



Promissory Notes, Treasury Bills, & Demand Loans

	Promissory Note	Treasury Bill/T-bill	Demand Loan
Issued by	Banks, companies, individuals, etc.	Federal government/provincial government	Banks
Face Value	Sum of money borrowed (present value)	Maturity value - in denominations of \$1,000 ; 5,000 ; 25,000 ; 100,000 or 1,000,000	Present value of money borrowed
Term	Specified by due date/date of maturity Usually given in months (ex. 6 month note) but days must be calculated	91 days, 182 days, or 364 days	Full or partial payment can be demanded at any time
Interest Rate	Specified rate at which loan accrues interest	Not specified, determined by market conditions on purchase date. Also called the "yield"	Varies, not specified

Promissory notes are a written promise to pay a certain amount of money at a specified rate of interest on a specific due date. The note can be transferred (sold) to another person, company, or bank before its due date. The **face value** of the note is the present value (or principal).

Example: Determine the legal due date, interest period, and maturity value of a promissory note for \$950 dated August 31, 2010 with interest at 6.5% per annum, issued for 6 months.

Solution:

- (1) Legal due date: A six month note would come due at the end of February. For 2010 (not a leap year), that is February 28.
- (2) Interest period: Use the date function on your calculator to determine the number of days between Aug 31, 2010 and Feb 28, 2011. This should give 181 days.
- (3) Maturity value of note: Apply the simple interest equation for future value using the interest rate given (recall: "per annum" means "annually")

$$S = P (1 + rt) = \$950 (1 + 0.065 \times (181/365)) = \$980.62$$

Sometimes the payee (lender) of a promissory note sells the note to a bank or finance company before it has matured. This situation is called **discounting**.



There are two steps required to solve these discounting problems:

- (1) Calculate the maturity value of the note, using the stated interest rate.
- (2) Calculate the present value of the note at the selling date using the days between the sell date and maturity date and the rate money is worth.

Example: A 270-day note for \$3000 with interest at 8.5% is dated February 2, 2010. Compute the value of the note on July 1, 2010 if money is worth 6%.

Solution:

- (1) First we determine the maturity value of the note. The term of the note is 270 days = October 30, 2010. The interest rate is 8.5%.

$$S = 3000 \left[1 + (0.085) \left(\frac{270}{365} \right) \right] = 3000(1 + 0.06288) = \$3188.63$$

- (2) Next we calculate the present value of the note when money is worth 6%. Now we move the money backwards in time from Oct 30 to July 1. Use the days between function in the calculator to find time: 121 days.

$$P = \frac{3188.63}{(1 + 0.06(121/365))} = \$3126.44$$

This is the value someone would be willing to pay for this note on July 1, 2010.

Treasury Bills (or T-bills) are promissory notes issued by the federal or provincial government. For a T-bill, the face value is what the investor is guaranteed to receive when the bill reaches maturity. An investor purchases the bill at a **discounted** value (less than the face value). An investor can also sell the T-bill to another investor before the maturity date is reached.

Example: An investor purchased a 182-day Canada T-bill with a face value of \$25,000 to yield an annual rate of return of 4.35%. (1) What was the price the investor paid to purchase the bill?

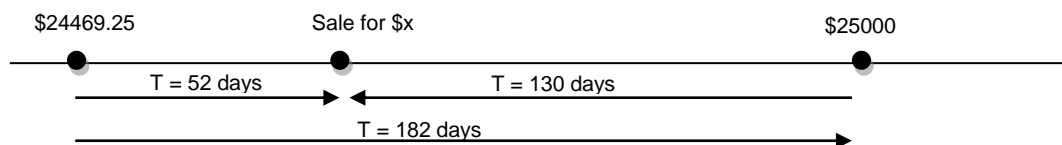
Solution:

The face value is the maturity value of the bill (\$25,000), the interest rate is 4.25% and the period is 182 days. The investor is purchasing the bill at a discounted price, which is the present value:

$$P = \frac{S}{1+rt} = \frac{25000}{1+0.0435\left(\frac{182}{365}\right)} = \$24469.25$$

Example: Using the above question, if the investor resold the T-bill 52 days after purchasing it for a yield of 4.12%, what was the profit realized on the sale?

Solution: Let's draw a timeline to make this easier:



The time from the resale of the T-bill to the maturity is 130 days. The value at the resale should be calculated using the second yield rate given (yield rates are always relative to the maturity value of a T-bill).

$$P = \frac{S}{1+rt} = \frac{25000}{1+0.0412\left(\frac{130}{365}\right)} = \$24638.46$$

The investor realized a profit of $\$24638.46 - \$24469.25 = \$169.21$.
At this point, you could also calculate the "rate of return" the first investor received while holding the T-bill for 52 days.

Demand loans means the lender can demand full or partial repayment at any time.

There are two methods of repayment:

(1) **separate interest payments:** the loan is repaid in regular payments and the *interest is calculated on the unpaid balance only*

(2) **declining balance:** the accrued interest is paid off first with any remainder of the payment reducing the outstanding principal

Example: On July 1, ARC Inc. borrowed \$15,000 at 6.75% interest on a note requiring payment of principal and interest on demand. ARC made payments of \$5000 on Sep 1, and \$7000 on November 1. What payment is required on Dec 30 to pay the note in full? (**Use the declining balance method**)

Solution:

For each payment, calculate the interest due to the date of the partial payment and deduct it from the payment made, then apply the remainder against the balance owing.

July 1 - Original loan balance		\$15000.00
Sep 1		
Deduct		
First partial payment	\$5000.00	
Less interest (Jul 1 – Sep 1)	171.99	← $15000 * 0.0675 * (62/365)$
	4828.01	
Unpaid balance		\$10171.99
Nov 1		
Deduct		
Second partial payment	\$7000.00	
Less interest (Sep 1 – Nov 1)	114.75	← $10171.99 * 0.0675 * (61/365)$
	6885.25	
Unpaid balance		\$3286.74
Dec 30		
Add interest (Nov 1 – Dec 30)		35.86 ← $3286.74 * 0.0675 * (59/365)$
Payment required to pay note in full:		\$3322.60



Practice Problems

1. Find the amount of interest payable and the maturity value of a five-month note for \$750 issued June 16, 2010 with a specified rate of 7.15% per annum.
2. What is the face value of a 140-day note dated October 15 with 6.60% p.a. with a maturity value of \$2533.87?
3. A 120-day, \$900 promissory note was issued March 3 with interest at 8%. What is the value of the note on May 6 if money is worth 5%?
4. Calculate the proceeds of a seven-month, \$6500 note dated December 15, 2014 with interest at 4.75% if the note is paid on April 4, 2015 when money is worth 6.08%.
5. A 160-day note for \$1400 at 11.2% p.a. issued February 3, 2013 is discounted March 30, 2013 at 12.5%. What is (a) the sale value of the note and (b) the amount of discount?
6. Mallory paid \$23,756.25 to purchase a \$25,000, 364-day T-bill on June 23. The T-bill was then sold on August 14 for \$24,120.17. (a) What was the market yield rate on June 23? (b) What was the yield rate on Aug 14? (c) What was the rate of return realized?
7. Anju bought a \$150,000, 182-day T-bill for \$145,672.18 on its issue date. After 53 days, she sold the T-bill for a yield of 3.790%. (a) What was the original (or market) yield on the T-bill? (b) For what price was the T-bill sold? (c) How much profit did she make on the sale? (d) What was the rate of return realized?
8. Michael borrowed \$3600 on a demand note. He agreed to repay the loan in five equal monthly installments, with interest of 8.5% p.a. calculated on the unpaid balance. Determine the total interest cost Michael will pay.
9. Zball Deziign borrowed \$28,400 with an interest rate of 11.75% on Jan 15, 2010. The loan was repaid in full on Sept 15, 2010 with payments of \$8000 on Mar 20, \$7500 on June 15, and \$9000 on Aug 1, 2010. How much did Zball Deziign pay on Sept 15? (Use the **declining balance** method).
10. Zhang borrowed \$6000 on December 1, 2010 on a demand note with 10.2% p.a. interest. Zhang made payments of \$1500 on Dec 31, 2010, \$2000 on Jan 20, 2011, and \$2500 on Feb 14, 2011. On Jan 1, 2011 the interest rate increased to 10.8% p.a. The final payment was made on March 1, 2011. What was the final payment? (Use the **declining balance** method).



Solutions

1. Due date is Nov 16, 2010, time 153 days.
Interest payable is \$22.48, maturity value is \$772.48
2. Face value is the present value, \$2,471.31
3. Find maturity value first: \$923.67, date of maturity July 1, go back from maturity date to May 6 (56 days) and find present value at May 6 using 5% interest rate: \$916.64
4. Find date of maturity July 15, 2015 (212 days), value at maturity \$6679.33. Find present value on April 4 (102 days before maturity), at 6.08%: \$6567.74 ← this is the proceeds (amount received for sale)
5. (a) Step 1 is to find the maturity date and maturity value: July 13, 2013 - \$1468.73. Step 2 is to find the days between the maturity date and discount date: 105 days, then find the present value: \$1417.75 (b) \$50.98 (difference between maturity value and value at sale)
6. (a) 5.25% (b) 4.27% (c) 10.8%
7. (a) 5.96% (b) \$148,017.34 (c) \$2345.16 (d) 11.1%
8. \$76.50
9. \$5362.34
10. \$97.07

