

According To CAPM, Which Of The Following 4 Stocks Has The Highest Level Of Idiosyncratic Risk: A. Total

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Introduction to CAPM and Risk Components

The Capital Asset Pricing Model (CAPM) is a foundational concept in modern finance, used to determine the expected return on an investment based on its systematic risk. It posits that investors should be compensated for the time value of money and the risk they undertake, primarily the market risk, which is non-diversifiable. However, in addition to systematic risk, individual stocks also carry idiosyncratic risk—unique to the company or industry—that can be mitigated through diversification. Understanding how CAPM relates to these risk components is essential in evaluating a stock's risk profile.

Understanding Systematic and Idiosyncratic Risks

Systematic Risk

- Also known as market risk.
- Affects all assets in the market.
- Cannot be eliminated through diversification.
- Measured by Beta (β), which indicates the stock's sensitivity to market movements.

Idiosyncratic Risk

- Also called unsystematic or specific risk.
- Unique to a particular company or industry.
- Can be diversified away with a well-diversified portfolio.
- Includes factors like management quality, product demand, regulatory changes, and company-specific events.

CAPM and Risk Measurement

The CAPM formula is:

$$E(R_i) = R_f + \beta_i (E(R_m) - R_f)$$

Where:

- $E(R_i)$ = Expected return of stock i

- (R_f) = Risk-free rate
- (β_i) = Beta of stock (i)
- $(E(R_m))$ = Expected return of the market portfolio

This equation implies that the expected return compensates investors for the systematic risk, as measured by Beta. It explicitly omits idiosyncratic risk because, in theory, it can be eliminated through diversification. Therefore, the CAPM suggests that the relevant risk for determining expected return is systematic, not idiosyncratic.

Assessing Idiosyncratic Risk in the Context of the Question

The question asks about which stock has the highest level of idiosyncratic risk among four stocks, given the CAPM framework. It's important to clarify that:

- CAPM primarily focuses on systematic risk (Beta).
- Idiosyncratic risk is considered diversifiable and is not directly priced in the CAPM model.

However, in practice, the total risk of a stock can be measured as the variance of its returns, which includes both systematic and idiosyncratic components. Therefore, even if the CAPM suggests that only beta (systematic risk) is relevant for expected return, the total risk (variance) provides insight into the stock's overall volatility, including idiosyncratic elements.

Determining Which Stock Has the Highest Idiosyncratic Risk

Given four stocks, each with their own total variance of returns, we can analyze their risk components as follows:

1. Identify each stock’s Beta: to understand the systematic risk component.
2. Estimate total variance: from historical return data.
3. Calculate the systematic variance: $\beta_i^2 \times \sigma_m^2$, where σ_m^2 is the variance of the market returns.
4. Determine the idiosyncratic variance: by subtracting the systematic component from the total variance.

$$\sigma_{\text{idiosyncratic}}^2 = \sigma_{\text{total}}^2 - \beta_i^2 \times \sigma_m^2$$

The stock with the highest $\sigma_{\text{idiosyncratic}}^2$ has the highest level of idiosyncratic risk.

Key Point: A stock with a high total variance but a low beta could have a significant amount of its risk due to idiosyncratic factors.

Analyzing the Four Stocks

Suppose the data for the four stocks are as follows:

Stock	Beta (β)	Total Variance (σ_{total}^2)
A	1.2	0.04
B	0.8	0.03
C	1.5	0.05

| D | 0.5 | 0.02 |

And assume the market variance, (σ^2_m) , is 0.02.

Calculations:

- Stock A:

- Systematic variance = $(1.2^2 \times 0.02 = 1.44 \times 0.02 = 0.0288)$

- Idiosyncratic variance = $(0.04 - 0.0288 = 0.0112)$

- Stock B:

- Systematic variance = $(0.8^2 \times 0.02 = 0.64 \times 0.02 = 0.0128)$

- Idiosyncratic variance = $(0.03 - 0.0128 = 0.0172)$

- Stock C:

- Systematic variance = $(1.5^2 \times 0.02 = 2.25 \times 0.02 = 0.045)$

- Idiosyncratic variance = $(0.05 - 0.045 = 0.005)$

- Stock D:

- Systematic variance = $(0.5^2 \times 0.02 = 0.25 \times 0.02 = 0.005)$

- Idiosyncratic variance = $(0.02 - 0.005 = 0.015)$

Conclusion:

- Stock B has the highest idiosyncratic variance at 0.0172.

- Stock D follows with 0.015.

- Stock A has 0.0112.

- Stock C has the lowest at 0.005.

Thus, Stock B exhibits the highest level of idiosyncratic risk among the four, despite its lower total variance compared to Stock C.

Implications for Investors and Portfolio Management

Understanding which stock has the highest idiosyncratic risk is crucial for portfolio diversification strategies. Since idiosyncratic risk can be eliminated through diversification, investors seeking to minimize overall risk should:

- Hold a diversified portfolio to mitigate stock-specific risks.
- Assess the residual risk after diversification to understand the true exposure.
- Recognize that high idiosyncratic risk may indicate greater potential for company-specific surprises, both positive and negative.

For example:

- A stock with high idiosyncratic risk may have higher potential returns but also higher volatility.
- Conversely, a stock with low idiosyncratic risk may be more stable but offer limited upside.

Limitations of CAPM in Measuring Idiosyncratic Risk

While the calculations above help in understanding the proportion of risk attributable to idiosyncratic factors, it's important to acknowledge the limitations:

- CAPM assumes perfect markets and rational investors.
- Historical data may not reflect future risks.
- Idiosyncratic risk can sometimes be difficult to quantify accurately.

- Systematic risk remains the primary concern for expected returns, as per CAPM.

In practice, investors analyze both the systematic and residual risks to make informed decisions, recognizing that CAPM provides a theoretical framework rather than a comprehensive risk profile.

Conclusion

In the context of the CAPM framework, the stock with the highest total variance is not necessarily the one with the highest idiosyncratic risk. Instead, by decomposing total risk into systematic and idiosyncratic components, investors can identify which stock carries the most company-specific risk. Based on the example calculations, Stock B exhibits the highest idiosyncratic risk among the four, characterized by a relatively high total variance but a lower beta, indicating that much of its risk stems from company-specific factors rather than market movements.

Understanding the nuances of risk components helps investors develop diversified portfolios aligned with their risk tolerance and investment goals. While CAPM emphasizes systematic risk as the primary driver of expected returns, appreciating the role of idiosyncratic risk remains vital for effective risk management and portfolio construction.

References:

- Bodie, Z., Kane, A., & Marcus, A. J. (2014). Investments. McGraw-Hill Education.
- Ross, S. A., Westerfield, R. W., & Jaffe, J. (2016). Corporate Finance. McGraw-Hill Education.
- Fama, E. F., & French, K. R. (2004). The Capital Asset Pricing Model: Theory and Evidence. Journal of Economic Perspectives, 18(3), 25–46.

Frequently Asked Questions

According To CAPM, Which Of The Following 4 Stocks Has The Highest Level Of Idiosyncratic Risk? A. Total Variance, B. Beta Variance, C. Residual Variance, D. Market Variance.

C. Residual Variance. In CAPM, idiosyncratic risk refers to the portion of total risk that is unique to a specific stock, often measured by residual variance after accounting for market movements.

How does CAPM define idiosyncratic risk compared to systematic risk?

CAPM defines idiosyncratic risk as the risk unique to a particular asset, which can be diversified away, whereas systematic risk affects the entire market and cannot be eliminated through diversification.

Which of the four stocks in the question is most likely to have the highest idiosyncratic risk?

The stock with the highest residual variance or total variance relative to its beta is most likely to have the highest idiosyncratic risk.

Why is understanding idiosyncratic risk important for investors according to CAPM?

Because idiosyncratic risk can be diversified away, understanding it helps investors focus on systematic risk when making portfolio decisions, and it influences the expected return of individual stocks.

In the context of the question, if Stock A has a total variance of 0.04 and a beta of 1.2, what does this imply about its idiosyncratic risk?

If the total variance is 0.04 and beta is 1.2, the residual (idiosyncratic) risk can be estimated by subtracting the systematic component, indicating the level of risk unique to Stock A.

Can a stock have high total risk but low idiosyncratic risk according to CAPM?

Yes, a stock can have high total risk primarily due to market-related systematic risk, with low idiosyncratic risk if its residual variance is small.

How does diversification affect the idiosyncratic risk of a stock?

Diversification reduces or eliminates idiosyncratic risk because it is specific to individual stocks and can be offset by holding a diversified portfolio.

What is the relationship between beta and systematic risk, and how does it relate to idiosyncratic risk?

Beta measures the sensitivity of a stock to market movements, representing systematic risk. Idiosyncratic risk is independent of beta and pertains to risks unique to the stock.

If a stock's total variance remains high even after accounting for its beta, what does this indicate about its idiosyncratic risk?

This indicates that the stock has a high level of idiosyncratic risk, as a significant portion of its total variance is not explained by market movements.

Additional Resources

According To CAPM, Which Of The Following 4 Stocks Has The Highest Level Of Idiosyncratic Risk:

A. Total

Understanding the nuances of risk within investment portfolios is fundamental for both novice and seasoned investors. When evaluating stocks, one critical aspect to consider is the distinction between systematic and idiosyncratic risk. According to the Capital Asset Pricing Model (CAPM), while systematic risk influences a stock's market-related fluctuations, idiosyncratic risk pertains to firm-specific factors that can affect a stock independently of the overall market. In this context, identifying which stock possesses the highest level of idiosyncratic risk is essential for managing diversification, portfolio stability, and risk-adjusted returns. This guide will explore the concept of idiosyncratic risk in detail, analyze how CAPM approaches risk measurement, and provide a structured approach to determine which of four stocks—A, B, C, or D—has the highest idiosyncratic risk.

What Is Idiosyncratic Risk?

Idiosyncratic risk, also known as unsystematic or specific risk, refers to the risk inherent to a particular company or industry. Unlike systematic risk, which affects the entire market (e.g., economic downturns, interest rate changes), idiosyncratic risk stems from factors unique to a company such as:

- Management quality
- Product recalls
- Labor strikes
- Regulatory changes affecting only that firm
- Competitive positioning within an industry
- Technological innovations or failures specific to the company

Because these risks are company-specific, they can often be mitigated through diversification.

Investors aiming to reduce their overall risk exposure can spread investments across different stocks

and sectors, effectively neutralizing the impact of any single company's adverse events.

The CAPM Framework and Risk Measurement

The Capital Asset Pricing Model (CAPM) provides a foundational approach to understanding the relationship between expected return and risk in an investment. The core formula is:

$$E(R_i) = R_f + \beta_i (R_m - R_f)$$

Where:

- R_f = Risk-free rate
- R_m = Expected return of the market portfolio
- β = Beta coefficient of the stock, measuring its systematic risk relative to the market

Beta is a key metric in CAPM, indicating how sensitive a stock's returns are to market movements. A beta greater than 1 suggests higher-than-market risk, while a beta less than 1 indicates lower market risk.

Total risk of a stock can be decomposed into:

- Systematic risk: Captured by beta and the covariance with the market.
- Idiosyncratic risk: The residual risk not explained by beta.

Mathematically, the total variance of a stock's returns, σ^2_{total} , can be expressed as:

$$\sigma^2_{\text{total}} = \beta^2 \sigma^2_m + \sigma^2_{\text{idiosyncratic}}$$

Where:

- σ^2_m = Variance of the market returns
- $\sigma^2_{\text{idiosyncratic}}$ = Variance attributable to firm-specific factors

This decomposition highlights that, based on CAPM, the higher the residual (or idiosyncratic) variance relative to total variance, the more a stock's returns are driven by firm-specific factors rather than market-wide movements.

How To Determine Which Stock Has the Highest Idiosyncratic Risk?

Given four stocks (A, B, C, D), to identify which has the highest level of idiosyncratic risk, follow this structured approach:

1. Gather Data on Each Stock

- Expected Return: Based on historical data or analyst forecasts.
- Beta (β): Measure of systematic risk, obtainable from regression analysis against market returns.
- Variance of Returns (σ^2): Total variance of each stock's historical returns.
- Market Variance (σ^2_m): Variance of the market index returns.

2. Calculate Systematic Risk for Each Stock

Using the beta and market variance:

$$\text{Systematic Variance} = \beta^2 \sigma^2_m$$

This indicates how much of the stock's total variance is attributable to market movements.

3. Compute Idiosyncratic Risk for Each Stock

Subtract the systematic component from the total variance:

$$\sigma^2_{\text{idiosyncratic}} = \sigma^2_{\text{total}} - \beta^2 \sigma^2_m$$

The stock with the largest $(\sigma^2_{\text{idiosyncratic}})$ has the highest level of firm-specific risk, which is the focus of this analysis.

Practical Example: Comparing Four Stocks

Suppose you have the following data:

Stock	Total Variance (σ^2_{total})	Beta (β)	Market Variance (σ^2_m)
A	0.04	1.2	0.02
B	0.03	0.8	0.02
C	0.05	1.5	0.02
D	0.02	0.5	0.02

Calculations:

- Stock A:

- Systematic Risk: $(1.2^2 \times 0.02 = 1.44 \times 0.02 = 0.0288)$

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- Stock C:

- Systematic Risk: $(1.5^2 \times 0.02 = 2.25 \times 0.02 = 0.045)$

- Idiosyncratic Risk: $(0.05 - 0.045 = 0.005)$

- Stock D:

- Systematic Risk: $(0.5^2 \times 0.02 = 0.25 \times 0.02 = 0.005)$
- Idiosyncratic Risk: $(0.02 - 0.005 = 0.015)$

Result: Stock B has the highest idiosyncratic risk at 0.0172, indicating it is most influenced by firm-specific factors.

Interpretation and Implications

- High Idiosyncratic Risk: Stocks like B, in our example, with higher firm-specific variance, are riskier in ways that are less predictable based on market movements. They can be more volatile due to internal factors.
- Diversification Strategy: Investors seeking to minimize unsystematic risk should avoid overly concentrated positions in stocks with high idiosyncratic risk unless compensated with higher expected returns.
- Risk Management: Knowing which stocks carry more firm-specific risk allows portfolio managers to implement hedging strategies or adjust asset allocations accordingly.

Limitations and Considerations

While the CAPM framework provides valuable insights, applying it to real-world data involves certain limitations:

- Historical Data Dependence: Variance and beta calculations rely on historical returns, which may not predict future risks accurately.

- Assumption of Market Efficiency: CAPM assumes markets are efficient, and all investors have access to the same information, which may not always hold.
- Static Beta: Betas can change over time, affected by company performance, industry changes, and broader economic factors.
- Measurement Errors: Variance and beta estimates are subject to statistical errors, especially with limited data.

Final Thoughts

In summary, According To CAPM, which of the following 4 stocks has the highest level of idiosyncratic risk depends on analyzing their total variance, beta, and the variance of the market. The stock with the largest residual variance—after accounting for systematic risk—is deemed to have the highest idiosyncratic risk. This understanding emphasizes the importance of diversification and risk assessment in portfolio management, enabling investors to optimize their risk-return profile according to their investment objectives.

By systematically applying the principles of CAPM and decomposing total risk, investors can make more informed decisions about which stocks to include or avoid, especially when balancing the trade-offs between risk and expected return.

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