Worksheet 7-4: Mutual Funds and RRSPs

Mutual fund is a type of investment where people pool their money together to buy stocks, bonds, and other assets. It is managed by an investment company that charges a fee. Investing often carries an element of risk. Some investments increase in value while some decrease in value. The growth rate of an investment is the percent by which the investment increases (or decreases) in value over a given time.

Increase in Value of Mutual Fund Investment:

1. A mutual fund has an average annual rate of return of 12.45%. The investment company charges 2% per year as a fee for managing the account. Suppose $1000 is invested for three years. Calculate the approximate value of the investment, assuming annual compounding. The future value of the investment will be an approximation since all conditions of the investment may not be shown.

$n = 1 \times 3 = 3$ *gain*   *payout*

First ⁂ *r*
Step   Net growth rate = $12.45\% - 2\%$
            $= 10.45\% = r$ $i = \dfrac{0.1045}{1}$
                                $= 0.1045$

Investment worth $= A = 1000(1 + 0.1045)^3$

$= 1347.40$

The future value is $\$1347.40$

Decrease in Value of Mutual Fund Investment: *Decrease (–ve)*

2. A mutual fund has an average annual rate of return of −5.29%. If the investment company's fees for managing the account are 2% per year, calculating the approximate value of a $1000 investment after two years, assuming annual compounding. The value of the investment will be an approximation since all conditions of the investment may not be known.

First ⁂ $r = -5.29\% - 2\%$ (Use calculator!)
step $= -7.29\%$ $i = \dfrac{-0.0729}{1} = -0.0729$

$n = 2$

Investment Value $= 1000(1 + (-0.0729))^2$

$= 1000(1 - 0.0729)^2$

$= 859.51$

Future value is $\$859.51$

An annuity is a series of **equal payments** made at equal intervals of time. An **ordinary annuity** is an annuity the payment of which is made at **the end of each interval.**

$$FV = \frac{PMT[(1+i)^n - 1]}{(i)}$$

where FV is the future value of the annuity (i.e. the sum of all the regular payments with interest),
PMT is the amount of each regular payment,
i is the interest rate per compounding period, and
n is the number of regular payments.

3. Many people set up an investment, such as a **Registered Retirement Savings Plan (RRSP)**, as a series of small, regular investments. Suppose you invest $200 per month from age 16 until your retirement at age 65, and the investment averages a 7% annual rate of return, compounded monthly. How much money will you have upon retirement?

$49 = 65 - 16$

age 65

$PMT = 200$ $i = \dfrac{0.07}{12}$ $n = 49 \times 12$
$= 588$

$$FV = \frac{PMT\left[(1+i)^n - 1\right]}{i}$$

$$= \frac{200\left[\left(1 + \frac{0.07}{12}\right)^{588} - 1\right]}{\left(\frac{0.07}{12}\right)}$$

$$= 1013844.75$$

4. Suppose you invest $2500 per year from age 21 until your retirement at age 65, and the investment averages a 5% annual rate of return, compounded annually. How much money will you have upon retirement?

$PMT = 2500$ $i = \dfrac{0.05}{1} = 0.05$ $n = 65 - 21 = 44$

$$FV = \frac{2500\left[(1 + 0.05)^{44} - 1\right]}{0.05}$$

$$= 377857.51$$

5. Katie just turned 30 and gave birth to a baby girl. She knows that when her daughter finishes high school, a post-secondary education will cost much more than it does today. Katie plans to put $10 per week into her daughter's **Registered Education Savings Plan (RESP)**. In addition, the federal government will contribute 20% of the investor's RESP contribution each year up to a maximum of $400 per year.

$PMT =$ $i =$ $n =$

(a) How much will Katie have invested by her daughter's first birthday?   1 year

$$\$10 \times 52$$
$$= \$520$$

Katie has invested $520.

(b) If Katie's investment earns 3.85% interest compounded weekly in the first year, how much interest will it earn?

$$A = FV = PMT\left[\frac{(1+i)^n - 1}{i}\right] \qquad i = \frac{0.0385}{52}$$

$$n = 52 \text{ in weeks}$$

$$= \frac{10\left[\left(1 + \frac{0.0385}{52}\right)^{52} - 1\right]}{\left(\frac{0.0385}{52}\right)} \qquad PMT = \$10$$

$$= 529.94$$

$$\text{Interest} = 529.94 - 520 = \boxed{9.94}$$

Answer statement

(c) How much will the federal government contribute to the fund?

$$520 \times 20\% \text{ or } 520 \times 0.2$$
$$= 104$$

Federal government will contribute $104.

(d) How much money will be in the fund after one year?

$$FV + Govt$$
$$= 529.94 + 104$$
$$= 633.94$$

There will be $633.94.

6. One year ago, Joseph invested $2500 in a mutual fund that decreased in value by 4.92%. The fund has a 1.5% management fee. Determine the value of Joseph's investment at the end of one year.

7. Heena invested $2000 in a mutual fund over a 10-year period. The fund had an averaged 7.3% growth, and a 2.5% management fee. What was the value of her investment?

8. When Maggie was 17, she began investing $300 per month in a no-fee investment that paid 3.8% interest per year, compounded monthly. Determine the value of Maggie's investment after five years.

$$PMT = 300 \quad i = \frac{0.038}{12} \quad n = 5 \times 12 = 60$$

$$FV = \frac{PMT\left[(1+i)^n - 1\right]}{i}$$

$$= \frac{300\left[\left(1 + \frac{0.038}{12}\right)^{60} - 1\right]}{\left(\frac{0.038}{12}\right)}$$

$$= 19789.26$$