

# Savings Calculator

With this program, the user can calculate the time value earnings of investing money. The user can also select a savings target and the program can identify the savings levels needed to achieve the target.

**How much will my savings be worth?**

Initial amount you have invested	\$ -	Years invested	20 years
Rate you can earn	7.5%	State & federal income tax rate	30%
Additional deposit per period	\$ 1,000.00	Inflation rate	2.0%
<input type="radio"/> Monthly <input checked="" type="radio"/> Quarterly <input type="radio"/> Yearly	Assume the additional deposit is made at the end of the period.		
Period length	<input type="button" value="Account worth over time"/> <input type="button" value="Sensitivity Analysis"/> <input type="button" value="Earning Target"/>		

When starting this program, the user is taken directly to the savings calculator, above graphic, that calculates the future value of a savings plan given specific information. This information includes the amount you initially invest, savings interest rate, additional deposits per period, period length, number of years to save, state and federal income tax rate, and inflation rate.

## Inputs

- **Initial amount you have invested:** The initial amount invested to open an investment or savings account.
- **Rate you can earn:** Interest rate earned on the investment as a yearly percentage.
- **Additional deposits per period:** Additional investments deposited into the account at the beginning of each period.
- **Period length:** Time span measured monthly, quarterly, or yearly that defines the length of one period.
- **Years invested:** Length of time, measured in years, the money is invested. Also referred to as investment horizon.
- **State & federal income tax rate:** Yearly percentage of income earned from investment that is owed in state and federal income taxes.
- **Inflation rate:** A general increase in prices paid for goods and services, stated as a yearly percentage rate. Earnings adjusted for inflation is also referred to as buying power.



In 20 years your savings will be worth:			
\$ 33,953	(Interest earnings taxed, notional)	\$ 43,305	(Tax-deferred, notional)
\$ 29,091	(Interest earnings taxed, buying-power)	\$ 34,470	(Tax-deferred, buying-power)

The program calculates the future value of the investment according to the information entered. This value is expressed in four distinct manners as seen in the above graphic:

**Interest earnings taxed, notional:** Future value of investment that accounts for taxed earnings and is not adjusted for inflation.

**Interest earnings taxed, buying-power:** Future value of investment that accounts for taxed earnings and is adjusted for inflation to show value of investment in today's dollars.

**Tax-deferred, notional:** Future value of investment where taxes on earnings are deferred, or exempt, and is not adjusted for inflation.

**Tax-deferred, buying-power:** Future value of investment where taxes on earnings are deferred, or exempt, and is adjusted for inflation to show value of investment in today's dollars.

### Example

\$1,000 is invested in a 20-year account that earns 7.5% interest with additional deposits of \$500 per quarter, along with a 30% tax rate and 2% inflation.

**FAST** How much will my savings be worth?

Initial amount you have invested: \$ 1,000.00      Years invested: 20 years

Rate you can earn: 7.5%      State & federal income tax rate: 30%

Additional deposit per period: \$ 500.00      Inflation rate: 2.0%

Period length:  Monthly  Quarterly  Yearly

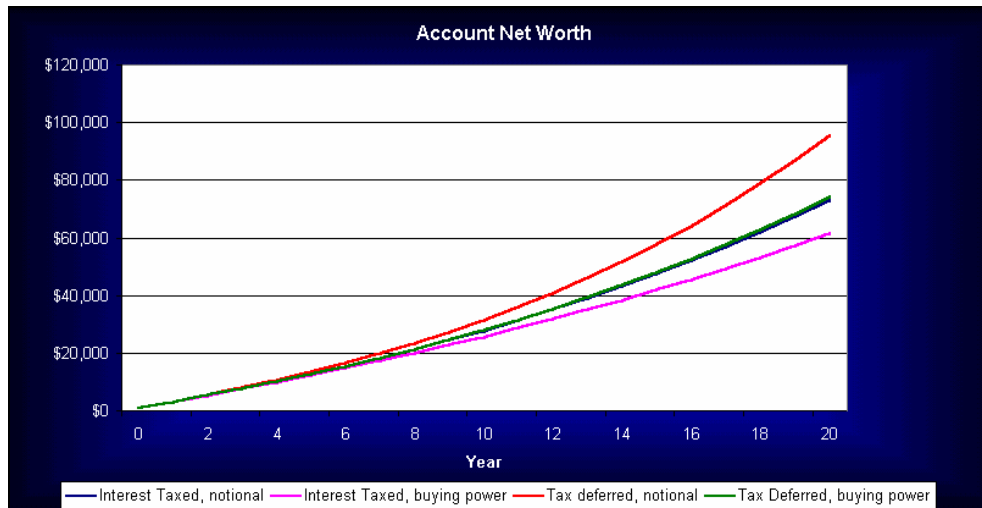
Assume the additional deposit is made at the end of the period.

Account worth over time      Sensitivity Analysis      Earning Target

In 20 years your savings will be worth:			
\$ 72,865	(Interest earnings taxed, notional)	\$ 95,616	(Tax-deferred, notional)
\$ 61,459	(Interest earnings taxed, buying-power)	\$ 74,095	(Tax-deferred, buying-power)

In 20 years, the investment will be worth:

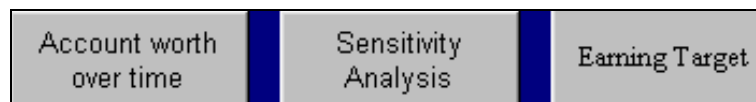
- **\$72,865** if earnings are taxed and not adjusted for inflation
- **\$61,459** if earnings are taxed and adjusted for inflation
- **\$95,616** if earnings are tax-deferred and not adjusted for inflation
- **\$74,095** if earnings are tax-deferred and adjusted for inflation



The above chart shows the relationship of accumulated earnings to years invested. In this example, due to annual compounded interest of 7.5%, the longer money is invested, the more the investment will earn.

## Summary and Analysis

The user can further examine the time value of investing money by clicking on one of the 3 **buttons** shown below. Each represents a different Excel spreadsheet found within the program. The program also provides navigation **tabs** located at the bottom of the Excel screen that correspond with the similar names on the buttons.



Account worth  
over time

Displays an output report showing principal invested, interest earned, net worth, and buying power for each period of the investment. This report shows values for both tax-deferred earnings and taxed earnings investments.

Sensitivity  
Analysis

Displays an output report showing net worth of the investment at alternative interest rates and at different levels of additional deposits per period of the investment.

**Earning Target**

Displays a worksheet calculating the deposit level needed per period to reach a target net worth at alternative interest rates and investment horizons.

**Account Worth Over Time**

The summary yearly worksheet, table below, shows the net worth of the investment for each period of the investment horizon.

Year	Beginning of Quarter	Aggregate principal invested	Tax Deferred			Interest Taxed		
			Interest earned during the period	Account net worth	Buying power	Interest earned during the period	Account net worth	Buying power
1	1	\$1,000	\$0	\$1,000	\$1,000	\$0	\$1,000	\$1,000
	2	\$1,500	\$19	\$1,519	\$1,513	\$13	\$1,513	\$1,509
	3	\$2,000	\$28	\$2,047	\$2,034	\$20	\$2,033	\$2,024
	4	\$2,500	\$38	\$2,586	\$2,561	\$27	\$2,560	\$2,543
2	1	\$3,000	\$48	\$3,134	\$3,096	\$34	\$3,093	\$3,067
	2	\$3,500	\$59	\$3,693	\$3,638	\$41	\$3,634	\$3,596
	3	\$4,000	\$69	\$4,262	\$4,187	\$48	\$4,182	\$4,130
	4	\$4,500	\$80	\$4,842	\$4,743	\$55	\$4,736	\$4,669
3	1	\$5,000	\$91	\$5,433	\$5,307	\$62	\$5,299	\$5,213
	2	\$5,500	\$102	\$6,035	\$5,879	\$70	\$5,868	\$5,762
	3	\$6,000	\$113	\$6,648	\$6,458	\$77	\$6,445	\$6,316
	4	\$6,500	\$125	\$7,272	\$7,045	\$85	\$7,030	\$6,876
4	1	\$7,000	\$136	\$7,909	\$7,640	\$92	\$7,622	\$7,441
	2	\$7,500	\$148	\$8,557	\$8,243	\$100	\$8,222	\$8,011
	3	\$8,000	\$160	\$9,218	\$8,854	\$108	\$8,830	\$8,587
	4	\$8,500	\$173	\$9,890	\$9,473	\$116	\$9,446	\$9,168

For example, the first four years of the account net worth are shown in the graphic above. It the beginning of the first quarter of the second year of the investment plan, the principal balance of \$3,000 will earn \$38 in interest yielding a net worth of \$3,134. When adjusted for inflation, the actual buying power equals \$3,096. If earnings on this investment are taxed, the net worth is \$3,093 with an actual buying power of \$3,067. If the period length is monthly or annually, instead of quarterly as shown in the above table, values are shown for each period either by month or by year.

**Sensitivity Analysis**

The sensitivity analysis worksheet shows how changes in interest rate and additional deposits per period affect the net worth of the investment.

The user can adjust the amount interest and deposits increase by inserting the appropriate values in the Sensitivity Factors section of the worksheet similar to the graphic below.

Sensitivity Factors	
Deposit increment	\$ 200.00
Earnings rate increment	2.50%

The user can also conduct sensitivity analysis by calculating net worth as either earnings taxed and not adjusted for inflation, earnings tax-deferred and not adjusted for inflation, earnings taxed and adjusted for inflation, or earnings tax-deferred and adjusted for inflation as seen in the graphic below.

Calculations based on:

Interest taxed    
  Interest tax-deferred    
  Interest taxed, buying power    
  Interest tax-deferred, buying power

**Example (continued)**

**Sensitivity Analysis** Return

Initial amount you have invested: \$ 1,000.00     Years invested: 20 years

Rate you can earn: 7.5%     State & federal income tax rate: 30%

Additional deposit per period: \$ 500.00     Inflation rate: 2.0%

Monthly     **Sensitivity Factors**  
 Quarterly     Deposit increment: \$ 200.00  
 Yearly     Earnings rate increment: 2.50%

Calculations based on:

Interest taxed    
  Interest tax-deferred    
  Interest taxed, buying power    
  Interest tax-deferred, buying power

In 20 years your savings will be worth						
Interest on earnings is taxed	Earnings Rate (pre-tax)					
	2.50%	5.00%	7.50%	10.00%	12.50%	
Additional deposit per quarter	2.50%	5.00%	7.50%	10.00%	12.50%	
-	1,418	2,008	2,838	4,006	5,647	
200	20,526	25,039	30,849	38,365	48,134	
400	39,634	48,071	58,859	72,724	90,622	
600	58,742	71,102	86,870	107,083	133,109	
800	77,849	94,134	114,881	141,441	175,596	
1,000	96,957	117,165	142,891	175,800	218,084	
1,200	116,065	140,197	170,902	210,159	260,571	
1,400	135,173	163,229	198,913	244,518	303,059	
1,600	154,281	186,260	226,923	278,877	345,546	
1,800	173,389	209,292	254,934	313,235	388,033	
2,000	192,497	232,323	282,944	347,593	430,521	
2,200	211,605	255,355	310,955	381,953	473,008	
2,400	230,712	278,386	338,966	416,312	515,495	
2,600	249,820	301,418	366,976	450,670	557,983	
2,800	268,928	324,449	394,987	485,029	600,470	

With a \$200 increase in additional deposits per period and a 2.50% increment in the interest rate, the graphic above shows the net worth of the investment in 20 years at incremental levels of additional deposits and interest rates. For example, at a 5.00% interest rate and \$400 deposited into the investment per quarter, the investment will be worth \$48,071 in 20 years with earnings taxed and not adjusted for inflation.

## **Earning Target**

The earning target worksheet shows the deposit level needed per period to reach the target net worth of the investment. This program calculates this deposit level at alternative interest rates and investment horizons.

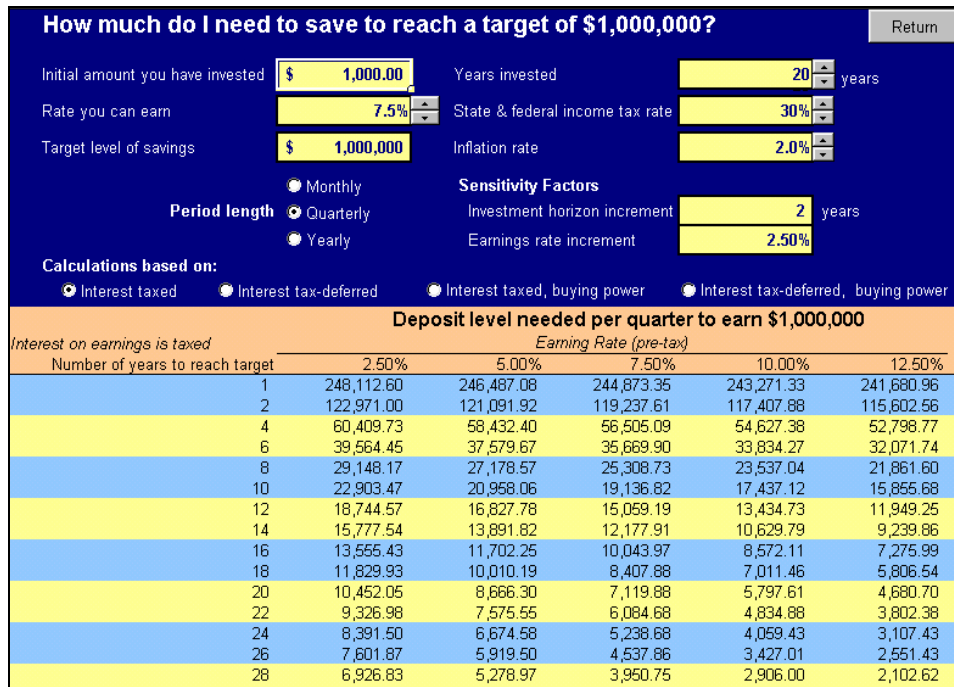
The user can adjust the amount interest and investment horizon increase by inserting the appropriate values in the Sensitivity Factors section of the worksheet similar to the graphic below.

<b>Sensitivity Factors</b>	
Investment horizon increment	<input type="text" value="2"/> years
Earnings rate increment	<input type="text" value="2.50%"/>

The user can also conduct sensitivity analysis by calculating net worth as either earnings taxed and not adjusted for inflation, earnings tax-deferred and not adjusted for inflation, earnings taxed and adjusted for inflation, or earnings tax-deferred and adjusted for inflation as seen in the graphic below.

<b>Calculations based on:</b>			
<input checked="" type="radio"/> Interest taxed	<input type="radio"/> Interest tax-deferred	<input type="radio"/> Interest taxed, buying power	<input type="radio"/> Interest tax-deferred, buying power

## **Example (continued)**



With a 2-year increase in time horizon and a 2.50% increase in the interest rate, the graphic above shows the deposit amount needed per period (quarter) to earn \$1,000,000 at incremental levels of time horizon and interest rate. For example, at a 7.50% interest rate, \$7,119.88 must be deposited into the investment each quarter in order to earn \$1,000,000 in 20 years with earnings taxed and not adjusted for inflation.

Additional Resources

The Consumer and Family Economics unit of University of Illinois Extension offers a Web site containing financial calculators similar to this program. These calculators are available at <http://www.ace.uiuc.edu/cfe/calculators.html>. This resource answers specific questions relating to saving for a car, home, college education, etc. Furthermore, the program analyzes how taxes and inflation affect savings, and contains a glossary defining terms commonly used in reference to savings and investments.