QUANTITATIVE METHODS
IN THE INVESTMENT DECISION MAKING PROCESS
OF LARGE GREEK COMPANIES

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INTRODUCTION :

The main purpose of this research is to shed some light on the area of financial management as it is practised by large Greek companies. A sample of irms will be used to discover how these firms make capital investment decisions.

Both academicians and businessmen have long known that the theory and practise of financial management in Greece lagged behind the North American standard. However, the extent of this gap has never been adequately quantified. Thus the secondary purpose of this research is to «measure» the size of this gap between the Greek and the North American theory and practise with respect to capital budgeting.

GENERAL BACKGROUND

According to modern capital budgeting theory (f.e., 8, 11, 13) and relative research [see References] the basic differences between the theory and the practise of financial management of firms can be classified as follows :

A. Differences of Purpose.

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Financial Management :

— The firm does not always maximize the common share price.

Capital Budgeting Theory :
  — The firm maximizes the common share price.

B. Differences in Estimation and Analysis of the Investment Risk.
Financial Management :
— Adjust for the risk hurdle rate.

Capital Budgeting Theory :
  — Adjust for variance.
— Markowitz's model.

C. Differences in Methods used to rank Investment Proposals.

Financial Management :
— The firms used mainly methods of discounted cash flows, although some also used payback periods and accounting rates of return.

Capital Budgeting Theory :
— Uses only methods of discounted cash flows.

DATA AND PROCEDURE OF THIS RESEARCH

I. Questionalre :

All data needed used in this research was collected by questionaire which sought information in the following areas :

A. Characteristics of the firm and the finacial manager's level of education, experience, etc.

B. Stages of the capital budgeting procedure.

C. Methods employed to rank investment proposals.

  — Pay Back Period (PBP)
  — Accounting Rate of Return (ARR)
  — Net Present Value (NPV)
  — Internal Rate of Return (IRR)

D. Use of the hurdle rate of the firm.

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E. Estimation and analysis of investment risks.

A preliminary questionaire was constructed in January 1984 in order to test the reliability and reaction of five large firms. The results of the preliminary questionaire led to the final structure of the questionaire which was circulated between March and August 1984.

II. Sample of Firms

Every year the Greek Manufactures Association publishes a list of the 200 largest manufacturing firms in order of their total assets (valued at acquisition prices on 31 December 1982). The largest firm in the sample had total assets of $651 million (US) and the smallest $ 30 million (US). The exchange rate at the time was $1US = 70 Drachmas. In the Fortune 500 largest firms for the same year the 321st firm had assets equal to the largest Greek firm.

All 200 firms were contacted and asked to provide information for this re-search. However, only 30 firms were willing to provide the information necessary. This means that the sample represents only 15 % of the total population of 200 firms. Follow up interviews suggest that the unwillingness to cooperate arises from three main causes.

First, many firms are family owned. These firms are unwilling to give infor-mation to outsiders.

Second, the capital markets in Greece are narrow and primitive ; the savings rate is low and the investors financially unsophisticated. There is no requirement or accepted practise of revealing financial information to shareholders or potential investors. Therefore the mechanism of financial reporting and decision making need not be very sophisticated, nor need it comply with any particular standard.

Third, some financial managers do not wish their level of education, experience, or expertise revealed. The total assets of the 15% sample account for 40% of the total assets of the 200 firm population. This indicates that there is some self selection in the sample, with the larger more sophisticated firms responding more readily. This will tend to bias the results towards a higher level of sophiscialtion than actually exists in the population.

TABLE I

INDUSTRY	SAMPLE NUMBER OF FIRMS	POPULATION NUMBER OF FIIRMS	%
Foods	4	38	10.5
Beverages	2	12	16.7
Tobacco	1	5	20.0
Textiles	6	34	17.6
Wood	1	3	33.3
Plastics	1	5	20.0
Chemicals	3	17	17.6
Metals	2	11	18.2
Munitions	3	20	15.0
Electrical Appliances	1	12	8.3
Shipyards – Aviation	2	16	12.5
Cement	3	15	20.0
Petroleum	1	6	16.7
Furniture	--	1	0.0
Newspapers	--	1	0.0
Paper	—	4	0.0
TOTAL	30	200	15.0 %

III. The Financial Managers

Of the thirty financial managers two have MBAs with majors in finance, two have MBAs with majors in accounting, and one has a PhD with a major in finance. Of these five financial managers three have bachelor degrees in engineering and two have bachelor degrees in business administration. The other financial managers have bachelor degrees in various fields.

It should be noted that in many of the sample firms MBAs worked under the supervision of financial managers who had no graduate education. The reasons for this are :

1) the age of the MBAs

2) the MBAs lack of connections in the business community.

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3) the social status of the MBAs.

(In Greece expertise is no substitute for politics)

It was also observed that most of the financial managers who have been working for more than 10 years and hold a bachelor degree from a Greek University did not use discounted cast flows.

BACKGROUND OF THE GREEK ECONOMY

I. Recent Trends in the Greek **Economy**[1]

After three years of continous decline in the Greek economy a modest growth appeared in 1984 ; GNP increased 2.4 % in 1984 compared to 0.3 % in 1983, and-0.2% in each of 1982 and 1981. Industrial production increased by 1.7% in 1984 compared to a decrease in production of 0.3 % the previous year.

The 1984 increase in GNP was mainly due to an increase in agricultural output. In the same year personal consumption increased by 1.4 % while government expenditure increased by 3.5 %. The inflation rate was 19.1 %, down slightly from 19.5% in 1983. However, unemployment increased from 7.4% in 1983 to 8.1% in 1984. The balance of payments deficit increased steadily leading to further downward pressure on the drachma.

In 1985 GNP is expected to increase by 2 % and industrial production by 1.75 %. Capital expenditures are expected to increase by 1.25%, personal consumption by 1 %, and government expenditure by 3.75 %. Production capacity utilization which was 74% in 1984 is predicted to rise marginally to 75% in 1985. Inflation is expected to average 18.25 %.

The balance of payments situation is expected to improve in the face of increased import restrictions and the 15 % devaluation of the drachma in the beginning of October 1985.

Capital markets in Greece are still in a primitive stage. The Athens stock exchange, the only stock exchange in Greece, is almost without activity. Low savings rates and unsophisticated investors are the chief reasons for the narrow financial markets. Since stocks and bonds can rarely be issued locally the only way of financing is bank loans which in many cases are difficult to obtain.

1. Source : Export Research Center.

   Founder : Pan Hellenic Exporters Association. June 1985.

FINDINGS

I. Stages of Capital Budgeting Procedure

The following exhibit indicated the importance and difficulty of the stages of capital budgeting in the companies opinions. Most of the firms found the initial stage most important and most difficult.

TABLE II

Stages	Most Important	Most Difficult
Definition of the investment proposal and estimation of the cash flow.	15	17
Financial analysis and selection (choice) of the investment.	10	9
Realization of the investment.	3	2
Control of the Investment.	2	2
	—	—
	30	30

II. Methods in Ranking Investment Proposals

The sample of 30 firms may be divided into two categories by total asset base. The first category consists of the 17 firms with assets from $30 to $143 millions. The second category consists of the 13 firms with assets from $143.1 to §651 millions.

The results show that firms in the first category use a wider variety of met-

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hods than firms in the second. On average three methods of capital budgeting were used for making one investment decision.

TABLE III

Method Used	Degree of Use		
	High	Low	Total
ARR	8	3	11
Pay Back	15	10	25
Pay Back with salvage value of the investment	0	1	1
Pay Back with time value of money	3	1	4
NPV	9	8	17
Profitability Index	1	0	1
IRR	10	0	10
			69

The firms were also asked which of the methods are more important to them. 12 firms answered that it was impossible to choose a method which was consistently more important ; 8 firms answered that «to stay in business» was the most important method ; the remaining firms answered that the choice of the most important method depends on the firm's activities, the kind of investment considered, the positions of the individuals responsible for the evaluation of the investment proposal etc.

Of the 18 firms responding to this question the following preferences were indicated.

TABLE IV

Method	Number
ARR	3
Payback	7
IRR	2
NPV	6
	18

The method prefered by firms in the two categories are summarized in the following table.

TABLE V

	Category 1 17 firms ($ (<143) Millions	Category 2 13 firms (< $ 143) Millions
ARR	%	%
High emphasis	28	10
Low emphasis	13	20
Total	41	30
Payback	%	%
High emphasis	60	35
Low emphasis	40	65
Total	100	100
IRR	%	%
High emphasis	11	61
Low emphasis	1	0
Total	11	61
NPV	%	%
High emphasis	12	60
Low emhasis	17	32
Total	29	92

The majority of the firms (70 %) indicated that these methods of evaluation for acceptance/rejection decisions and to rank investment proposals. However, in follow up interview s I found that in some 70 % of cases the ranking of investment proposals is primarily based on the: risk, on the strategy of the firm, and on political and qualitative factors.

Of the 30 firms in the sample only 8 answered that they have no difficulty in finding investment opportunities. 17 firms answered that capital rationing is the most important problem in capital budgeting. In general capital rationing is

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the most important reason for rejecting or postponing investment projects that are otherwise economically acceptable.

A detailed classification of the causes of capital rationing have been given by Fremgen [1973], Firm responses are shown below :

TABLE VI

External Causes of Capital Rationing	%
Limit on new debt imposed by some agreement with outside parties (usually banks).	37
Limit imposed by higher authority outside the reporting organization (this usually applies to subsidiaries).	17
Lack of free access to capital markets for some other reason.	47
Internal Causes of Capital Rationing	
Limit on borrowing imposed by management (usually in subsidiaries)	10
Management's desire to maintain a regular dividend policy and thus to restrict retained earnings available for new investment.	0
Management's goal of maintaining some specific earnings per share or price earnings ratio and thus a policy of restricting issuance of additional shares of common stock.	3.3
Some other restriction on issuance of new shares of common stock (ie. a desire to maintain close control of a corporation).	6.6
Inadequate cash flow from operations to finance new investments.	47

All firms in the sample stated that they do not use linear programming to solve the problems of capital rationing. However, during the follow up interviews I found that the subsidiaries of multinational companies solve these problems by using facilities at corporate headquarters. Alternately, decisions on major investment proposals would be made at corporate headquarters while the subsidiary evaluated only the smaller investment proposals.

Those firms using more than one evaluation method did not use all methods for all investment proposals. 15 firms stated that they use the non discounted cash flows method to evaluate smaller investment proposals and the ranking of these

investments is done by lower level managers. Ten firms answered that they use less detailed analysis for smaller investment proposals. The majority of the firms in the sample also stated that the method used to rank investment proposals is often decided within the affected department of the firm. Generally the payback and ARR methods are used for investment proposals which seem to have a relatively high rate of return, short life, and low initial investment.

Of the discounted cash flow methods 57 % used NPV and 33.3 % used **IRR.**

III. Methods used in Ranking Investment Proposals

The following table summarizes the reasons behind the evaluation metdhods practised by the sample firms.

TABLE VII

Pay Back	
Tradition	100 %
Simplicity	100 %
Ranking the investment proposal	100 %
Working Capital Management	20 %
Risk Measurement	20 %
ARR	
Tradition	36.3 %
Study the influence of the investment proposal on the balance sheets	
(or Accounting Statement)	20 %
Utility for statement control	36.3 %
NPV	
Property for decisions acceptance/rejection	57 %
Security margin	40 %
Property for mutually exclusive investment proposals	10 %
Property for estimating the highest cost of the investment pro-	
posal	10 %
The existing one rate of interest for discounting	57 %
Easy estimation	57 %
IRR	
Easy to understand	33.3 %
Property for ranking investment proposals	33.3 %

Several firms were aware of linear programming. However, they maintain that linear programming is of little use because it does not evaluate risk and because investment proposals are not always available at the same time

IV. The Hurdle rate of an investment proposal

The following table shows the distribution of 22 firms who use discounted cash flows methods according to the initial method used to estimate the hurdle rate.

TABLE VIII

Method	Number of firms
Weighted cost of capital	7
Current rate of return (returning) of bonds	1
Current rate of return (returning) of common stock	1
Banking interest	8
Historical returning of investments	1
Current returning of investments	1
Industry returning	2
Other methods	1
	22

2 of the firms used two methods for the hurdle rate. 20 firms estimate the hurdle rate as the sum of one method and a subjectively estimated risk. The 8 firms that use bank interest did so because banking debt is the main source of capital. Of the 7 firms that use WCC, all of which were in the category of larger firms, 5 used accounting calculation, 1 weighted desireable capital stucture, and weighted the industry market.

The following table shows the distribution of the 7 firms according to the estimation procedure used for the cost of the common stock. Some firms use more than one methods

TABLE IX

Procedure	Number of firms
Historical return by dividend plus a percentage increase	3
Current return by dividend plus a percentage increase	3
Return required by investors	1
Dividend/share	3
Cost of debt plus a risk premium for common stock	1
Market rate of return plus a risk premium	1
Earnings/share index	2
	14

Only 1 of these 7 firms use the WCC method to calculate the firm value, and 4 firms use WCC to finish one existing investment. 6 of the 7 firms estimate their WCC on an annual basis ; all 7 firms reevaluate whenever the environment changes significantly or whenever they evaluate a new investment proposal.

The following table shows the qualitative factors the firm undertakes in the estimation of their hurdle rate.

TABLE X

Qualitative Factor	Number of firms
Estimation of risk	22
Strategic goals	8
Type of investment	3
The life of the investment	15
Adequate capital	4
Administrative quality	18
Other	3
	73

Of the 22 firms 14 use a hurdle rate, but 8 firms classify investments by risk (3 firms) or by the type of investment (5 firms), and then use different hurdle rates for the different classifications.

In follow up interviews with the two companies that used the CAPM experimentally, I ascertained that the lack of wide acceptance of the CAPM was due to :

a) the problem with statics data

b) lack of people with graduate degrees in finance

c) inability to afford the required econometricians, statiticians, and/or operations researchers.

d) the difficulty in evaluating the R_f, $E(R_j)$, and β. (Where Rf is the riskless rate of return, $E(R_j)$ is the required rate of return on investment in security j,

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and β, is the measure of risk that reflects the covariance of the individual investment return relative to the return on the market.

V. Analysis and Evaluation of Investment Risk

The following table shows the distribution of the firms in the sample according to the firms concept of the term «dangerous investment».

TABLE XI

Concept of Risk	Number of firms
Probability of undesireable return on the investment	2
Flexible return on the investment	2
Uncertain payback period	9
Uncertain capacity of the market	9
Entrance in unknown area of the market without experience	3
Success Index (expected gain/expected loss)	2
Other	3
	30

The following table shows the procedure of classification of the investment proposals by risk.

TABLE XII

Procedure	Number of firms
Classification of investment proposals in pools of risk	7
Measurement of the risk separately for each proposal	19
Non discrimination of the proposal by risk	4
	30

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The following table shows the effect of the qualitative and quantitative factors in analysis and evaluation of the investment proposal risk.

TABLE XIII

	Very Unim-portant	Unim-portant	Mean Impor-tance	Im-portant	Very Im-portant
Cost of Investment			1	3	26
Payback Period			1	4	25
Relation between the return on investment and the return on other invest-ments in the firm		1	1	18	10
Progress of the department proposing the in-vestment	3	3	9	9	6
Progress of the manager proposing the investment	5	4	3	11	7

The following table shows the distribution of the sample firms according the method used to estimate risk.

TABLE XIV

Method	Number of firms
Payback period	17
Payback period with estimation of the salvage value	1
Payback period with time value of money	3
Probabilities theory	3
Simulation	2
Discounted rate of return adjusted to risk	10
Certainty equivalents	1
Sensitivity analysis	2
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The research shows that there is a direct relationship between the degree of education of the financial manager and the method of risk analysis and estimation used. The managers with graduate degrees use more sophisticated methods such as simulation, probability theory, and sensitivity analysis. On the other hand most of the financial managers with bachelor degrees more than 10 years old used only the simple pay back period method.

COMPARISON WITH NORTH AMERICAN FIRMS

Some of the reasons why the sample of Greek firms is different from similar samples of North American firms are :

1) North American firms are larger and publically rather than privately owned,

2) have access to financial markets and sources of capital not available to Greek firms,

3) have access to investment opportunities in a larged fully developed economy whereas Greek firms are generally restricted to a small, developing economy subject to economic and political volatility.

4) have the confidence of national and international investors, whereas Greek firms have not demonstrated sufficient expertise to generate either.

5) have access to a pool of highly educated people from which to draw their financial managers. The level of Greek business education, although developing rapidly, cannot compare to the North American standard.

6) have access to a network of financial expertise which encompasses the government, universities, financial and managerial consultants, and professional organizations which simply does not exist in Greece.

COMPARISON WITH RESEARCH IN NORTH AMERICA

The results of this research are similar to the results obtained in Fremgen [1973] and Gitman and Forrester [1977], both of which found that the project definition and estimation of cash flows are the most important stage in capital budgeting procedure.

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The mean number of evaluation methods used in the Greek sample is greater than the mean number of methods found by Hoskins and Dunn [1974] in their sample of Canadian firms. This is probably an indication of a continuing trend towards the use of multiple methods in the evaluation of investment proposals by firms. This trend towards the use of multiple methods is also indicated by Fremgen [1973] and Petry [1975].

The literature of the theory of finance advocates the use of one method fo- the evaluation of investment alternatives : the net present value. However, empi, rical evidence indicates that companies habitually use more than one method.

The finding of a 57 % and 33 % use rate for the NPV and IRR methods in the Greek sample are considerably less than the use rates found in North American firms. Similarly 23 % of Greek firms use the weighted cost of capital compared to the 55% for North American firms found by Brigham [1975]. 7% of Greek firms use synchronous methods for estimation of the of portfolio risk such as simulation, CAPM, sensitivity analysis, etc. This is significantly lower than the 31 % estimated by Hoskins and Dunn [1974].

I-conjecture that Greek firms do not use linear programming methods so popular in the literature and in North American firms because few financial managers are familiar with these techniques, are not aware of their benefits, and top management is uncomfortable with the associated techniques, terminology and interpretation.

RECOMMENDATIONS

I. Short and Middle Run Recommendations

1) Extend The financial management taught in Greek Universities beyond simple capital budgeting. Areas which should be included are

Financial structure policy et cost of capital
Dividend policy
Pricing new security issues
Long term financing decisions
Financial planning
Working capital-bank relationships

Liquid asset management

Trade credit management

Mergers and aquisitions

Financial management in an inflationary environment

Financial management in multinational enterprises

Computer finance packages and their use

Financial management scenarios

The use of case studies should be encouraged.

2) Establish gratuate programs in financial management in the Greek Administrative Schools.

Graduates from Greek Universities wishing to extend their expertise beyond the limited level offered in Greece are forced to go abroad. This can be a very expensive proposition. I recommend that Greece develop a network Of exchange agreements for both professors and students in areas where Greece does not have necessary expertise to develop its own program. Such an arrangement would be similar to those arrangements already established between York University and Universities in Spain, Italy, France, Germany, and Japan.

3) Establish university based consulting services. These consulting services would be available to all Greek firms free of charge. At the same time it would provide an opportunity to graduate and undergraduate students to gain practical experience under the quidance of qualified professors. It would be essential to ensure **that** all data and information be kept entirely confidential.

4) Strengthen the ties between the university and the business community by encouraging qualified financial managers to give lectures and/or seminars in specific areas of finance in the university.

5) Publish on an annual basis a register of all Greek companies for the purpose of information and analysis. Since the required information is generally not given voluntarily the implementation of this recommendation hinges on governmentwillingness to publish registration information.

6) Establish a standard in government controlled firms that requires the evaluation of investment proposals which include consideration of the time value of money.

7) Use financial analysis in labour negotiations.

II. Middle and Long Run Recommendations

1) Establish a Greek Trans University Center of Financial Management, to coordinate Greek Research and Development in Financial Management and to define the level of expertise which must be obtained in order to graduate from the various educational institutions and levels of study (high school, technical college, BBA and MBA).

2) Begin teaching the principles of Financial Management in the final year of high school as in USA and Canada.

3) Introduce more stringent controls on companies whose shares are listed on the Athens Stock Exchange similar to controls that exist in New York, Toronto, London etc. and give the Exchange the legal power to enforce these controls. This will increase investor confidence and increase the efficiency of the Greek capital market.

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