

# Treasury Bill With A Par Value Of \$5000 Sold At \$4,750. After Six Month The Discount Of This Treasury

**Treasury Bill With A Par Value Of \$5000 Sold At \$4,750. After Six Month The Discount Of This Treasury** is a common scenario faced by investors and financial analysts when evaluating the profitability and yield of short-term government securities. Treasury bills (T-bills) are considered one of the safest investment options, backed by the full faith and credit of the issuing government. Understanding how to calculate the discount, yield, and effective return from such a transaction is essential for investors seeking to optimize their investment decisions. In this article, we will explore the key concepts surrounding T-bills sold at a discount, focusing on a specific example where a T-bill with a par value of \$5,000 is sold at \$4,750, and analyzing the discount after six months.

## Understanding Treasury Bills (T-Bills)

### What Are Treasury Bills?

Treasury bills are short-term debt instruments issued by the government to finance its immediate funding needs. They are sold at a discount to their face (par) value and mature at their full face value. T-bills are typically issued with maturities of 4, 13, 26, or 52 weeks, making them highly liquid and low-risk investments.

### Features of T-Bills

- **Discounted Price:** T-bills are sold at a price below their par value.
- **Face Value:** The amount paid to the holder at maturity, usually \$1,000 or higher.
- **Maturity:** The period until the T-bill matures, often 3 months (13 weeks), 6 months (26 weeks), or 1 year (52 weeks).
- **Interest:** The difference between the purchase price and the face value represents the interest earned.
- **Safety:** Backed by the government, making them among the safest investments.

# Analyzing the Example: Selling at a Discount

## Scenario Details

In our example, a treasury bill with a par value of \$5,000 is sold at a price of \$4,750. This indicates that the investor purchased the T-bill at a discount.

- **Par (Face) Value:** \$5,000
- **Purchase Price:** \$4,750
- **Discount:** The difference between the face value and the purchase price.

## Calculating the Discount

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

$$\text{Discount} = \text{Par Value} - \text{Purchase Price}$$

$$\text{Discount} = \$5,000 - \$4,750 = \$250$$

This \$250 represents the interest earned by the investor over the life of the T-bill.

## Calculating the Discount Rate and Yield

Understanding the return on investment requires calculating the discount rate and the yield based on the purchase price and maturity period.

### Discount Rate Calculation

The discount rate is expressed as a percentage of the face value:

$$\text{Discount Rate} = \frac{\text{Discount}}{\text{Par Value}} \times 100$$

$$\text{Discount Rate} = \frac{\$250}{\$5,000} \times 100 = 5\%$$

This indicates that the T-bill was sold at a 5% discount relative to its face

value.

## Yield to Maturity (YTM) Calculation

The yield to maturity (YTM) on a T-bill reflects the annualized return based on the purchase price and the time until maturity.

Suppose the T-bill matures in six months (or 26 weeks). To calculate the annualized yield:

$$\text{YTM} = \frac{\text{Discount}}{\text{Purchase Price}} \times \frac{365}{\text{Days to Maturity}}$$

- Discount: \$250
- Purchase Price: \$4,750
- Days to Maturity: 182 days (assuming 6 months)

Plugging in the values:

$$\text{YTM} = \frac{\$250}{\$4,750} \times \frac{365}{182} \approx 0.05263 \times 2.0055 \approx 0.1055 \text{ or } 10.55\%$$

This indicates that, on an annualized basis, the investor's yield is approximately 10.55%.

## Understanding the Discount After Six Months

### The Nature of the Discount

The discount of \$250 represents the interest earned over the six-month period. Since the T-bill matures in six months, the actual return realized by the investor is the discount amount.

### Effective Return for the Investor

The effective return considers the actual amount invested and the period:

$$\text{Effective Return} = \frac{\text{Discount}}{\text{Purchase Price}} = \frac{\$250}{\$4,750} \approx 5.26\%$$

This is the six-month return. To compare it with other investments or to

understand its annualized equivalent:

$$\text{Annualized Return} = \left(1 + \text{Effective Return}\right)^{\frac{365}{\text{Days to Maturity}}} - 1$$

Using the effective return of 5.26% over 182 days:

$$\text{Annualized Return} \approx (1 + 0.0526)^{\frac{365}{182}} - 1 \approx (1.0526)^{2.0055} - 1 \approx 1.107 - 1 = 0.107 \text{ or } 10.7\%$$

Thus, the annualized yield aligns closely with the earlier YTM calculation, confirming the investor's return.

## Implications for Investors

### Advantages of Buying T-Bills at a Discount

- Safety: Minimal risk due to government backing.
- Predictable Returns: Fixed discount and maturity value.
- Liquidity: Easily sold or held until maturity.
- Tax Benefits: Often exempt from state and local taxes.

### Considerations When Investing in Discount T-Bills

- The actual return depends on the purchase price and maturity period.
- The shorter the maturity, the less time for interest to accrue.
- Market interest rates influence the discount rate; higher rates mean larger discounts.
- Inflation can erode real returns, so investors should compare yields with inflation rates.

## Conclusion

Investing in treasury bills sold at a discount, such as in the example where a \$5,000 par value T-bill is purchased at \$4,750, provides a safe and predictable way to earn short-term returns. The discount of \$250 over six months translates into an annualized yield of approximately 10.55%, highlighting the attractiveness of such instruments in conservative investment portfolios. Understanding how to calculate discounts, yields, and effective returns enables investors to make informed decisions and compare T-bills with other short-term investment options. As always, considering market conditions, interest rates, and inflation is essential when evaluating the true profitability of treasury bill investments.

## Frequently Asked Questions

### **What is the discount amount on a Treasury Bill with a par value of \$5,000 sold at \$4,750?**

The discount amount is \$250, calculated by subtracting the purchase price (\$4,750) from the par value (\$5,000).

### **How do you compute the discount yield of this Treasury Bill after six months?**

The discount yield is calculated as  $(\text{Discount} / \text{Par Value}) \times (360 / \text{Days to Maturity})$ . In this case, it is  $(\$250 / \$5,000) \times (360 / 180) = 0.05 \times 2 = 10\%$  annualized.

### **What is the actual amount earned by an investor after six months from this Treasury Bill?**

The investor earns \$250 in discount over six months, which is the difference between the par value and purchase price, representing the interest earned.

### **What is the effective interest rate for this Treasury Bill over six months?**

The effective interest rate over six months is 5%, since the discount of \$250 on the \$4,750 purchase price equals 5%, and annualized it approximates to 10%.

### **Why is the Treasury Bill sold below its par value, and what does this indicate?**

The Treasury Bill is sold at a discount below par value to compensate the investor for the interest earned over the period; this indicates it is a zero-coupon security with implied interest.

### **How would the discount be affected if the Treasury Bill's maturity period was extended beyond six months?**

If the maturity period were extended, the discount amount would likely increase proportionally, and the discount yield would need to be recalculated based on the new maturity period to reflect the annualized return.

# Additional Resources

Treasury Bill With A Par Value Of \$5000 Sold At \$4,750. After Six Month The Discount Of This Treasury

In the world of government securities, treasury bills (T-bills) stand out as a popular and secure investment instrument. They serve as a vital tool for government debt management while offering investors a relatively safe avenue to earn returns. Recently, a treasury bill with a face (par) value of \$5,000 was sold at a discounted price of \$4,750. After a period of six months, investors and analysts are keen to understand the implications of this discount—specifically, how much discount was realized and what it signifies in terms of yield and investment returns. This article delves into the mechanics of T-bills, demonstrates the calculation of the discount, and explores the broader implications for investors.

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## Understanding Treasury Bills: An Overview

Before analyzing the specific transaction, it's essential to comprehend what treasury bills are, their features, and how they work.

### What Are Treasury Bills?

Treasury bills are short-term debt instruments issued by the government to finance national expenditures. They are considered one of the safest investments because they are backed by the full faith and credit of the government. T-bills are typically issued with maturities of:

- 4 weeks (1 month)
- 13 weeks (3 months)
- 26 weeks (6 months)
- 52 weeks (1 year)

Investors buy T-bills at a discount to their face value and receive the full face value at maturity. The difference between the purchase price and the maturity value represents the interest earned by the investor.

### Key Features of Treasury Bills

- Discounted Price: Investors purchase T-bills below their face value.
- Maturity Value: The face value paid at maturity, e.g., \$5,000.
- Interest Earned: The difference between the face value and the purchase price.

- No Coupon Payments: T-bills do not pay periodic interest; instead, they are issued at a discount.
- Low Risk: Backed by the government, making them virtually risk-free.
- Highly Liquid: Easily tradable in the secondary market.

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## The Initial Transaction: Buying the Treasury Bill

In our scenario, an investor purchases a treasury bill with a par value of \$5,000 at a discounted price of \$4,750. This transaction raises pertinent questions regarding the yield, discount rate, and the investor's potential return after six months.

### Details of the Purchase

| Item                | Description                                                                            |
|---------------------|----------------------------------------------------------------------------------------|
| ---                 | ---                                                                                    |
| Par (Face) Value    | \$5,000                                                                                |
| Purchase Price      | \$4,750                                                                                |
| Discount            | $\$5,000 - \$4,750 = \$250$                                                            |
| Discount Percentage | $(\text{Discount} / \text{Par Value}) \times 100 = (\$250 / \$5,000) \times 100 = 5\%$ |

The discount of \$250 represents the interest earned over the period of holding the T-bill, in this case, six months.

### Why Discounted Price Matters

The discounted purchase price is the key to understanding the yield an investor earns. It reflects the return on investment, which can be expressed through various yield measures such as:

- Discount Rate
- Bank Discount Yield
- Bond Equivalent Yield (BEY)
- Effective Annual Rate (EAR)

Next, we will explore how to calculate these yields and interpret the results.

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# Calculating the Discount and Yield after Six Months

The core of understanding the return lies in calculating the discount rate and effective yield based on the purchase price, face value, and holding period.

## 1. Discount Rate (Bank Discount Rate)

The discount rate is calculated based on the face value:

Formula:

$$\text{Discount Rate} = \frac{\text{Discount}}{\text{Face Value}} \times 100$$

Calculation:

$$\frac{\$250}{\$5,000} \times 100 = 5\%$$

This indicates that the investor earns a 5% discount over the face value during the holding period.

## 2. Discount Yield (Based on Face Value)

The bank discount yield reflects the annualized yield based on the face value, assuming a 360-day year (standard in money markets).

Formula:

$$\text{Discount Yield} = \frac{\text{Discount}}{\text{Face Value}} \times \frac{360}{\text{Days to Maturity}} \times 100$$

Details:

- Discount = \$250
- Face value = \$5,000
- Days to maturity = 180 days (6 months)

Calculation:

$$\frac{\$250}{\$5,000} \times \frac{360}{180} \times 100 = 0.05 \times 2 \times 100 = 10\%$$

So, the discount yield over six months is approximately 10% annualized.

### 3. Bond Equivalent Yield (BEY)

Since the bank discount yield tends to underestimate the actual yield (because it's based on face value and not the purchase price), the bond equivalent yield adjusts for this.

Formula:

$$\text{BEY} = \frac{\text{Discount}}{\text{Purchase Price}} \times \frac{365}{\text{Days to Maturity}} \times 100$$

Calculation:

$$\frac{\$250}{\$4,750} \times \frac{365}{180} \times 100 \approx 0.05263 \times 2.0278 \times 100 \approx 10.66\%$$

The BEY indicates an approximate annual yield of 10.66% based on the purchase price.

### 4. Effective Annual Rate (EAR)

The EAR considers compounding effects, providing a more accurate annualized yield.

Formula:

$$\text{EAR} = \left(1 + \frac{\text{Discount}}{\text{Purchase Price}}\right)^{\frac{365}{\text{Days to Maturity}}} - 1$$

Calculation:

$$\left(1 + \frac{\$250}{\$4,750}\right)^{\frac{365}{180}} - 1 \approx (1 + 0.05263)^{2.0278} - 1$$

$$\approx 1.05263^{2.0278} - 1 \approx 1.1067 - 1 = 0.1067$$

Expressed as a percentage, the EAR is approximately 10.67% per annum.

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## Implications for Investors: Interpreting the Discount and Yield

Understanding these calculations is crucial for investors aiming to maximize returns and compare different short-term investments.

## **Return on Investment (ROI) for Six Months**

- The immediate profit from holding the T-bill is the discount of \$250.
- Over six months, this corresponds to a yield of approximately 10.66% (BEY) or 10.67% (EAR).
- Annualizing this yield suggests that, if reinvested or repaid at this rate, the investor would expect similar returns over a year.

## **Factors Influencing the Discount and Yield**

- Interest Rate Environment: Higher prevailing interest rates generally lead to higher discounts.
- Credit Risk: T-bills are considered low risk; thus, discounts tend to be modest.
- Market Demand: Increased demand for short-term government securities can influence prices and yields.
- Inflation Expectations: Rising inflation typically pushes yields higher to compensate investors.

## **Advantages of Investing in Treasury Bills**

- Safety: Backed by the government, virtually free of default risk.
- Liquidity: Easily sold in secondary markets.
- Predictability: Fixed maturity date and guaranteed return (face value).
- Tax Benefits: Often exempt from state and local taxes, depending on jurisdiction.

## **Limitations and Risks**

- Low Returns: Given their safety, yields are generally lower compared to other instruments.
- Reinvestment Risk: Future yields may be lower if interest rates decline.
- Inflation Risk: If inflation exceeds returns, real purchasing power diminishes.

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## **Conclusion: The Significance of the Discount in Investment Decisions**

The example of a treasury bill with a par value of \$5,000 sold at \$4,750 illustrates the fundamental mechanics of short-term government securities.

The \$250 discount over six months translates into an annualized yield of approximately 10.66%, highlighting the attractive risk-adjusted return these instruments can offer, especially in a low-interest-rate environment.

Investors analyzing T-bills must understand the various yield measures to make informed decisions. The discount rate, discount yield, bond equivalent yield, and effective annual rate all serve to illuminate different facets of return, enabling investors to compare T-bills against other short-term investment options effectively.

In summary, the discount on a treasury bill is not merely a reduction in purchase price but a reflection of the expected return, market conditions, and prevailing interest rates. For conservative investors seeking safety, T-bills provide a reliable, predictable, and liquid investment avenue, with yields that mirror current economic realities. As with all investments, understanding the underlying mechanics ensures investors can optimize their portfolios and make

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