Study Plan

Chapter 3

Learning Objectives

After studying this chapter you should be able to:

- Understand how to find the future value of a lump sum invested today;

- Calculate the present value of a lump sum to be received in the future;

- Find the future value of cash flow streams, both mixed streams and annuities;

- Determine the present value of future cash flow streams, including mixed streams, annuities, and perpetuities;

- Apply time-value techniques to compounding more frequently than annually, stated versus effective annual interest rates, and deposits needed to accumulate a future sum;

- Use time-value techniques to find implied interest or growth rates for lump sums, annuities, and mixed streams, and an unknown number of periods for both lump sums and annuities.

Summary and Conclusions

- Financial managers can use future-value and present-value techniques to equate cash flows occurring at different times to compare decision alternatives. Managers rely primarily on present-value techniques and commonly use financial calculators or spreadsheet programs to streamline their computations.

- The future value of a lump sum is found by applying compound interest to the present value (the initial investment) over the period of concern. The higher the interest rate and the further in the future the cash flow's value is measured, the higher its future value.

- The present value of a lump sum is found by discounting the future value at the given interest rate. It is the amount of money today that is equivalent to the given future amount, considering the rate of return that can be earned on the present value. The higher the interest rate and the further in the future the cash flow occurs, the lower its present value.

- The future value of any cash flow stream—mixed stream, ordinary annuity, or annuity due—is the sum of the future values of the individual cash flows. Future values of mixed streams are most difficult to find, whereas future values of annuities are easier to calculate because they have the same cash flow each period. The future value of an ordinary annuity (end-of-period cash flows) can be converted into the future value of an annuity due (beginning-of-period cash flows) merely by multiplying it by 1 plus the interest rate.

- The present value of a cash flow stream is the sum of the present values of the individual cash flows. The present value of a mixed stream is the most difficult to find, whereas present values of annuities are easier to calculate because they have the same cash flow each period. The present value of an ordinary annuity can be converted to the present value of an annuity due merely by

multiplying it by 1 plus the interest rate. The present value of an ordinary perpetuity—a level stream that continues forever—is found by dividing the amount of the annuity by the interest rate.

- Some special applications of time value include compounding interest more frequently than annually, stated and effective annual rates of interest, deposits needed to accumulate a future sum, and loan amortization. The more frequently interest is compounded at a stated annual rate, the larger the future amount that will be accumulated and the higher the effective annual rate.

- The annual deposit needed to accumulate a given future sum is found by manipulating the future value of an annuity equation. Loan amortization—determination of the equal periodic payments necessary to fully repay loan principal and interest over a given time at a given interest rate—is performed by manipulating the present value of an annuity equation. An amortization schedule can be prepared to allocate each payment to principal and interest.

- Implied interest or growth rates can be found using the basic future-value equations for lump sums and annuities and require an iterative trial-and-error approach for mixed streams. Using a financial calculator or spreadsheet can greatly simplify these calculations.

- Given present and future cash flows and the applicable interest rate, the unknown number of periods can be found using the basic equations for future values of lump sums and annuities. Using a financial calculator or spreadsheet greatly simplifies these calculations.