Pure Mathematics 30

Student Project: Investment for Growth

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Alberta EDUCATION

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Project: Investment for Growth

Introduction

In this project, you will be investigating various investments. Part A deals with growth stocks, Part B with the growth of an RRSP and the power of regular investments, and Part C with mutual fund risk assessment. In Part D, you will research an investment of your choice.

Part A

Companies that show consistent growth in their revenues and earnings per share (EPS) over a period of time are considered good companies to invest in.

Revenue is the total money made by the company, whereas earnings per share (EPS) is the ratio of a company's profit divided by the number of common shares.

1. The revenues and EPS for two companies, ABC and XYZ, for the years 1993 to 2004 are shown in the table below. Use this data to create lists in a graphing calculator or a spreadsheet program. Let 1993 be year 0, 1994 be year 1, and so on.

		Company ABC		**Company XYZ**	
Year	**Year Number**	**Revenue (in $1000)**	**EPS ($)**	**Revenue (in $1000)**	**EPS ($)**
1993	0	7 500	0.24	295	0.18
1994	1	7 070	0.25	332	0.21
1995	2	8 964	0.48	445	0.20
1996	3	6 579	0.71	640	0.23
1997	4	7 053	1.22	631	0.28
1998	5	7 946	1.31	689	0.34
1999	6	8 667	2.36	819	0.47
2000	7	9 427	2.16	930	0.57
2001	8	10 151	2.39	1 002	0.63
2002	9	11 369	2.67	1 192	0.74
2003	10	16 102	2.81	1 445	0.70
2004	11	17 588	3.02	1 865	0.82

2. Graph EPS as a function of year number from 1993 to 2004 for company ABC and for company XYZ.

3.
- For each company, ABC and XYZ, write an exponential regression equation in the form $y = a \times b^x$, where x = year number and y = EPS, to find an expression for the EPS in terms of years starting with 1993. Round the values for a and b to the nearest thousandth.
- What do the values for a and b represent in this context?

4.
- If each company continues to grow at the rates shown in the table, what will each company's EPS be at the end of 2009?
- In which year will the value of the EPS for company XYZ first become twice as large as its value at the end of 2004? Describe how you arrived at these values and show all your calculations.

5.
- Which company would you choose to invest in? Explain your choice.
- What are some factors that should be considered before investing in either of these companies?

Part B

One method of investing is to make regular contributions to a Registered Retirement Savings Plan (RRSP).

1. Set up a spreadsheet to show how $3\,000$ invested in an RRSP every September (starting in 2005) at 6%/a, compounded annually, will grow. What will the value of the plan be immediately after the September 2016 contribution?

You may use the following format when setting up your spreadsheet.

	A	B	C	D	E
1	**Contribution**	**Annual**	**Total**	**Interest**	**Total**
2	**Date**	**Contribution**	**Start of Year**	**Earned**	**End of Year**
3	1-Sep-05	$3,000.00	$3,000.00	$180.00	$3,180.00
4	1-Sep-06	$3,000.00	$6,180.00	$370.80	$6,550.80
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2. The value of this same plan after the September 2016 contribution can also be calculated by using the sum of the geometric series $3\,000 + 3\,000(1.06)^1 + 3\,000(1.06)^2 + \ldots$. To do this,

- complete this series and describe what the first term and the last term represent
- use the sum of the geometric series formula to calculate the value of the plan after the September 2016 contribution

3. If it is assumed that the annual rate of growth remains the same, the following equation could be used to determine how many years from September 2005 it will take this RRSP to reach $500\,000$.

$$500\,000 = \frac{3000(1.06^n - 1)}{1.06 - 1}$$

$$\frac{30\,000}{3\,000} = 1.06^n - 1$$

$$11 = 1.06^n$$

- Explain how the value of n could be determined graphically.
- Determine the calendar year in which the RRSP will reach a value of $500\,000$.

4. A financial advisor suggested that, instead of a yearly deposit of $3 000, a monthly deposit of $250 invested at 6%/a, compounded monthly, would allow the RRSP to grow to $500 000 sooner. Determine algebraically if the advisor is correct.

5. Determine how much money you would have to invest each year on your birthday if you wanted to have $1 000 000 after the deposit on your 55th birthday. Use this year's birthday as the time of the first deposit, and use an interest rate of 5%/a, compounded annually.

Part C

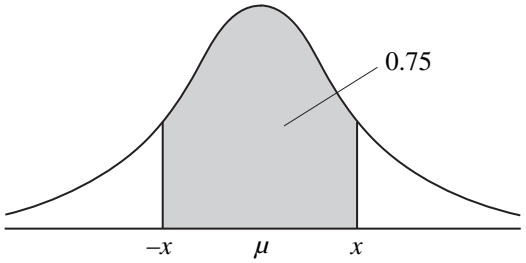
Mutual funds are investment vehicles that people can buy in units. A mutual fund manager buys different investment products. If these do well, the units of the mutual fund increase in value. When considering whether or not to buy a mutual fund, a person should look at its growth in value as well as the consistency of its return for the past few years. For each of the last 12 years, the rate of growth for mutual fund DEF and the rate of growth for mutual fund RST are shown in the tables below.

Fund DEF	
Year	**Rate of Growth**
1993	5.1%
1994	−2.1%
1995	8.3%
1996	7.9%
1997	12.2%
1998	−5.1%
1999	9.8%
2000	12.3%
2001	7.1%
2002	−0.5%
2003	−8.3%
2004	4.1%

Fund RST	
Year	**Rate of Growth**
1993	19.1%
1994	−8.1%
1995	31.5%
1996	6.1%
1997	20.3%
1998	−19.1%
1999	6.3%
2000	18.1%
2001	−1.5%
2002	−11.8%
2003	20.5%
2004	16.3%

1. One way to assess the risk involved in investing in a particular mutual fund is to calculate the standard deviation in its annual growth rate. Determine the mean and standard deviation, to the nearest tenth of a percentage, for each fund.

2. The standard deviation of the annual growth rates of a mutual fund is an indicator of how volatile, or risky, the fund is. Determine the upper and lower limits of the annual growth rate for each fund, such that there is a 0.75 probability that the actual annual growth rate falls symmetrically about the mean within those limits, as shown in the diagram below.



Part D

Research another investment method, such as asset allocation, dollar cost averaging, or GIC laddering. Describe how the plan works, and give some advantages and disadvantages of investing in this manner. You might want to use the following web sites for information:

http://www.cibc.com
http://www.royalbank.com
http://www.scotiabank.com
http://www.atb.com