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Learning Objectives

- Identify accounting topics where time value of money is relevant;
- Distinguish between simple and compound interest;
- Learn how to use compound interest tables (NOTE we will also cover using excel worksheets & formulas and financial calculators);
- Identify variables fundamental to solving interest problems;
- Solve future and present value of 1 problems;
- Solve future and present value of ordinary and annuity due problems;
- Solve PV problems related to deferred annuities and bonds;
- Apply the expected cash flow approach to present value measurement.

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Key Terminology

- **Present Value:** Today's value of money to be received in the future;
- **Future Value:** Value of an amount known today which will be received/ paid in the future.
- **Compound:** Interest earning interest. Compounding period should be stated, generally monthly
- **Annuity:** Payments over a period of time in equal amounts.
- **Payment Interval:** Frequency of annuity pmts.
- **Ordinary annuity:** payments made at the end of the payment interval
- **Annuity due:** payments made at the beginning of the payment interval

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Time-Value of Money basics

- \$1 today is worth more than \$1 tomorrow;
- GAAP seeks to present the "economic substance over legal form" of a transaction. Consequently, PV becomes relevant. Glaring example:
 - Real estate sold to buyer for \$10 million, payable as follows:
 - \$7,500,000 due in cash at close of escrow; \$2,500,000 note payable bearing 0% interest payable in one lump-sum in 5 years.
 - » Is the sales price \$10 million
 - NO- \$2.5 million in 5 years is worth < \$2.5 million!
- The risk is commensurate with the reward- the higher the perceived risk, the higher the interest rate.

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Key Variables

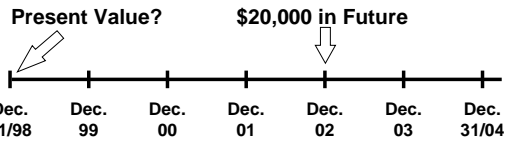
Whether using a table, microsoft excel formula or a financial calculator, the key variables are:

- Present value and/ or Future value;
- Interest Rate
- Payment (if an annuity)
- Period (note: depends on compounding period)

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Present Value



BE6-2 Itzak Perlman needs \$20,000 in 4 years. What amount must he invest today if his investment earns 12% compounded annually?

What table do we use ?

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Present Value of a Single Sum

Number of Periods	Table 6-2				
	Discount Rate				
	4%	6%	8%	10%	12%
2	.92456	.89000	.85734	.82645	.79719
4	.85480	.79209	.73503	.68301	.63552
6	.79031	.70496	.63017	.56447	.50663
8	.73069	.62741	.54027	.46651	0.40388

What factor do we use ?

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Present Value of a Single Sum

Number of Periods	Table 6-2				
	Discount Rate				
	4%	6%	8%	10%	12%
2	.92456	.89000	.85734	.82645	.79719
4	.85480	.79209	.73503	.68301	.63552
6	.79031	.70496	.63017	.56447	.50663
8	.73069	.62741	.54027	.46651	0.40388

$$\$20,000 \times .63552 = \$12,710.40$$

Funds Needed Factor Present Value

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Present Value

Present Value? **\$20,000 in Future**

Dec. 31/98 Dec. 99 Dec. 00 Dec. 01 Dec. 02 Dec. 03 Dec. 31/04

Itzak Perlman needs \$20,000 in 4 years. What amount must he invest today if his investment earns 12% compounded quarterly?

What table do we use ?

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Present Value of a Single Sum

Table 6-2

Number of Periods	Discount Rate				
	3%	4%	6%	9%	12%
4	0.88849	.85480	.79209	0.70843	.63552
8	0.78941	.73069	.62741	0.50187	0.40388
12	0.70138	0.6246	0.49697	0.35554	0.25668
16	0.62317	0.53391	0.39365	0.25187	0.16312

What factor do we use ?

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Present Value of a Single Sum

Table 6-2

Number of Periods	Discount Rate				
	3%	4%	6%	9%	12%
4	0.88849	.85480	.79209	0.70843	.63552
8	0.78941	.73069	.62741	0.50187	0.40388
12	0.70138	0.6246	0.49697	0.35554	0.25668
16	0.62317	0.53391	0.39365	0.25187	0.16312

\$20,000 x **.62317** = **\$12,463.40**

Funds Needed Factor Present Value

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Present Value

Today Interest paid \$80,000 repaid

Dec. 31/95 Dec. 96 Dec. 97 Dec. 98 Dec. 99 Dec. 00 Dec. 31/01

Doc Company entered into a three year loan agreement that requires \$80,000 to be repaid at maturity plus annual interest payments in the amount of \$9,600. What is the present value of the interest payments assuming a market interest rate of 12%?

What table do we use ?

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Present Value of Ordinary Annuity

Table 6-4

Number of Periods	Discount Rate				
	4%	6%	8%	10%	12%
1	0.961	0.952	0.925	0.909	0.892
3	2.775	2.673	2.577	2.486	2.401
6	5.242	4.917	4.622	4.355	4.111
9	7.435	6.209	6.246	5.759	5.328

What factor do we use ?

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Present Value of Ordinary Annuity

Table 6-4

Number of Periods	Discount Rate				
	4%	6%	8%	10%	12%
1	0.961	0.952	0.925	0.909	0.892
3	2.775	2.673	2.577	2.486	2.401
6	5.242	4.917	4.622	4.355	4.111
9	7.435	6.209	6.246	5.759	5.328

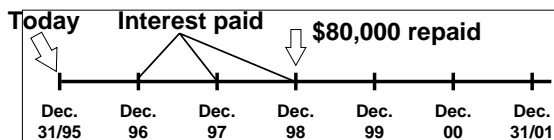
$$\$9,600 \times 2.401 (2.40183) = \$23,058$$

Interest Payment Factor Present Value

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Present Value



Doc Company borrowed \$80,000 under a three year loan agreement that requires annual interest payments in the amount of \$9,600. What is the present value of the principle payment assuming a market interest rate of 12%?

What table do we use ?

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Present Value of 1 (Single Sum)

Table 6-2

Number of Periods	Discount Rate				
	4%	6%	8%	10%	12%
1	.962	.943	.926	.909	.893
3	.889	.840	.794	.751	.712
6	.790	.705	.630	.564	.507
9	.703	.592	.500	.424	.361

What factor do we use ?

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Present Value of 1 (single sum)

Table 6-2

Number of Periods	Discount Rate				
	4%	6%	8%	10%	12%
1	.962	.943	.926	.909	.893
3	.889	.840	.794	.751	.712
6	.790	.705	.630	.564	.507
9	.703	.592	.500	.424	.361

\$80,000 x .712 (.71178) = \$56,942.40

Principal Borrowed Factor Present Value

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Present Value of Ordinary Annuity

Summary --

PV of Interest \$23,058

PV of Principle 56,942.40

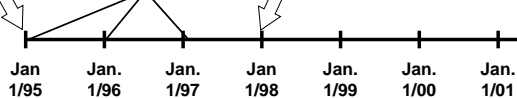
Total PV \$80,000

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Present Value

Today Lease paid End of Lease term



Doc Company leases a facility under a three year agreement that requires annual payments in the amount of \$75,000 at the beginnin of the year. What is the present value of the payments assuming a market interest rate of 10%?

What table do we use ?

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Present Value of Annuity Due

Table 6-5

Number of Periods	Discount Rate				
	4%	6%	8%	10%	12%
1	1.000	1.000	1.000	1.000	1.000
3	2.886	2.833	2.783	2.735	2.690
6	5.451	5.212	4.992	4.790	4.605
9	7.732	7.209	6.746	6.334	5.967

What factor do we use ?

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Present Value of Annuity Due

Table 6-5

Number of Periods	Discount Rate				
	4%	6%	8%	10%	12%
1	1.000	1.000	1.000	1.000	1.000
3	2.886	2.833	2.783	2.735	2.690
6	5.451	5.212	4.992	4.790	4.605
9	7.732	7.209	6.746	6.334	5.967

$$\text{\$75,000} \times 2.735 (2.73554) = \text{\$205,165.50}$$

Annual Payment Factor Present Value

Expected Cash Flow Approach- CON 7

CON 7 attempts to relieve the reliance on estimating an appropriate interest rate by imposing estimated probabilities to possible cash flows, then discounting using the risk free rate.

Example if time permits.