

Suppose That You Purchase A 91-day Treasury Bill For \$9,850 That Is Worth \$10,000 When It Matures. The

Suppose That You Purchase A 91-day Treasury Bill For \$9,850 That Is Worth \$10,000 When It Matures. The investment scenario described involves a short-term government security, a Treasury bill (T-bill), which is widely regarded as a safe and liquid investment.

Understanding the mechanics of Treasury bills, their pricing, yields, and the overall investment implications is essential for investors aiming to optimize their portfolio or evaluate the risks and returns associated with such securities. This comprehensive guide will delve into the fundamentals of Treasury bills, the calculations involved in determining yields, and the factors influencing their attractiveness.

Understanding Treasury Bills (T-Bills)

What Are Treasury Bills?

Treasury bills, commonly known as T-bills, are short-term debt securities issued by the U.S. Department of the Treasury to finance the national debt. They are considered one of the safest investments because they are backed by the full faith and credit of the U.S. government. T-bills are typically issued with maturities ranging from a few days up to one year, with 4-week, 13-week, 26-week, and 52-week options being the most common.

Features of T-Bills

- Discount Securities: T-bills are sold at a discount to their face (par) value and do not pay periodic interest.
- Maturity Value: At maturity, the investor receives the full face value of the bill.
- Liquidity: Highly liquid, easily tradable in the secondary market.
- Safety: Low risk of default due to government backing.

Pricing of Treasury Bills

Understanding the Purchase Price and Face Value

When purchasing a T-bill, the investor pays less than the face value upfront. The difference

between the purchase price and the face value at maturity constitutes the interest earned.

Given Scenario:

- Purchase Price: \$9,850
- Face Value (Maturity Value): \$10,000
- Maturity Period: 91 days

Discount Rate and Yield Calculations

The key to understanding T-bill investments is differentiating between the discount rate and the yield.

Discount Rate Formula:

$$\text{Discount Rate} = \frac{\text{Face Value} - \text{Purchase Price}}{\text{Face Value}} \times 100\%$$

In this scenario:

$$\frac{\$10,000 - \$9,850}{\$10,000} \times 100\% = \frac{\$150}{\$10,000} \times 100\% = 1.5\%$$

This rate indicates the discount relative to the face value, but investors are more interested in the yield, which reflects the annualized return.

Calculating the Yield of the 91-Day T-Bill

Bank Discount Yield

The bank discount yield is a common measure but can be misleading because it assumes a 360-day year and relates directly to the face value.

Calculation:

$$\text{Bank Discount Yield} = \frac{\text{Discount}}{\text{Face Value}} \times \frac{360}{\text{Days to Maturity}} \times 100\%$$
$$= \frac{\$150}{\$10,000} \times \frac{360}{91} \times 100\% \approx 0.015 \times 3.956 \times 100\% \approx 5.93\%$$

Note: The bank discount yield is not equivalent to the actual annualized return for the investor.

Investment Yield (True Yield or Bond Equivalent Yield)

To better reflect the investor's actual return, the yield is calculated based on the purchase price rather than the face value.

Formula:

$$\text{Yield} = \frac{\text{Face Value} - \text{Purchase Price}}{\text{Purchase Price}} \times \frac{365}{\text{Days to Maturity}}$$

Calculation:

$$\begin{aligned} &= \frac{\$10,000 - \$9,850}{\$9,850} \times \frac{365}{91} \approx \\ &\frac{\$150}{\$9,850} \times 4.010 \approx 0.0152 \times 4.010 \approx 6.09\% \end{aligned}$$

This yield, approximately 6.09%, provides a more realistic annualized return based on the actual purchase price.

Interpreting the Investment Return

Comparison of Yields

Yield Type	Approximate Rate
Bank Discount Yield	5.93% (annualized based on face value)
True Yield / Investment Yield	6.09% (annualized based on purchase price)

The true yield offers a more accurate reflection of the investor's return, considering the actual investment amount.

Implications for Investors

- Risk-Free Return: T-bills are considered virtually risk-free, making them attractive during economic uncertainty.
- Liquidity: They provide liquidity with short-term maturity, ideal for parking funds temporarily.
- Comparison with Other Investments: The yield can be compared with other short-term investments such as certificates of deposit, money market funds, or commercial paper.

Factors Affecting T-Bill Yields

Market Interest Rates

- When market interest rates rise, T-bill yields tend to increase to remain competitive.
- Conversely, falling interest rates lead to lower yields.

Economic Conditions

- During periods of economic uncertainty, demand for safe assets like T-bills increases, pushing prices up and yields down.
- During economic expansion, yields tend to rise as investors seek higher returns elsewhere.

Inflation Expectations

- Higher expected inflation reduces real returns, affecting T-bill yields.
- Investors require higher yields to compensate for inflation risk.

Federal Reserve Policies

- The Fed's monetary policy influences short-term interest rates, impacting T-bill yields directly.

Advantages and Disadvantages of Investing in T-Bills

Advantages

- Safety: Backed by the U.S. government, virtually free from default risk.
- Liquidity: Easily bought and sold in the secondary market.
- Tax Benefits: Interest income is exempt from state and local taxes.
- Simplicity: Easy to understand and invest in.

Disadvantages

- Lower Returns: Generally offer lower yields compared to other investments due to safety.
- Inflation Risk: Returns may not keep pace with inflation, reducing real purchasing power.
- Reinvestment Risk: Short maturity periods require reinvestment, which may occur at lower interest rates.

How to Invest in Treasury Bills

Methods of Purchase

- TreasuryDirect: Directly buy T-bills from the U.S. Treasury online.
- Brokerage Accounts: Purchase through banks or brokerages that facilitate government securities.
- Secondary Market: Buy T-bills that are already issued via financial exchanges.

Primary Auction Process

- Investors submit competitive or non-competitive bids.
- Non-competitive bids guarantee purchase at the auction rate up to a specified amount.
- Competitive bids specify the yield the investor is willing to accept.

Conclusion

Investing in a 91-day Treasury bill purchased at \$9,850 and maturing at \$10,000 exemplifies a low-risk, short-term investment strategy. The calculation of yields—both discount yield and true yield—illustrates how investors can evaluate the profitability of such securities. With an approximate annualized yield of 6.09%, the T-bill offers a safe avenue for capital preservation and liquidity, especially suitable for conservative investors or those seeking to diversify their portfolio with risk-free assets. Understanding the mechanics, market factors, and investment process surrounding T-bills enables investors to make informed decisions aligned with their financial goals.

Keywords: Treasury bill, T-bill, short-term investment, government securities, discount rate, yield calculation, investment return, TreasuryDirect, risk-free investment, liquidity, annualized yield, market interest rates, inflation, Federal Reserve.

Frequently Asked Questions

What is the annualized yield of a 91-day Treasury Bill purchased for \$9,850 and maturing at \$10,000?

The annualized yield can be calculated using the formula: $((\text{Face Value} - \text{Purchase Price}) / \text{Purchase Price}) (365 / \text{Days to Maturity})$. Plugging in the numbers: $((\$10,000 - \$9,850) / \$9,850) (365 / 91) \approx 0.0152$ or 1.52% . Therefore, the annualized yield is approximately 1.52%.

How do you determine the discount rate of this Treasury Bill?

The discount rate is calculated as: $(\text{Face Value} - \text{Purchase Price}) / \text{Face Value}$. For this bill, it is $(\$10,000 - \$9,850) / \$10,000 = 0.015$ or 1.5%.

What is the significance of the purchase price being less than the face value in Treasury Bills?

This indicates that the bill is bought at a discount, and the difference between the purchase price and face value represents the interest earned upon maturity, reflecting the bill's yield.

How does the short-term nature of a 91-day Treasury Bill impact its risk and return profile?

Short-term Treasury Bills are considered very low risk due to their brief maturity period and government backing, typically offering lower yields compared to longer-term securities, but with higher liquidity.

If interest rates rise after purchasing this Treasury Bill, how does it affect its market value?

When interest rates increase, the market value of existing Treasury Bills decreases because newer issues may offer higher yields, making existing bills less attractive if sold before maturity.

What is the primary purpose of investing in a Treasury Bill like this one?

Investors typically buy Treasury Bills for safety, liquidity, and short-term investment goals, as they are backed by the U.S. government and have a fixed maturity date.

Additional Resources

Suppose That You Purchase A 91-day Treasury Bill For \$9,850 That Is Worth \$10,000 When It Matures

Investing in government securities often presents an attractive option for those seeking a secure and predictable return. One such investment is purchasing a Treasury bill (T-bill), which serves as a short-term debt instrument issued by the U.S. Department of the Treasury. In this scenario, you purchase a 91-day T-bill for \$9,850, which matures to a value of \$10,000. This seemingly simple transaction embodies several key facets of short-term investing, risk management, and yield calculation, making it a noteworthy topic for both novice and experienced investors. In this comprehensive review, we will explore the features, calculations, advantages, disadvantages, and strategic considerations associated with such a T-bill investment.

Understanding Treasury Bills (T-Bills): An Overview

Treasury bills are short-term debt instruments issued by the federal government to finance national debt and fund government operations. They are considered among the safest investments because they are backed by the full faith and credit of the U.S. government.

Features of T-Bills:

- Short-term maturity: Ranging from a few days up to one year, with 91-day, 182-day, and 364-day bills being the most common.
- Discount pricing: Sold at a discount to face value, with no periodic interest payments.
- Maturity value: The face value (also called par value) paid at maturity.
- Auction process: Sold via competitive or non-competitive bids in weekly auctions.

In your scenario, the 91-day T-bill is purchased at a discount, meaning you buy it for less than its face value, and upon maturity, you receive the full face value.

Price and Yield Calculations

The core of understanding T-bill investments lies in calculating their yield, which reflects the return an investor earns over the holding period.

Given Data:

- Purchase Price (Price paid): \$9,850
- Face Value (Maturity value): \$10,000
- Maturity Period: 91 days

Step 1: Calculate the Discount Amount

The discount is the difference between the face value and the purchase price:

$$> \text{Discount} = \text{Face Value} - \text{Purchase Price} = \$10,000 - \$9,850 = \$150$$

Step 2: Calculate the Discount Yield

The discount yield expresses the return relative to the purchase price:

$$> \text{Discount Yield} = (\text{Discount} / \text{Purchase Price}) \times (360 / \text{Days to Maturity})$$

Using the standard 360-day year convention for money market calculations:

$$> \text{Discount Yield} = (\$150 / \$9,850) \times (360 / 91) \approx 0.01523 \times 3.956 \approx 0.0603 \text{ or } 6.03\%$$

This percentage represents the annualized discount yield based on the purchase price.

Step 3: Calculate the Bond Equivalent Yield (Optional)

Since T-bills are discounted instruments, some investors prefer to use the bond equivalent yield (BEY), which adjusts for the fact that interest is earned over a shorter period.

$$> \text{BEY} = (\text{Face Value} - \text{Purchase Price}) / \text{Purchase Price} \times (365 / \text{Days to Maturity})$$

$$> \text{BEY} = (\$150 / \$9,850) \times (365 / 91) \approx 0.01523 \times 4.011 \approx 0.0611 \text{ or } 6.11\%$$

Key Takeaway: The effective annualized yield on your T-bill is approximately 6.03% to 6.11%, depending on the calculation method.

Pros and Cons of Investing in a 91-day Treasury Bill

Understanding the advantages and disadvantages of T-bills helps investors make informed decisions aligned with their financial goals.

Pros:

- Safety and Security: Backed by the U.S. government, T-bills are virtually risk-free regarding credit default.
- Liquidity: Highly liquid — can be sold in the secondary market if needed before maturity.
- Predictable Returns: Fixed maturity value provides certainty of the return if held to maturity.
- Short Maturity: The 91-day term allows for quick reinvestment, enabling adaptive cash management.
- No State or Local Taxes: Interest income might be exempt from state and local taxes,

depending on jurisdiction.

- Minimal Management: No need for active management or monitoring once purchased.

Cons:

- Lower Yield Compared to Other Investments: Generally, T-bills offer lower returns than corporate bonds, stocks, or riskier assets.
- Inflation Risk: Returns may not keep pace with inflation, reducing real purchasing power.
- Reinvestment Risk: Short maturity means the need to repeatedly reinvest to maintain income streams, which may be challenging in a declining interest rate environment.
- No Periodic Income: Unlike bonds or dividend-paying stocks, T-bills do not pay interest until maturity.

Strategic Considerations for Investors

Investors should evaluate their financial objectives, liquidity needs, and risk tolerance when considering T-bills like the one in this scenario.

2.1 Suitability for Conservative Investors

T-bills are suitable for investors seeking safety and capital preservation. They are ideal for parking surplus cash temporarily, especially during uncertain economic times or when awaiting more lucrative opportunities.

2.2 Cash Management and Liquidity

The 91-day maturity aligns with short-term cash flow needs, making T-bills a practical instrument for managing liquidity. If an investor expects to need funds within three months, locking in a T-bill ensures safety and a guaranteed return.

2.3 Reinvestment Strategies

Given the short duration, investors often roll over T-bills or invest in other short-term instruments upon maturity. Monitoring interest rates is crucial because declining rates reduce reinvestment yields.

2.4 Tax Implications

While federal interest income is taxable at the federal level, municipal or state tax exemptions may apply depending on the investor's jurisdiction. It's important to incorporate tax considerations into the overall yield assessment.

Market Dynamics and Risks

While T-bills are among the safest investments, understanding market dynamics and potential risks is essential.

2.1 Interest Rate Movements

An increase in prevailing interest rates leads to lower secondary market prices for existing T-bills. Conversely, falling rates can increase their market value if sold before maturity.

2.2 Reinvestment Risk

The primary risk associated with short-term instruments is reinvestment risk— the possibility that upon maturity, the new investment opportunities offer lower yields.

2.3 Inflation and Real Returns

If inflation exceeds the nominal yield of approximately 6%, real returns could be negative, eroding purchasing power.

2.4 Liquidity Risks

Although highly liquid, in extraordinary market conditions, selling T-bills before maturity might result in losses if market prices decline.

Comparison with Other Short-term Investments

Investors often compare T-bills with alternatives such as certificates of deposit (CDs), commercial paper, or money market funds.

Feature	Treasury Bills	CDs	Commercial Paper	Money Market Funds
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Risk Level	Very Low	Low	Low to Moderate	Very Low
Return	Moderate (around 6%)	Varies, often higher	Similar or higher	Similar or slightly higher
Liquidity	High	Varies	Usually less liquid	Very high
Taxation	Federal taxable	Federal taxable	Federal taxable	Varies

T-bills tend to be more secure but may offer slightly lower yields than some alternatives.

Conclusion

Purchasing a 91-day Treasury bill for \$9,850 that matures to \$10,000 exemplifies a conservative, short-term investment with predictable returns and minimal risk. The yield of approximately 6% annually, calculated through discount and bond equivalent methods, reflects a balance between safety and modest return. While the advantages—such as safety, liquidity, and simplicity—make T-bills appealing, investors must consider limitations like lower yields relative to inflation and other risk factors like reinvestment risk.

For individuals seeking to preserve capital, manage cash flows, or diversify their investment portfolio with secure assets, T-bills are an excellent choice. However, it remains essential to evaluate market conditions, interest rate trends, and personal financial goals when incorporating such instruments into a broader investment strategy. Overall, T-bills serve as a foundational element of a prudent investment portfolio, especially suited for conservative investors or those with short-term liquidity needs.

In summary, the purchase of a 91-day Treasury bill for \$9,850 that matures at \$10,000 provides a safe, predictable, and liquid investment opportunity with a reasonable annualized yield. By understanding the mechanics of discount pricing, yield calculations, and market considerations, investors can leverage T-bills effectively to meet their financial objectives while managing risk prudently.

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