Chapter 5 Practice Questions

Question guide

- Questions 5.1 – 5.9 test material from Sections 5.1 – 5.4.
- Questions 5.10 – 5.16 test material from Sections 5.5 – 5.6.
- Questions 5.17 – 5.20 are from the SOA/CAS Course 2 exam or the IOA/FOA 102 exam.

Question 5.1

A bank lends Elaine \$5,000 now. She repays \$620 at the end of each quarter for 5 years. Find the net present value for the bank using a nominal rate of interest of 4% a year convertible quarterly.

Question 5.2

A project requires an initial investment of \$10,000 and it produces net cash flows of \$10,000 one year from now and \$2,000 two years from now. The annual effective interest rate is 11%. Determine the project's net present value and internal rate of return.

Question 5.3

A zero-coupon bond costs \$85 and it will pay \$100 in 5 years. Determine the internal rate of return for this bond.

Question 5.4

A project requires an initial investment of \$50,000. The project will generate net cash flows of \$15,000 at the end of the first year, \$40,000 at the end of the second year, and \$10,000 at the end of the third year. The annual effective interest rate is 13%. What is the internal rate of return for the project?

Question 5.5

\$30,000 is invested at the start of each year for the next 20 years. The money invested earns interest at an annual effective rate of 4%. The interest earns interest at an effective rate of 2% a year. If all interest payments are made at the end of the year, find the value of the investment at the end of 20 years.

Question 5.7

Mr. and Mrs. Rich both decide to invest identical amounts of money in the stock of a particular corporation.

They each invested \$1,000 at the start of the year when the stock price was \$1.00. They also each invested an additional \$1,000 on June 30. Mrs. Rich's stock purchase was processed at 1:55 p.m. on that day, while Mr. Rich's was processed at 2:05 p.m.

Unfortunately for Mrs. Rich, the stock price fell suddenly from \$1.25 to \$0.80 at 2:00 p.m. that day.

By first calculating the number of shares Mr. and Mrs. Rich will each have at the end of the year (when the stock price had risen again to \$1.00), find the value of each spouse's fund at the end of the year, and then calculate the dollar-weighted rate of interest in each case.

Question 5.8

On 1/1/03, the value of a pension fund was \$4 million. The pension fund received a contribution of \$1 million on June 30, 2003 and \$1.5 million on March 31, 2004. The fund paid out a large payment of \$4,570,000 on November 1, 2004. The value of the fund on June 29, 2003 was \$4.3 million; on March 30, 2004 it was \$5.2 million; on October 31, 2004 it was \$6 million; and on December 31, 2004 it was \$2 million. Find the time-weighted rate of interest.

Question 5.9

The following table shows the annual effective interest rates credited to an investment fund by calendar year of investment. The investment year method applies for the first two years, after which a portfolio rate is used.

Calendar year of investment	Investment year rates		Calendar year of portfolio rate	Portfolio rate
	i(1)	i(2)		
1995	t	5.5%	1997	4.5%
1996	6.0%	6.1%	1998	5.0%
1997	7.0%	t+2.5%	1999	5.5%

An investment of \$100 is made at the beginning of 1995 and 1997. The total amount of interest credited by the fund during the year 1998 is \$13.81. Calculate t.

Question 5.17

SOA/CAS (amended)

A corporation is considering an investment in one of two potential projects. Each project requires an initial investment of \$5,000. Project X will produce cash flows of \$300 at the end of each 6-month period. The cash flows are expected to continue forever. The first cash flow is expected 6 months after the initial investment. Project Y will have a single cash flow of \$Z, which will be received exactly 5 years after the initial investment. The IRR on both projects is the same. Calculate the net present value of Project Y, using an annual effective interest rate of 10%.

Question 5.19

SOA/CAS

You are given the following information about the activity in two different investment accounts:

Account K			
	Fund value	Activity	
Date	before activity	Deposit	Withdrawal
January 1, 1999	100.0		
July 1, 1999	125.0		X
October 1, 1999	110.0	2X	
December 31, 1999	125.0		

Account L			
	Fund value	Activity	
Date	before activity	Deposit	Withdrawal
January 1, 1999	100.0		
July 1, 1999	125.0		X
December 31, 1999	105.8		

During 1999, the dollar-weighted return for investment account K equals the time-weighted return for investment account L, which equals i.

Calculate i.

Chapter 5: Project appraisal and loans

Q5.1: $6,188.24

Q5.2: 17.08%

Q5.3: 3.3038%

Q5.4: 14.83%

Q5.5: $886,999.03

Q5.7: Mrs. Rich's dollar-weighted interest rate is -13.2% and Mr. Rich's dollar-weighted interest rate is 16.9%.

Q5.8: 14.9%

Q5.9: 0.05

Q5.17: $559.88

Q5.18: 14.18%

Q5.19: 15%