a 43,61% chance of success and a 56,39% chance of failure. The next step is to calculate the NPV on the investment if it survives to the IPO.

$$NPVSUCESS = \frac{FinalcashFlow}{(1+r)^t}$$

The final step is to calculate the expected value using the probabilities derived above. If the project succeeds, the payoff is $30,19 million if the project fails the investor looses $10 million:

E(NPV) = $30,19 million × 43.61% - $10 million × 56.39% = $7.52 million

Choice "b" is incorrect. This calculation reverses the probabilities.

Choice "c" is incorrect. This calculation ignores the probability of losing the original $10 million.

Choice „d" is incorrect. This calculation includes the present value of the IPO payoff. No allowance is made for the probabilities of success or failure.

## Question 2

**a.** There are three possibilities.

Project does not survive until the end of the eight year.

Project survives and the investor exits with a payoff of $25 million.

Project survives and the investor exits with a payoff of $35 million.

There is an 80 percent chance that the project will not survive until the end of the eight year. That is, a 20 percent chance that the project will survive, and the investor will exit the project then. If the project survives, it is equally likely that the payoff at the time of exit will be either $25 million or $35 million.

The project's NPV is the present value of the expected payoffs minus the required initial investment of $1.4 million.

$$NPV = 0.8 \times \$0 + 0.2 \times \frac{\left[\left(0.5 \times \$25 + 0.5 \times \$35\right)\right]}{1.2^8} - \$1.4 = -\$0.004592 \; million \; or - \$4,592$$

**b.** Because the expected NPV of the project is negative, the project should be rejected.

## Question 3

The probability that the venture capital project survives to the end of the first year is (1-0.28), 1 minus the probability of failure in the first year; the probability that it survives to the end of the second year is the product of the probability it survives the first year times the probability it survives the second year, or (1-0.28)×(1-0.25). So the probability that the project survives to end of the sixth year is:

$$\begin{aligned}&(1-0.28)\times(1-0.25)\times(1-0.22)\times(1-0.18)\times(1-0.18)\times(1-0.10)=\\&0.72\times0.75\times0.78\times0.82\times0.82\times0.90=0.255 \; or \; 25.5\%\end{aligned}$$

The net present value of the project, if it survives to the end of the sixth yaer and thus earns $60 million, is:

$$-\$4.5 \; million + \frac{\$60 \; million}{(1.22)^6} = \$13.7 \; million$$

The net present value of the project if it fails is $4.5 million. Thus, the project expected NPV is a probability-weighted average of these two amounts, or;

$$(0.255 \times \$13.7) + \left(0.745 \times (-\$4.5)\right) = \$141,000$$

Based on the project's positive net present value, VenCap should accept the investment.

## Question 4

**Choice "a" is correct.** ETFs provide quick diversification for equity and bond portfolios by offering an opportunity to invest in a wide range of indexes with a single trade for each rather than purchasing portfolios of the securities underlying those indexes.
Choice "b" is incorrect. ETF dividends maintain the taxable features of the underlying investments. Thus, some dividends are tax-free but others are nor.
Choice "c" is incorrect. Large institutional investors can often achieve better cost and tax efficiencies by investing directly in indexed or managed portfolios.
Choice "d" is incorrect. This is a disadvantage since no ETF is available for mid or low market-cap stocks. This is not the case in the United States, where a variety of ETF products trade actively.

## Question 5

**Choice "c" is correct**. When a commodities market is in contango, futures prices are higher than current spot prices. This is an indication that investors anticipate that spot prices will be higher in the future. Operating on the fear that prices will be higher later, and in attempt to hedge against inflation risk, consumers will buy futures contracts.

Choice "a" is incorrect. Producers would be willing to sell their commodities below the prices expected in the future when they are trying to protect against business risk. This situation is most likely to occur when the market is in backwardation, rather than contango.

Choice "b" is incorrect. When the market is in contango, futures prices are above (not below) current spot prices.

Choice "d" is incorrect. Consumers will buy future contacts not sell.

## Question 6

**Choice "c" is correct.** Tracking error is a standard deviation, so it's value should be interpreted as the dispersion of actual returns around the mean return of the benchmark.