PROBLEMS WITH THE TRADITIONAL COST OF CAPITAL ESTIMATES AND AN ANALYSIS OF RECENT DEVELOPMENTS IN CAPITAL BUDGETING THEORY : A SUMMARY*

Yrd. Doç. Dr. İ. Hakkı SÖNMEZ**

The cost of capital as a standard for investment decisions has been one of the most thoroughly researched and yet one of the most ambiguous and controversial topics in the field of modern finance. It is common practice to attempt to evaluate the relative attractiveness of proposed investment projects by adjusting the discount rates applied to project cash flows. This process of evaluating competing investment proposals is one of the most important financial problems faced by the managers of firms.

Without a knowledge of its cost of capital, the firm will have difficulties in two areas. First, it will not be able to correctly select the cutoff rate for new capital budgeting proposals. The cost of capital separates the proposals that increase the firm's net present value from those that may decrease it. Second, the firm will not have a complete picture when deciding which securities should be used to raise additional funds. Knowing the existing cost of capital and the cost of raising funds from different sources can help the financial manager select additional financing.

Any theory of optimal investment decisions is premised on the existence of an objective function that the firm maximizes. Current financial theory generally assumes that the firm should maximize the market value of its common shares. The behavior of the firm under uncertainty and the valuation of risky assets are basic concerns of financial theorists, and there is a growing body of litera-

---

* This summary of the Ph.D. dissertation has been prepared by the author nimself.

** Member of the teaching staff, the Faculty of Economics and Administrative Sciences Erciyes University, Kayseri.

ture that explains how share values are determined under conditions of uncertainty.

The dissertation begins with a review of existing traditional capital budgeting models, focusing on the traditional weighted average cost of capital (WACC) method and the Modigliani and Miller (MM) valuation model. This puts into perspective the recent developments in capital budgeting theory which are subsequently presented in the dissertation.

Much of the early literature is concerned with the MM proposition that the market value of a firm is unaffected by its financing decisions, and most of the early proofs use the arbitrage argument. MM emphasized the now obvious conclusions that the total value of a firm depends on the nature of its assets and, in the absence of taxes, is independent of financial structure. As a matter of theory, there appears to be no unique optimum capital structure for a firm. However, when corporate taxation is considered, the firm's value increases with the proportion of debt in the capital structure. This leads to the conclusion that the optimal capital structure should contain all debt, a conclusion that few managers would accept.

Three basic models are used in capital budgeting theory; the weighted average cost of capital (WACC) method, the Miller and Modigliani (MM) approach, and the adjusted present value (APV) approach. The capital asset pricing model (CAPM), which is a separate model, can be used in conjunction with any of the three methods to determine the cost of equity capital. The WACC procedure uses a discount factor based on the average cost of financing. The MM method deals with an overall cost of capital measure that adjusts for both business and financial risk. The APV approach discounts at a rate appropriate for a pure equity firm and then adds back the value of the benefits of incremental debt Finally. the CAPM uses a risk-adjusted discount rate which is composed of the riskless rate plus a premium for the undiversifiable risk of a project.

The traditional WACC method is reviewed in Chapter I. An analysis is made of the recent arguments that have been raised against the WACC, and the appropriateness of the WACC formula for evaluation of finite-lived investment projects is also discussed. It is found that the appropriate discount rate (ADR) for capital budgeting decisions for finite-lived projects (other than n=l) is not

the traditional WACC. It is also shown that the difference between the ADR and the WACC depends upon the financing arrangement for a project.

The MM valuation theory and a sample of some theoretical criticisms that are raised against the MM argument are presented and discussed in Chapter II. By introducing the possibility of bankruptcy cost into the analysis, the effect of financial leverage on the market value of a firm is analyzed. The traditional WACC formula is compared to the MM cost of capital, and it is found that they are equivalent if the firm's current and future target leverage is the same. But, when growth is present, it is shown that the WACC underestimates the MM cost of capital significantly.

Chapter III introduces a new investment decision rule - Adjusted Present Value - into the capital budgeting analysis. The general formula and the closed-form expression for the APV method are derived, and the APV rule to evaluate finite or infinite-lived projects is discussed in great detail. When cost of capital formulas are compared to the APV formula for finite-lived projects, it is found that the MM cost of capital and the traditional WACC formulas understate the true cost of capital. Thus, using the net present value NPV) method, it is shown that the use of the MM and the WACC in the NPV method overstates the true excess NPV of a finite-lived project.

In Chapter IV, the capital asset pricing model (CAPM) is introduced into the analysis of capital budgeting. When the CAPM is integrated with the MM tax-adjusted valuation model, it is found that there are some theoretical problems and inconsistencies regarding the relationship between the firm's systematic risk Beta) and its leverage. Introducing risky debt into the analysis, we present a revised formulation that integrates these two models appropriately. The problems associated with the use of formulas derived from the CAPM to rank projects are discussed. Comparing the traditional capital budgeting formula to the formula derived from the CAPM, the factors that determine the systematic risk are analyzed, and it is shown that a project's Beta depends upon the life of the project and the elasticity of expectations. Finally, error tables are prepared to show the potential errors caused by the use of the traditional formula instead of the formula derived from the CAPM, and it is found that the traditional formula consistently overestimates the value of a project.

The purpose of this dissertation is to review and to discuss the recent developments in capital budgeting theory. In addition, a comparison and investigation is made of the errors and problems associated with these three specific budgeting models (the WACC method, the MM approach, and the APV approach). After explaining and rigorously examining the deficiencies of each model, the theoretical problems associated with the integration of the CAPM with the theory of capital budgeting are discussed extensively. Then the relationship among different cost of capital measures is analyzed in detail. Finally, conclusions are drawn concerning the soundness of the models when used in capital budgeting decision applications.

BIBLIOGRAPHY

Books

1. BIERMAN, Harold, and SMIDT, Seymour. **The Capital Budgeting Decision.** 4th ed New York: MacMillan, 1976.

2. FAMA, Eugene F., and MILLER, Merton H. **The Theory of Finance.** New York: Hol, Rinehart and Winston, 1972.

3. HALEY, Charles W., and SCHALL, Lawrence D. **The Theory of Financial Decisions.** 2nd ed. New York: McGraw-Hill, 1979.

4. JOHNSON, Robert. **Financial Management.** Boston, Mass.: Allyn and Bacon Inc., 1971.

5. MYERS, Stewart C. **Modern Developments in Financial Management** New York: Praeger Publishers, Inc., 1976.

6. VAN HORNE, James C. **Fundamentals of Financial Management.** 3rd ed. Englewood Cliffs, N.J.: Prentice-Hall Inc., 1977.

7. WESTON, Fred J., and BRIGHAM, Eugene F. **Managerial Finance.** 6th ed. Hindsdale, Ill.: The Dryden Press, 1978.

Periodicals

1. ANG, James S. «Weighted Average vs. True Cost of Capital.» **Financial Management.** 2, 3 (Autumn 1973) : 56-60.

2. ARDITTI, Fred D. «The Weighted Average Cost of Capital: Some Questions on Its Definition, Interpretation, and use.» **The Journal of Finance.** 28, 4 (September 1973) : 1001-1007.

3. BERANEK, William. «Some New Capital Budgeting Theorems.» **Journal of Financial and Quantitative Analysis.** 13, 5 (December 1978) : 809-829.

4. BOUDREAX, Kenneth J., and LONG, Hugh W. «The Weighted Average Cost of Capital as a Cutoff Rate : A Further Analysis.» **Financial Management.**

8, 2 (Summer 1979) : 7-14.

5. EZZELL, John R., and PORTER, Burr. «Correct Specification of the Cost of Capital and Net Present Value.» **Financial Management.** 8, 2 (Summer 1979) : 15-17.

6. FAMA, Eugene F. «Risk Adjusted Discount Rates and Capital Budgeting Under Uncertainty.» **Journal of Financial Economics.** 5, 1 (August 1977) : 3-24.

7. HAMADA, Robert S. «Portfolio Analysis, Market Equilibrium and Corporation Finance.» **The Journal of Finance.** 24, 1 (March 1969) 13-31. 13-31.

8. MAO, James C.T. «Survey of Capital Budgeting : Theory and Practice.» **The Journal of Finance.** 25, 2 (May 1970) : 349-360.

9. MILLER, Merton H., and MODIGLIANI, Franco. «The Cost of Capital, Corporation Finance and the Theory of Investment.» **American Economic Review.** 48, 3 (June 1958) : 261-297.

10. MYERS, Stewart C. «Interactions of Corporate Financing and Investment Decisions- Implications for Capital Budgeting.» **The Journal of Finance.** 29, 1 (March 1974) : 1-25.

11. RENDLEMAN, Richard J. Jr. «Ranking Errors in CAPM Capital Budgeting Applications.» **Financial Management.** 7,4 (Winter 1978) : 40-44.

12. SHARPE, W.F. «Capital Asset Prices : A Theory of Market Equilibrium Under Conditions of Risk.» **The Journal of Finance.** 19, 3 (September 1964) : 425-442.

13. WESTON, Fred J. «Investment Decisions Using The CAPM.» **Financial Management.** 2, 1 (Spring 1973) : 25-33.