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TAX AND INVESTMENT CODES OF PERU, CHILE, AND PAPUA NEW GUINEA

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ABSTRACT

In the last twenty years, developing countries have sought to stimulate their economies by revising their investment and tax codes. The purpose of this thesis is to examine the consequences of changes in tax codes of Chile, Peru, and Papua New Guinea. Issues that are examined are 1) how do governments view the competitiveness of their tax and investment codes, and 2) what are the advantages and disadvantages of investment of the tax codes of Chile, Peru, and Papua New Guinea.

The tax and investment codes of Chile, Peru, and Papua New Guinea were applied to copper mining operations in each of the three countries. With the country's own set of operating and capital costs, all three codes were examined and the results tabulated for comparison. In several cases, there were differing amounts of spread in the results. The amount of spread as well as the average value of the results can be used by both the government and the firm to arrive at a general indication of the competitiveness of the codes.

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CHAPTER ONE

INTRODUCTION

Since the late 1960s and early 1970s, developing countries with undeveloped natural resources have sought to stimulate their economies by revising their investment and tax codes to encourage investment by foreign firms. Exploiting these resources can provide a readily available source of foreign exchange earnings, infrastructure development, and employment. In addition it can encourage economic growth and improve terms of trade.

The main issues addressed in this thesis are 1) how do governments view the competitiveness of their investment and tax codes, and 2) from the point of view of U.S. mining firms, what are the financial advantages and disadvantages of the investment and tax codes in selected developing countries. Subsidiary issues addressed in the evaluation of these codes are how the decision to invest by U.S. mining firms is influenced by the respective goals of the firm and the developing country. Other issues presented are how the U.S. mining firms' decisions are influenced by sources of low-cost capital for projects in developing countries and how the host government's positions are influenced by outside sources of economic aid such as the the

International Monetary Fund or World Bank.

The hypothesis of this thesis is that from the firm's point of view and the government's point of view, the current tax codes are preferable to the other codes that were examined. This will be the basis of comparing the other codes.

The countries chosen for this study are Chile, Peru, and Papua New Guinea. All have instituted new codes which have had a substantial influence on the decision making process of mining firms operating within their borders. These countries have tried to pursue investment to meet their goals. Codes will be compared to determine their competitiveness in attracting mining firm investment.

Because they are not quantifiable, such risks as political risk, economic risk, and the risk involved in major policy changes in the mineral sector in developing countries will not be addressed in this analysis.

The first step in comparing the goals of the three governments with the goals of the investing firms will be an initial breakdown of the investment codes. Several case studies will be described and analyzed using these codes as they apply to large-scale, open-pit copper mining operations. To determine the relative ranking of the investment codes, consideration will be given to the

respective goals of the governments and to the potential financial constraints imposed from outside sources of credit. Ranking parameters for the three governments will be as follows:

Magnitude of tax revenues
Foreign exchange earnings
Retained Value
Potential impact of the codes on overall economic growth

By incorporating theory related to comparative economic advantage and to the concept of retained value, an indexing of government tax and investment codes will be attempted to draw comparisons in the codes. The following components will be examined:

Corporate income tax
Excess profits tax
Dividend tax
Withholding tax on interest and dividends
Export or sales tax
Patrimonial participation
Value added taxes
Reinvestment incentives

A number of financial measurements that will be used for

comparison purposes by the firm will be based upon similar geological and metallurgical characteristics, variable infrastucture requirements and variable worker productivity. The following financial measurements to be used are

Payback period

Estimated capital costs

Estimated operating costs

Discounted cash flow measurements (Net present value and discounted cash flow rate of return)

CHAPTER TWO

LITERATURE REVIEW

A considerable volume of literature exists on the nature of developing country government policies regarding investment in their country and on the investment decision process of firms in developing countries. The mining and extractive industry traditionally has played an important role in the economies of many lesser developed countries (LDCs), and as a result of this role, many authors have investigated the application of international investment theory to the mining industry.

The literature reviewed in this chapter will serve as the basis for defining terms that will be used throughout the remaining chapters of this thesis. The concept of retained value has been adopted in this study to determine some form of measure of accrued benefits to the developing countries. For this reason, the work of R.F. Mikesell and others was examined to develop a framework and to define terms to be used in the case studies. Mikesell (1979) reviews the copper industry and devotes several chapters to foreign investment and to the political and economic interests of the host countries. In another study of the copper industry, Mikesell (1975) reviews the Toquepala

project in Peru and the Bougainville project in Papua New Guinea. Since the tax codes of both Papua New Guinea and Peru will be evaluated in case studies, Mikesell's description of these projects was found to be of value in generating the case studies. Mikesell describes the history of the projects, performs a financial analysis, and incorporates the concept of retained value, primary components of which include wages, domestic purchases, royalty payments, dividends, corporate taxes, withholding taxes, and customs duties.

A similar concept of "returned value" was described by Mamalakis and Reynolds (1965). Brodsky and Sampson (1980), have incorporated rent payments into the concept of retained value and have shown its potential uses such as foreign exchange earnings, terms of trade, and savings.

A component of this thesis will be the description of a number of goals of developing countries. Both Gluschke and Varon (1980) and Gillis and Beals (1980) described goals and objectives of developing countries which will be considered in the case studies in this thesis.

Gluschke and Varon (1980) carefully defined the objectives of host countries by listing characteristics of the mineral sector, and descibing the impact of the mineral sector on their economies. Glusche and Varon also created

a series of objectives which were subdivided into general development objectives and mineral sector objectives, and ranked these objectives. In particular, Gluschke and Varon state that developing countries want an increase in income, improvements in the terms of trade between developing countries and developed countries, an improved market structure, and an increased share of world industrial production. Both Welborn (1970) and Bennett (1973) describe the implementation national mineral policies in developing countries and analyze the impact of these policies on mining firms. Inga (1982), in a detailed analysis of the Peruvian mineral industry, defines a number of economic and social goals of host governments and presents several scenarios of the potential impact of changes in current policies. In another study on the Peruvian mineral industry, Sawada (1983) reviews current mineral legislation, Japanese mineral development in Peru, and the negotiation of agreements between the Peruvian government and Japanese mining interests.

Benefits to developing countries as a result of mineral production are described by Gillis and Beals (1980). In their analysis, the authors describe government objectives with respect to the Indonesian mineral industry. The analysis uses objectives similar to those of Gluschke and

Varon and incorporates the concept of retained value to model the potential benefits accruing to the Indonesian government.

In an overview of the problems in the extractive industry in developing countries, Cobbe (1979) describes the general nature of mining in developing countries and reviews the market structure and the behavior of the firm. Cobbe also describes the various forms of governments in less developed countries, the features characteristic of the mineral industry, and describes case studies in Zambia and Botswana. Sideri and Johns (1980) present a slightly different approach to the international mining industry by reviewing a number of commodities, the nature of mineral markets, the financing of mineral projects, as well as suggesting mineral policy changes.

Bosson and Varon (1977), after describing the general nature of the mineral industry, define a number of problems in mineral development in developing countries as a result of conflicting objectives of governments and firms.

An important component in the determination of goals or policies of developing countries is their macroeconomic basis. Gillis (1978) provides a good description of the macroeconomic impacts of the mineral industry in Bolivia, material helpful to this thesis. Gillis covers various

impacts on domestic aggregate demand, on the supply of foreign exchange, and on government fiscal and monetary policy. Behrmen (1977) takes a theoretical approach to macroeconomic policy and the mining industry in Chile. In this study, the author used data on the Chilean economy in a complete-model analysis for simulation of changes in fiscal and monetary policies and their effect on extractive industries. Garnaut(1978) tries to define the impact upon the economy of resource investments, the instability as a result of fluctuations in demand of the resources, the long-term effect of growth, and domestic and international policy. Also described by Garnaut are direct and indirect linkages, and the concept of resource rents.

Mikesell(1971) briefly describes the sources of conflict between LDCs and the firm with emphasis on tax structure, the theory of rents, and as conflicts in negotiation of mineral agreements.

One of the more important sections of this thesis concerns the effects of taxation on the mineral industry. A major new source of information on mineral taxation by Garnaut and Ross (1983) is an excellent source. In their analysis, the authors discuss what they refer to as the supply price of investment, which relates risk factors to the scale of investment and the methods that investors use

for ranking investment opportunities. Also, in this study, the authors evaluate various forms of rent taxes and analyze rent taxes in Papua New Guinea. In an earlier study, Garnaut and Ross (1975) describe the theory of resource rent tax as a method for maximizing long-term product and for capturing the greatest possible benefits for the public generated from the extraction of natural resouces. The authors 1) describe the nature of taxing resource projects, 2) suggest a possible method of taxing resource rents, and 3) outline possible difficulties and complications of implementing a resource rent tax.

To balance host government positions on mineral development, the goals and objectives of the firm were taken into account in this thesis. Two sources were found to be excellent. Aharoni (1966) provides an excellent source of information on the decision process of the firm, and Kelly (1981) provided an excellent source of data from questionnaires on how firms rank financial criteria on investments.

Johnson (1981) suggests using profit criteria in determining where to invest and outlines the potential problems in using profit criteria, such as current versus constant terms, and loan leverage. Johnson further defines considerations in the design of an effective fiscal regime. Major considerations include the taxation of excess profits

through a resource rent tax that would not unduly hamper "average deposits," and possible equity participation by the government.

The actual decision process to invest in foreign projects is presented by Aharoni (1966) and encompasses the decision to invest overseas, the process of investigating overseas investment, an analysis of risk, and the negotiation process.

Kelly (1981) gives a detailed description of foreign investment evaluation practices of U.S. multinational corporations. In this investigation, the author discusses positive theories of foreign direct investment, normative theories of the decision process of the firm, and political and foreign exchange risks. The remaining sections of the investigation describe the methodology and results of a survey of 255 Fortune 500 firms operating overseas regarding investment methods used to determine project viability. The results of this investigation were divided into geographic areas which included Latin America, Asia and the Far East, and Europe. The results also included a ranking of the use of probability distributions to measure political risk, the use of cost of capital to adjust for business risk, the use of a risk-free rate for cost of capital, and ranking of other criteria to measure political risk.

CHAPTER THREE

THEORY AND GOALS OF THE DEVELOPING COUNTRY

3.1 THE CONCEPT OF RETAINED VALUE

Since many developing countries rely upon projects that produce primary commodities for exchange earnings and revenues, methods that can be used by developing countries to generate useful data on investment and policy development are important. A number of methods have been used to measure activity in exports, but the concept of retained value will be used here because of its flexibility and its ability to reflect the true nature of a project's influence on export trade on the economy. Retained value has been defined by Mikesell(1975) as

> that portion of gross revenues accruing to the host country in the form of taxes, dividends, payments to domestic shareholders, wages, salaries and fringe benefits, domestic purchases of goods and services, and other transfers to the domestic economy.

The convenience of this kind of measurement is that it is an expenditure model based upon available statistics. Four disadvantages to the concept of retained value are 1) it does not deduct from the "value-added" of the export industry inputs from other domestic industries, 2) it does not indicate how the government takes advantage

of the resources at its disposal, 3) it does not take into account the true costs or social costs of production, and 4) it does not take into account the timing of projects.

From the government's position, if social costs such as increased pollution from new projects are taken into account, retained value would be less than if social costs are not taken into account. On the other hand, retained value may be increased by increased employment and wages as a result of new investment. Policy decisions in this case would be at least partially influenced by economic and social priorities. In the case of a large integrated industry in a developing country, this disadvantage might not be given a high priority.

The first major use of the concept of retained value on the mining industry was by Reynolds (1965) who described it as "returned value." Returned value was used as an indicator of the effects of the copper industry on the Chilean economy and was considered by the author to be one of the most significant exogenous factors determining the level and rate of growth of gross national product.

Brodsky and Sampson (1980) further define the factors composing retained value in terms of a production function:

$$Q = f(Ld,Lf,Kd,Kf,Md,Mf,R),$$

where:

Q is equal to quantities produced;

L is equal to labor services (total wage and salary payments net of taxes paid to to the domestic government for the quantity Ld);

K is equal to capital services (payments made by the foreign firm in the form of interest on loans raised locally, Kf, and profits paid for domestic equity investment net of government taxes for Kd);

M is equal to intermediate inputs (only the valued-added component for domestic inputs, Md); and

R represents rent associated with the project, with d symbolizing domestic inputs and f symbolizing foreign inputs, respectively.

Rent payments are defined by the authors as the sum total of government revenues extracted for the right to exploit the natural resource. Rent was further subdivided into explicit and implicit components. The explicit component is composed of corporate taxes on profits by foreign companies, income taxes on foreign and domestic labor, taxes on income earned on loans raised domestically, and indirect taxes such as sales taxes. The implicit component is composed of revenues from sales of foreign currency at a discriminatory rate or from a general overvaluation of the currency. In this model, the authors

assumed for purposes of simplicity that there was no domestic consumption, that most of the commodity was exported in an unrefined state, and that marketing and extraction were controlled by foreign enterprises.

A general definition of retained value to be used in this thesis is

$$RV = Ld+Lf-Lfa+Kd+Md+T+Md,$$

where

RV is equal to retained value;

Ld is equal to gross wages paid to domestic labor;

Lf is equal to wages paid to expatriates;

Lfa is equal to wages paid to expatriates abroad;

Kd is equal to domestic capital payments including equity;

Md is equal to the payments to domestic inputs;

T is equal to the income taxes paid to the government; and

Md is import duties paid to the government.

Multiplier effects on increases in income from employment and government sources were not considered in this analysis because of the lack adequate data on the marginal propensity to consume, domestic spending and the corresponding change in equilibrium income and aggregate demand. The concept of discounting retained value over time

might be considered by governments in the evaluation of a project, but the determination of what discount rate to be used presents problems in the analysis. It can be argued that if a government uses a set of discount rates for the analysis of policies or nongovernment projects (as in the case of Papua New Guinea), the same set of discount rates should also be used in the determination of the effect of the project on the domestic economy.

Garnaut and Ross (1983b) suggest that public discount rates that governments might use could be expected to be lower than private discount rates used in natural resource projects. The authors further suggest that this may not be possible if the country cannot gain access to international markets because of insolvency or balance of payments problems which might indicate future insolvency. As a result of the complexity of the issue, the argument over what is the correct discount rate to use will not be discussed in this paper.

The use of retained value as a tool for policy changes by developing countries can be quite useful in defining the impact of a given project on the economy. Foreign exchange earning ability can be defined by the following equation which represents a subset of retained value:

$$RV2 = Ld + Kd + Md + R + Kf$$

As a result of highly volatile price fluctuations for most primary-commodity producing developing countries, the retained value component undergoes more severe fluctuations than the non-retained value components. Therefore, these countries try to stabilize those components of retained value to stimulate real growth in their economies.

Since in many primary commodity-producing developing countries, the export component of mining is disproportionately large with respect to gross domestic product and represents a major source of foreign exchange, the ratio of retained value per unit of exports to total value of exports and the ratio of retained value as a percentage of total exports could be used as economic indicators. These indicators, referred to as unit percentage of export, and percentage of total exports are expressed as

UPOE = Retained value per unit of exports per total value of exports

and

POE = Retained value per total value of exports

Caution should be taken in the use of these indicators if the final product contains appreciable imported components. In the case of the mineral industry, if the final product is a concentrate, this type of problem would not occur.

For the case studies analyzed in this thesis, the following indicators will be calculated to determine the impact on the domestic economy with the fiscal and investment codes currently in use for Papua New Guinea, Peru, and Chile:

1. Retained Value (RV)
2. Unit Percent of Export (UPOE)
3. Percent of Export (POE)

The use of several indicators was considered more applicable than one indicator as in the the case studies analyzed by Mikesell. This resulted in a better definition of the effects on the economy by mining projects in developing countries.

3.2 GOALS OF DEVELOPING COUNTRIES

Although there are differences between developing countries, economically, socially, and culturally, there tends to be a common denominator regarding their goals for growth and development. Many of the goals professed by governments cannot be proportionately benefited by the mining sector as a result of the unique nature of the extractive industry even though in many developing countries the mineral sector produces a significant portion of the foreign exchange earnings

available to the governments. Some goals are more easily achieved than others and have a greater impact on policy implementation. The concept of retained value can be used as a powerful tool in determining the overall impact of a new mining project on a local economy. Goals of developing governments can be quantified either as a whole or by component; therefore, if the size of the project is significant, retained value can play a role politically or economically in developing mineral policy.

Economic and social conditions play an important role in the definition of goals for developing countries. Gluschke and Varon (1980) define several conditions common to developing countries for Peru, Chile, and Papua New Guinea. These seven conditions are as follows:

1. A low level of per capita gross domestic product and per capita income. Limiting the purchasing power of the majority of the population, restricts markets for durables and capital goods, resulting in a lowered derived demand for minerals and metals. Also, with low capital formation, investment in the minerals sector is limited. It can be argued though that for Peru, Chile, and Papua New Guinea the funding required would be beyond the scope of a local, well developed market for the size of the deposits considered for development. Historically, the minerals industry has been

encouraged to supply a source of foreign exchange earnings through the export of most of the minerals produced. Also, at least in the case of Peru and Chile, there has been an established mineral sector that has functioned successfully for many years.

2. The presence of disparities between regions of the country and segments of the population is common in these countries. A reduction of these disparities is a common goal of developing countries.

3. The reduction in the illiteracy rate and an increase in social services.

4. The lack of physical infrastructure. In remote regions, the infrastructure required might not contribute significantly in the way of external benefits to the economy. In an undeveloped region, if the sole use anticipated for the infrastructure was for the project, benefits would accrue to the mine alone. The long-run effects of the infrastructure might generate some external benefits if it allowed for the development of future natural resources or local markets.

5. A low level of exploitation of natural resources. As a result of poorly trained personnel, and a lack of knowledge regarding potential resources, there tends to be a low level of resource exploitation.

6. The export of raw materials in either an unrefined state or unprocessed state. This results in less value added to the export, and less foreign exchange earnings.

7. The dependence on earnings from only a few primary commodities. As a result of the cyclical nature of commodity prices, development is slowed or curtailed as a result of lower export earnings. Chile, Papua New Guinea, and Peru have all been susceptible to this condition as a result of low copper prices.

Gluschke and Varon (1980) further mention a number of other goals or objectives for countries which are of a more general nature. The more important of these goals are 1) an increase in economic stability, 2) diversification of the economic structure so as not to rely upon one sector too heavily, 3) creation of employment, 4) reduction of dependence through the support of the production of food and other raw materials, and 5) strengthening of the public sector.

Peru's National Commission for Foreign Investment and Technology (CONITE) takes the following financial goals into consideration when evaluating requests for projects:

1. Increase in the creation of jobs
2. Development of the most backward regions of the country

3. Increase in the production of goods destined to satisfy the country's requirements
4. Selective substitution of imports
5. Development of the process of Andean integration

As a member of the Andean Pact, Peru also reviews projects with the following objectives:

1. Channeling of subregional savings and facilitation of projects involving shared interests
2. Strengthening subregional capacity in the areas of finance, technology, and competence in the markets of third countries
3. Generation of sources of occupation in the subregion

The goals and objectives of the government of Papua New Guinea have been described in the "Eight Point Improvement Plan," commonly referred to as the "Eight Aims" (1981). Important goals that pertain to the mineral sector are

1. A rapid increase in the proportion of the economy under the control of Papua New Guinean individuals and groups and in the proportion of personal and property income that goes to Papua New Guineans;

2. More equal distribution of economic benefits, including movement toward equalization of personal income and equalization of services;

3. A more self-reliant economy less dependent on

imported goods and better able to meet the needs of its people through local production;

4. An increase in capacity to meet government spending requirements from locally raised income; and

5. Government control and involvement in those sectors of the economy where control is necessary to assure the desired type of development.

In addition to these goals, the government of Papua New Guinea has expressed concern about inflation, infrastructure problems as a result of urbanization, and has undertaken promotional investment campaigns to encourage private sector activity.

Many of the goals professed by developing countries are extremely difficult to quantify; other methods had to be devised by investigators to quantify the value of projects on the economy. The major components of projects-- labor, capital, inputs, and tax revenues-- have been used to arrive at potential impacts on the economy through retained value of projects.

3.3 MACROECONOMIC IMPACT OF THE MINERAL SECTOR

The reasons for policy changes in developing countries vary with the perceived goals of governments. Changes in mineral policies can have long lasting effects on the

mineral sector. Therefore, a description of some of the theoretical aspects of macroeconomic impacts of the mineral sector on developing countries is presented to supplement the analysis of tax and investment codes.

Gillis (1978) states that the traditional models used to analyze developing country economies may not be appropriate for certain countries as a result of differing direct and indirect linkages, and other constraints. Factors that must be considered when describing the economies of Chile, Peru, and Papua New Guinea are as follows: First, the mining sector is a major earner of foreign exchange. These countries all rely heavily upon the natural resources available to them as a primary source of foreign exchange earnings and also rely heavily upon the import of intermediate goods as a result of poorly developed local industries. Second because as tax revenues provide a source of revenue to the government, these revenues can be used to affect distribution of income. Finally, in many developing countries, major mining development has been for metals that have experienced considerable price volatility. This volatility is reflected in fluctuations in retained value (RV) as mentioned above. As a result of the cyclical nature of the mining sector, government revenues from mining projects also produce undesirable fluctuations in the

economy.

Two aspects to be considered in this analysis are that 1) changes in the quantity of output result in changes in mining project revenue, and 2) changes in the price of output also result in changes in revenue. Gillis (1978) states that with increases in the quantity of output, there would be resulting changes in labor, materials, and energy purchased. This increases income flows to the mine owner and tax revenue to the government. On the other hand, where there is a change in the price of the output, this change would result in increased income to the mine owner and increased government tax revenues without increased use of inputs. With a progressive mineral tax, an increase in prices for output would cause an increase in revenues rather than an increase in output.

Inasmuch as a large part of government revenues tend to be used domestically, the increase in prices would have a larger impact on domestic aggregate demand than would an increase in output. With an increase in domestic prices, the values for POE and UPOE described earlier would decrease, reflecting a worsening in the terms of trade and foreign exchange earnings ability. One dampening effect of heavy foreign exchange borrowing by governments is that during times of increased foreign exchange earnings, there could

also be an increase in demand for foreign exchange. This is a result of the government's need to repay foreign loans. With the increase in the size of projects internationally since 1970 and the subsequent need for project financing or heavy debt requirements, developing countries which rely on the mining sector are faced with deteriorating terms of trade and foreign exchange earnings even with increases in output. One final effect of increased foreign exchange earnings is that there could also be an increased demand for consumable imports as a result of increased aggregate demand.

The determination of the impact of the mining sector on the economy is an important consideration in the policy. making process of developing countries. To this end, policy decisions that influence tax or investment structure must be evaluated to determine the potential for a significant increase or decrease in the size of the mining sector. And if there is a decrease in the mining sector, the cost to the government of this decrease must be considered.

In policy construction, governments generally have a reasonable grasp of the contribution of foreign exchange earnings of the mining sector but might not be aware of the sector's contribution to the overall economic welfare. Gillis (1978) presents a case for the Bolivian mining

sector and the supply of foreign exchange. An assumption in his analysis is that for most developing countries, the governments have little influence on the price of the commodity. This assumption allows one to express the supply of mining output measured in U.S. dollars net of direct mining imports as a positive function of the government's exchange rate. This relationship is shown in Figure 3-1. The area under the curve for any quantity of output to be a measure of total variable cost of producing that quantity of output. Figure 3-2 shows a similar relationship for other exports which generate foreign exchange. The elimination of the mining sector would free resources as measured by the area of Figure 3-1. This could result in an increase in the exchange rate that would stimulate production of other exports equal to the area ABCD. The author states that this area represents the incremental domestic resource cost of producing an additional U.S. dollar's worth of nonmining exports. The horizontal summation of both supply curves given in Figure 3-3 shows the potential loss to the economy should the mining sector be eliminated. With an increase in the exchange rate, there would be an induced increase in nonmining exports, and an increase in the price of imported goods. This increase in the price of imported goods would result in less imports being consumed. The loss to the

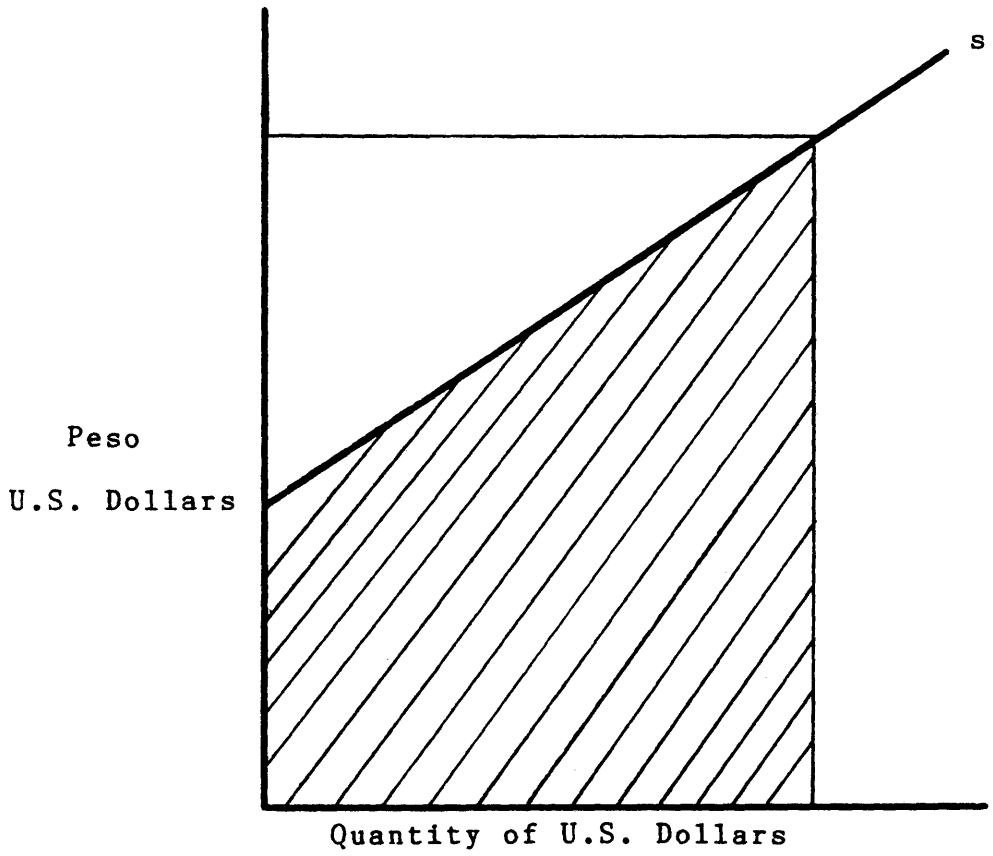


Figure 3-1
Supply of Mining Output

Source: Gillis, M. 1978. Taxation and Mining. Cambridge, Mass.: Ballinger Pub. Co. p. 84.

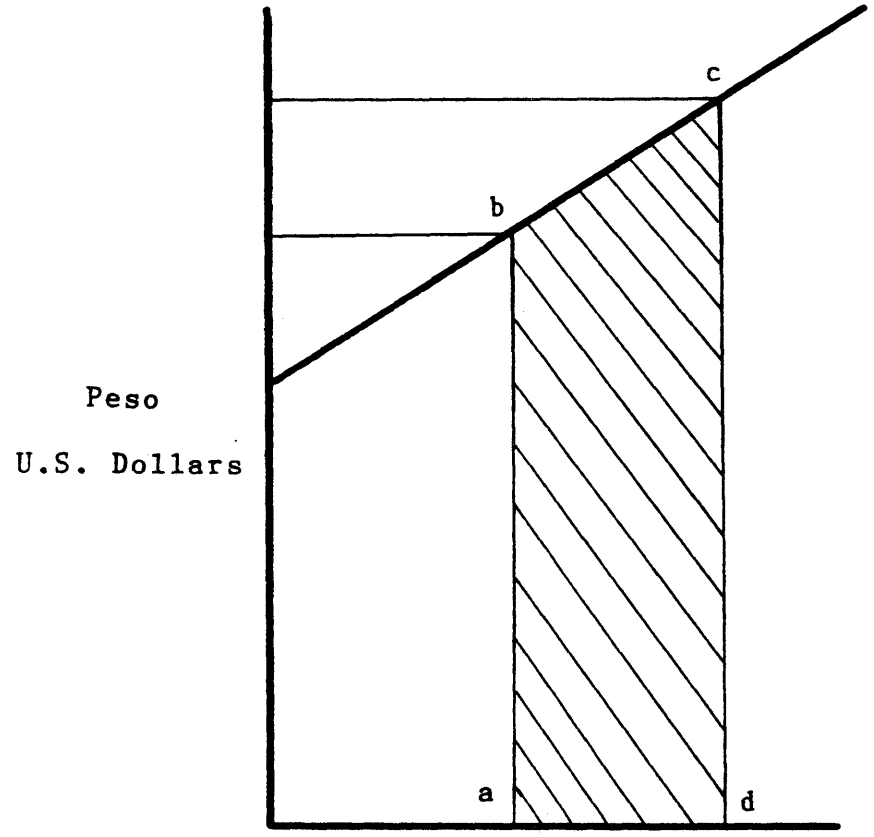


Figure 3-2
Supply of Foreign Exchange

Source: Gillis, M. 1978. Taxation and Mining. Cambridge, Mass.: Ballinger Pub. Co. p. 85.

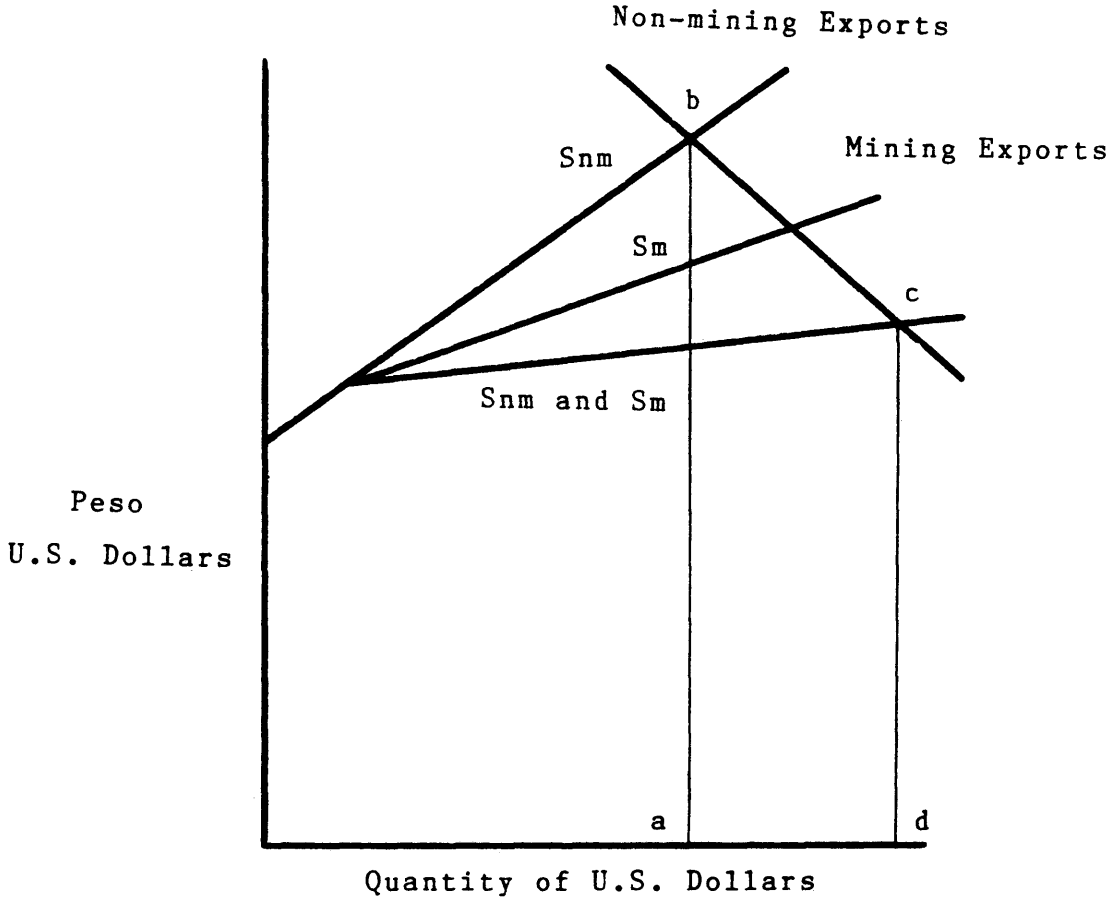


Figure 3-3
Loss To The Economy Of Mining Sector

Source: Gillis, M. 1978. Taxation and Mining. Cambridge, Mass.: Ballinger Pub. Co. p. 86.

economy through reduced consumption would be equal to the area ABCD in Figure 3-3.

CHAPTER FOUR

GOALS AND DECISION ANALYSIS OF THE FIRM

4.1 INTRODUCTION

As a result of variable international tax structures, the goals of the firm are important in the decision to invest abroad. So long as the goals of the firms are met, significantly different approaches to taxation may be acceptable to the firm. By defining a number of these goals in financial terms, the impact of differing tax structures will be measured in the case studies that follow.

The decision to invest in mining projects by U.S. firms has usually been the result of a number of factors, some of which are quantifiable; others are the result of business factors that are not readily quantifiable. In general, because of the complex nature of overseas investment, defining the actual point at which the decision is made is most difficult.

In some cases, because of business conditions, the actual decision to invest is made prior to an investigation of the details of the tax and investment codes applicable to the firm. Ahroni (1966) took a behavioral theory approach and considered this type of decision the result of initiating forces. The author states:

> the decision to look abroad is therefore undertaken as a result of a chain of events. Environmental forces, organizational factors, personal traits, and sheer accident are all blended in disrupting the balance of forces in the organization and bringing about such a decision.

For this chapter, material has been used from a number of sources, but primarily from Ahroni (1966), Kelly (1981), Garnaut and Ross (1983), Bugnion (1972), Nathanson (1968), and Bashivi (1979).

4.2 GOALS OF THE FIRM

4.2.1 Introduction

Primary reasons or motivations to invest abroad result from internal corporate pressures and a variety of market pressures. The following are the most important.

Outside submittals

The Bandwagon effect

Market loss

Competition from abroad

Growth and continuity of the firm

Lower costs, and increased profits

A variety of methods have evolved over time to rank overseas projects, but even though there is no firm and universal group of techniques used by all firms, the most important ranking techniques are

Payback period

Return on sales

Internal rate of return or discounted rate of return

Net present value

Contribution to earnings per share

4.2.2 Motivations For Foreign Investment

There are six major motivating forces that tend to influence the decision process of the firm to invest abroad. The first is outside proposals. These proposals come from a variety of sources, chiefly from distributors of the company's products, representatives of foreign governments, and representatives of other companies. If the proposal comes from a creditable source the decision to invest may be accelerated.

The second is the "bandwagon" effect. In this case Ahroni(1966) states:

> These cases, however, may be better classified as the "band wagon effect": imitating the commitments of a leader on the grounds that one is less vulnerable if his exposures are the same as those of his principal competitors.

Field research has shown that the bandwagon effect is a major factor and that businesses already there present an important source of information about foreign countries.

The third is the fear of losing a market. As new products are exported and gain acceptability, local

producers enter the market. This results in the buyers of the product becoming more price responsive. In order to prevent the loss of markets, the firm establishes overseas production. The choice of investing in this case is not between local and foreign operations, but rather the incurrence of a loss of a market or starting a project that would at least prevent a loss. While these reasons for investing applys more to export enterprises, an analogy can be drawn with mining by the fact that many mining firms have considered overseas investment because of the competition for scarce, high grade, low-cost deposits.

A fourth reason for investment is strong competition from abroad. This relates to the competition for scarce mineral deposits. U.S. mining firms continue to find it hard to compete with the terms offered by Japanese and other foreign mining firms. Firms are motivated to invest overseas as a result of the potential for increased volume of sales, increased market share, and increased earnings-to-share ratios, as well as for the opportunity to obtain economies of scale overseas.

The fifth reason, growth and continuity of the firm is, in essence, the transfer of established techniques from other projects to develop a broader economic base for the firm and establish longevity. The foreign firm could use to

its benefit previously successful techniques to other projects. These techniques include special marketing skills, managerial skills, access to capital markets, and economies of scale. Capitalization of know-how and spreading fixed costs increases the growth of the firm. Furthermore, know-how, in the form of patents and designs, can be depreciated, and as a result, a firm could acquire a share of profit proportionately larger than its investment. Ahroni (1966) describes a case in which a firm agreed to participate in a foreign project financed by a loan for 15% of the equity as a consideration for its know-how.

Last, but not least, many developing countries may have lower production costs, thus increasing the profits of the mining firm.

4.3 RANKING TECHNIQUES FOR FOREIGN INVESTMENTS

4.3.1 Technical Approaches To Evaluation

Normative theories of direct foreign investment have been discussed by a number of authors with interesting results. Stonehill and Nathanson (1968) concluded that long-run profit maximization was not an important goal in the decision making of foreign investment.

Financial measurements that will be used to compare tax structures have been examined in part by Stonehill and

Nathanson (1968). The authors recommended that 1) the parent company should discount cash flows by the weighted average cost of capital under the firm's optimal capital structure; 2) incremental cash inflow from the viewpoint of the parent should include dividends, know-how payments, interest and loan repayments, export profits, any intangible gains, and the "cash out" value of the subsidiary over the time horizon for capital budgeting so as to reflect the value of the reinvested earnings; 3) the incremental cash flow from the viewpoint of the subsidiary should include net earnings after local taxes but before depreciation, interest, and "know-how" payments (cash outflow should be the original investment in assets); and 4) the foreign subsidiary should make allowance for political and foreign exchange uncertainty by charging the cash flows to account for uncertainty. The cost and methods of the type of program would depend upon the program the parent has undertaken. Since this form of discounting does not show uniformity in the industry, there will be no discounting for political risk in the case studies to be examined. Some form of discounting should be kept in mind, though, when examining projects of firms. Bugnion (1972), in an article on capital budgeting and the international firm, modified a capital-budgeting model to fit international conditions

including differing political and economic structures and the financial differences between the parent and the subsidiary. In this model the decision to invest was carried out at the parent firm's office to take into account the worldwide effects of taxation after consolidation.

The method considered was 1) to rank each project of each subsidiary in order of increasing cost in order to define the capital supply function of the subsidiary, 2) to rank the financing of the projects, 3) to calculate the net rate of return of each project by deducting from its rate of return the cost of the funds required for the project's financing, and 4) to rank all projects in order of decreasing net rate of return.

This approach to choosing which project to invest in has a number of drawbacks in that it does not adequately take into account the risk preferences of the investor, but it can be modified to account for the perceived risk present in each project.

Five methods suggested for the analysis of foreign investments are the following:

1. Cash flows should be evaluated from either the parent's or the subsidiary's perspective so long as the underlying assumptions are satisfied.
2. Discounted cash flow methods should be used in the

analysis of the project's cash flows.

3. If possible indirect benefits from foreign projects should be measured with cash flows from the project, as these benefits could have tangible benefits at a later date to the parent and the subsidiary.
4. The range of risk variables to be used for project evaluation should include probability analysis, sensitivity analysis, simulation models, and decision tree analysis.
5. The allowance for risk should be done by calculating equivalent risk-free cash flows or using risk-adjusted discount rates to reflect uncertainty of the cash flow streams of the proposed project.

4.3.2 Behavioral Approaches To Evaluation

Garnaut and Ross (1983) used a behavioral approach for the determination of investment decisions of the firm. The authors used a discount rate (a minimum acceptable rate of return) that would give a zero expected net present value to a mineral investment that was just marginally acceptable to define the supply price of investment.

The supply price as described by the authors for any project could be determined by the expected returns of other projects in the industry as well as by the scarcity of expertise or any other entry requirements of the industry.

Expected returns in this case might be inferred in terms of rate of return based upon cash flow. Uncertainty was considered to be a major controlling factor in project selection and, though the firm does not know the true value of the deposit prior to mining, the firm is forced to determine prior to development the maximum price it is willing to pay. As a result of the risk-averse nature of the firm, the firm will tend to discount the price of the deposit (net present value) below the expected value of the deposit. In their analysis, the authors based their theory on the fact that investors will respond to risk by adding a premium to the discount rate for risk-free projects.

In the decision process, the objectives of three groups that must be taken into consideration are the bankers, equity-holders, and the management. The behavior of bankers tends towards what the authors refer to as total risk aversion. This approach, as a result of risk, results in the need for a short pay-back period. Because of the need to avoid risk, early stage exploration must be financed from other source such as cash flow. As only smaller projects can be financed in this fashion, the requirements imposed by bankers are more likely to impact large investments and large firms rather than smaller projects and smaller firms. Where losses from large projects could threaten the

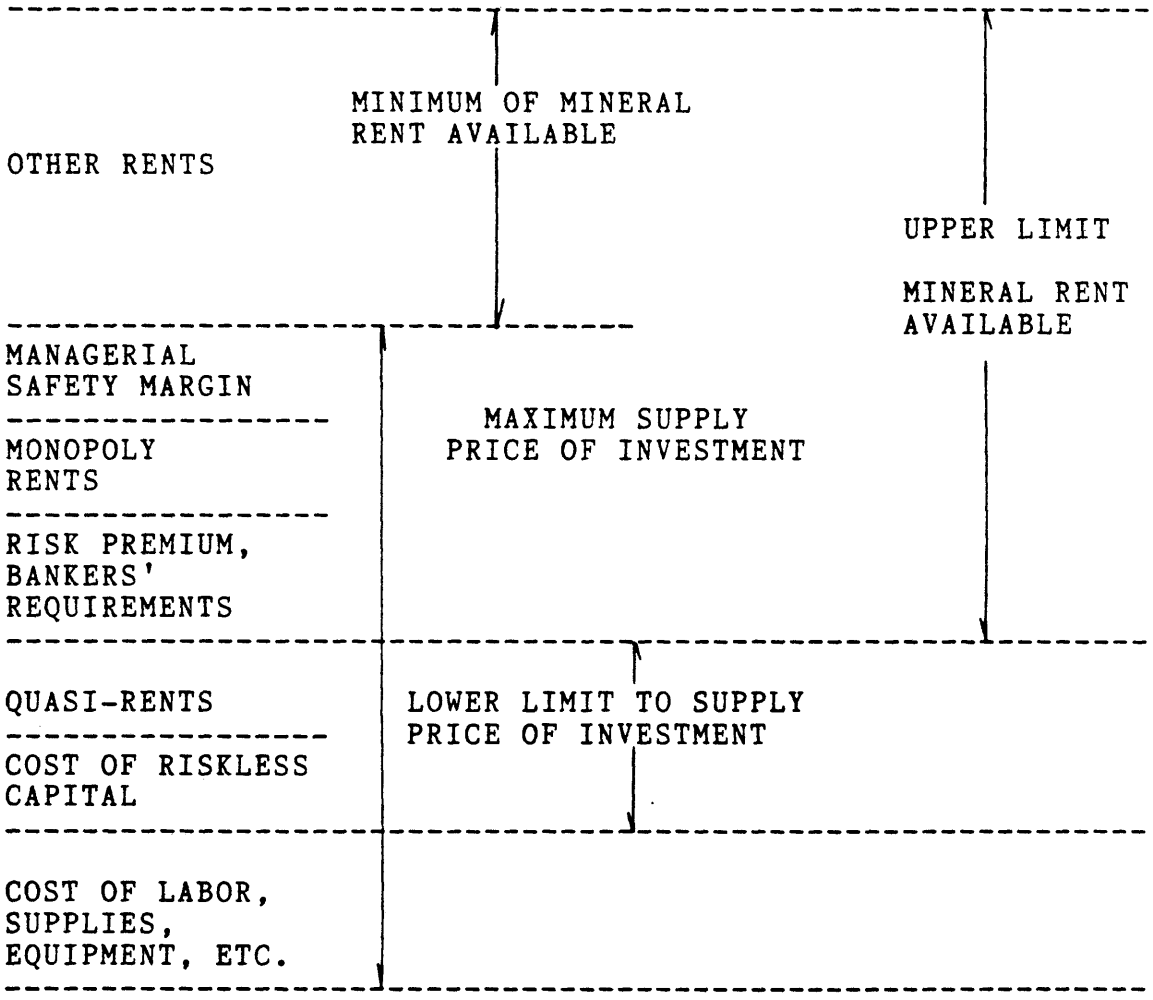
existence of the firm, risk premiums may be higher for larger projects than for smaller projects. These risk premiums may result in unacceptable rates and result in the cancelation of the project. Higher risk premiums are the result of the potential diversification of risk by the firm.

The second group, equity-holders, apply a premium for risk to the expected rate of return than they otherwise would. It was also mentioned that miners claim that those who invest in mining place a heavy emphasis on the risk premium approach.

Finally, the approach taken by managers is that of including safety margins between the minimum expected returns they require in advance and the returns they will find acceptable after the fact. Furthermore, the authors suggest that the safety margin for a project will tend to increase the greater the risk of the project. In this scenario, the treatment of risk is similar to the bankers' approach, but does not necessarily include the concept of short pay-back period.

Behavioral theory indicates that managers may not consciously make their decisions, but may act as if rules were applied. One further source of additional premiums is know-how and can be considered a form of rent. Table 4-1 shows the full relationship of the various forms of risk

Table 4-1
Mineral Rents



Source: Garnaut, R. and A.C.Ross. 1983. Taxation of Mineral Rents. Oxford: Clarendon Press. p. 342.

and their relationship to the supply price of investment.

Garnaut and Ross (1983) state that the actual price of investment used by mining firms in the 1960s when interest rates and inflationary expectations were low was approximately 15% in the evaluation of risky, large-scale mining projects in developing countries which represents a real rate of return of over 10% over prime long-term interest rates. By the mid 1970s this discount rate rose to 20% or 10% premium over the prime long-term lending rates. Table 4-2 presents typical hurdle rates used by large mining firms.

In the evaluation of projects, managers of firms consider stability important in the determination of the correct discount rate for evaluating cash flows. If methods could be devised to reduce instability, risk expectations would be reduced and more projects could be developed as a result of the use of lower discount rates considered for financial analysis. Very successful after-tax outcomes for investors could most likely result in changes in the fiscal regimes of countries so as to capture more of the rent of the project. Fiscal regimes that compress the probabilty distribution of after-tax outcomes are more likely to be stable over time and would be more likely to be seen as stable over time.

Table 4-2
Hurdle Rates For Large Mining Firms

COUNTRY OF INVESTMENT	CURRENT TERMS IRR* RANGE**	MID-POINT	CONSTANT TERMS IRR RANGE	MID-POINT
U.S.A.	14 - 18%	16.0%	3.6 - 7.3%	5.5%
AUSTRALIA, CANADA	16 - 23	19.5	5.5 - 11.8	8.6
STABLE DEVELOPING	22 - 28	25.0	10.9 - 16.4	13.6
LESS STABLE DEVELOPING	25 - 32	28.5	13.6 - 20.0	16.8

* Inflation Rate: 10 Percent
** For the Majority of MNCS; some MNCS have hurdle rates above those shown. values shown are for late 1970s.

Source: Johnson, C.J. 1981. "Taking the Take But Not The Risk". Materials and Society. Vol.5. No.4. pp. 455-469.

Sovereign risk is reduced by government equity investment because of the knowledge of the intentions of the government. This would tend to give the investor greater confidence and lower the supply price of investment.

One significant method of gaining a percentage of the equity of a project is by providing the infrastructure requirements of a project. These requirements could be provided by low-interest loans from sources such as the World Bank. This form of purchase would not affect the distribution of probable outcomes of the projects and would provide a method of capturing a portion of the rent, it would also transfer some of the risk of the project onto the government.

4.3.3 Questionnaires And Data Generation

To determine what methods were used to analyze foreign projects by firms, Kelly (1981) sent a questionnaire to more than 200 manufacturers. Of these, 108 firms responded. Table 4-3 shows the main objectives of firms undertaking foreign investment. The results show that increasing profits are a significant factor, but several other factors are very important in the decision as well. Table 4-4 gives a more detailed breakdown of the various reasons for investing in foreign projects. Again, as in Table 4-3, the respondents show a number of reasons for investing.

Table 4-3
Reasons For Foreign Investment

MOST RECENT INVESTMENT BY FIRM (PERCENT) *	INVESTMENT TODAY (PERCENT)**	OBJECTIVE
43.8	43.8	INCREASE MARKET SHARE
51.4	49.5	INCREASE GROWTH
74.3	80.0	INCREASE PROFITS
14.3	19.0	DECREASE PRODUCTION COSTS
9.5	9.5	DECREASE RISK THROUGH GEOGRAPHIC DIVERSIFICATION

* Last Investment overseas - percent responding, objective considered significant
** If investment made today - percent responding, objective considered significant

Source: Kelly, M.W. 1981. Foreign Investment Evaluation Practices of U.S. Multinational Corporations. Research for Business Decision No 40. Ann Arbor: UMI Research Press. p. 232.

Table 4-4
Motivations For Foreign Investment

MOST RECENT INVESTMENT BY FIRM (PERCENT)*	INVESTMENT TODAY (PERCENT)**	SPECIFIC REASON
26.7	25.7	GAIN ECONOMIES OF SCALE
13.3	11.4	LOWER WAGE COSTS
19.0	24.8	RESPOND TO GOVERNMENT PRESSURES TO PRODUCE LOCALLY
21.0	24.8	TAKE ADVANTAGE OF GOVERNMENT INCENTIVES
27.6	31.4	OVERCOME TARIFF BARRIERS
20.0	18.1	FOLLOW CUSTOMER
8.6	14.3	FEAR OF LOSING EXPORT MARKET
20.0	18.1	MARKET POTENTIAL
16.2	20.0	OTHER

* Most recent investment overseas - percent responding, reason considered significant
** If investment made today - percent responding, reason considered significant

Source: Kelly, M.W. 1981. Foreign Investment Evaluation Practices of U.S. Multinational Corporations. Research for Business Decisions No 40. Ann Arbor: UMI Research Press. p. 232.

A component of the survey included a question that defined at what point income was measured. The result of this question is presented in Table 4-5. In this case measuring income after foreign taxes and all cash inflows to the parent after foreign and domestic taxes rank high in the determination to invest. The consolidation of accounts for foreign operations are important in the eyes of the investor in the evaluation stage and will be used in the case studies that follow. Finally, the firms questioned were asked to rank the various financial methods by levels of importance, the results of which are given in Table 4-6.

4.4 SUMMARY AND APPLICATION

For the case studies the following criteria will be used to determine the impact of taxation on the firm with the most current investment and tax codes of Papua New Guinea, Peru, and Chile:

Payback Period

Net Present Value

Discounted Rate of Return

Operating Costs

Capital Costs

Table 4-5
Methods of Determining Income From
Foreign Investments

MOST RECENT INVESTMENT BY FIRM (PERCENT)*	INVESTMENT TODAY (PERCENT) **	MEASURE OF INCOME
58.1	53.3	ALL EARNINGS AFTER FOREIGN TAXES
15.2	21.9	ALL EARNINGS AFTER FOREIGN TAXES AVAILABLE FOR REPATRIATION
41.0	43.8	ALL CASH INFLOWS TO PARENT AFTER FOREIGN AND DOMESTIC TAXES
31.4	35.2	ALL CASH FLOWS TO PARENT PLUS REINVESTED EARNINGS ADJUSTED FOR FOREIGN AND DOMESTIC TAXES
6.7	6.7	ALL CASH INFLOWS TO PARENT PLUS REINVESTED EARNINGS ADJUSTED FOR FOREIGN TAXES ONLY
4.8	4.8	OTHER

* Most recent investment overseas - percent responding, measure considered significant
** If investment made today - percent responding, measure considered significant

Source: Kelly, M.W. 1981. Foreign Investment Evaluation Practices of U.S. Multinational Corporations. Research for Business Decisions No 40. Ann Arbor: UMI Research Press. p. 232.

Table 4-6
Financial Methods for Evaluating

FINANCIAL CRITERIA	RATING				
	NOT IMPORTANT		IMPORTANT		VERY IMPORTANT
	1	2	3	4	5
PAYBACK					
MOST RECENT *	20.0	9.5	21.9	26.7	21.9
TODAY **	19.0	11.4	22.9	24.8	21.9
ACCOUNTING ROI					
MOST RECENT *	24.8	16.2	16.2	11.4	31.4
TODAY **	23.8	17.1	14.3	13.3	31.4
RETURN ON SALES					
MOST RECENT *	54.3	14.3	14.3	10.5	6.7
TODAY **	53.3	12.4	10.2	9.5	8.6
INTERNAL RATE OF RETURN					
MOST RECENT *	29.5	6.7	6.7	14.3	41.9
TODAY **	28.6	4.8	5.7	14.3	46.7
NET PRESENT VALUE					
MOST RECENT *	52.4	4.8	18.1	9.5	15.2
TODAY **	50.5	5.7	16.2	14.3	13.3
CONTRIBUTION TO EPS					
MOST RECENT *	33.3	15.2	16.2	20.0	15.2
TODAY **	32.4	13.3	16.2	20.0	18.1

* Most recent investment overseas - percent responding, measure considered significant
** If investment made today - percent responding, measure considered significant

Source: Kelly,M.W. 1981. Foreign Investment Evaluation Practices of U.S. Multinational Corporations. Research for Business Decisions No 40. Ann Arbor: UMI Research Press. p. 232.

CHAPTER FIVE

MINING AND INVESTMENT CODES OF PAPUA NEW GUINEA

5.1 INTRODUCTION

Papua New Guinea represents a unique case in mineral taxation in that the government has instituted a resource rent tax system. This tax system incorporates not only flexibility for the mining company and the government, but allows for the capture of some of the high profits from successful operations. This chapter will present the basic structure of Papua New Guinea's tax and investment codes that will1 be incorporated in this thesis to simulate cash flows and retained value.

5.2 GENERAL BACKGROUND

Papua New Guinea (PNG) lies within the southern tropics and comprises the eastern half of the island of New Guinea and numerous other islands. PNG has an established mining sector which historically has contributed a significant percentage of the gross domestic product and export earnings (approximately 26 percent of GDP and 40 percent of gross export earnings in 1980).

The Panguna copper mine on Bougainville Island, the tenth largest producer in the world, and the recent OK

Tedi copper-gold mine, now under construction, represent a major component of the country's mining sector. As a result of the isolated nature of these projects, infrastructure such as roads and housing has presented a major obstacle in the development of mining projects. Therefore, government assistance in establishment of these infrastructure requirements has had a limited effect on employment and other industries. The official policy towards foreign investment has been to encourage foreign investment in the mining sector. The government has taken a selective approach to foreign investment where projects must pass the scrutiny of the government and may be rejected as undesirable. This method of screening allows the government to judge beforehand which industries are open to investment and to determine how these investments fit in a national investment priorities schedule.

5.3 NATIONAL MINING CODE

In Papua New Guinea, mineral rights are retained by the government. Exploration for mineral deposits requires authorization by the Ministry of Minerals and Energy for time periods up to two years, with renewals dependent upon successful completion of exploration programs. Upon the completion of exploration and the location of a commercially

viable ore body, a special mining lease is negotiated with the government which is subject to certain terms and conditions in an accompanying agreement. General or standard clauses in mining agreements include terms on currency, import/export taxes, and local charges. A more detailed breakdown of these clauses is given in Figure 5-1.

Pollution control clauses are considered important to the government. As part of the OK Tedi agreement, the government required a detailed environmental impact study to be completed before the start of mining and milling, the submittal of a detailed pollution control program, and the potential compensation for any damage resulting from its operation.

Negotiated clauses are an important component in mining agreements and provide clear requirements for infrastucture. Infrastructure is usually the responsibility of the firm, but should the government consider the infrastructure significant to the local economy, the government could provide infrastructure either for a user fee or for equity equal to cost of the infrastructure construction.

5.4 TAX CODES

Taxable income in PNG is calculated on the difference between a firm's gross revenue and allowable deductions.

I. CURRENCY CLAUSES:

Government guarantees:

Convertibility of the Kina (PNG's currency) for the following purposes:

- The provision of foreign exchange to allow efficient operation of the mine;
- Repayment of interest and principal on foreign loans; and
- Remittance of dividends abroad.

Additionally, the government can provide contractural guarantees allowing the investor to retain proceeds of exports overseas for three months for the above mentioned purposes.

II. IMPORT/EXPORT TAXES:

The government can guarantee against the imposition of an export tax on copper products. Duty rate for imported inputs for copper mining projects are guaranteed to be never in excess of the average rate applied to a wide range of production inputs in general.

III. LOCAL CHARGES:

The government insures that all local charges will be applied in a nondiscriminatory manner and the protection of property improvements constructed by mining investors from land tax.

Source: Golder Associates. 1980. Country Profile, Papua New Guinea. U.S. Bureau of Mines Minerals Availability System.

Figure 5-1

Clauses in Mining Agreement

For the purposes of tax calculations, gross revenue includes interest, royalties, fees for services, and dividends. Special deductions are allowed for mining firms which can be broken into exploration expenditures, capital expenditures, provisions for accelerated depreciation, and deductions for new equipment after operation. These categories are described in detail below:

1. Exploration Expenditures

Exploration expenditures incurred within eleven years before the granting of a special mining lease and during the period between the granting of the lease and the initiation of production becomes deductible at a rate of one-fifth of the residual cost each year beginning in the year in which income is first derived from the mine.

2. Capital Expenditures

Capital expenditure on the development of a mine is deductible at the rate of the greater of one-tenth of the residual cost each year, and an installment based on the estimated life of the mine.

3. Accelerated Depreciation

During the initial years of operation of the mine, a deduction for accelerated depreciation at a rate of twenty-five percent of the investment is applicable if the mine has a profit of less than twenty-five percent of the

investment. This deduction reduces the tax payable and therefore increases the profitability which allows the early retirement of loans. This deduction is available during the investment recovery period (the period up to and including the year of income in which the taxpayer's total income first exceeds the initial capital investment). Once the firm has recovered its inital capital investment the deduction reverts to a ten percent rate.

4. New Equipment Deductions

After operation of the mine a deduction is available at a rate of twenty-five percent of the cost of new equipment in the year it is installed.

5. Other Deductions

Other deductions available are interest charges, realistic management fees paid to the parent firm, royalties, losses from prior years which may be carried forward for up to 7 years, and depreciation calculated by straight-line or diminishing balance methods. A summary of depreciation rates for certain types of assets are listed in Table 5-1.

The tax structure for corporations can be divided into two main categories: resource rent tax on production and other taxes and duties.

The resource rent tax concept was derived from the

Table 5-1
Depreciation Rates

TYPE OF ASSET	PERCENTAGE ALLOWABLE	
	PRIME COST	DIMINISHING VALUE METHOD
1.FIXED ASSETS NORMALLY USED		
BY FIRMS:		
OFFICE BUILDINGS		
BRICK, STONE, AND CONCRETE	2	3
WOOD, IRON, AND FIBRO	3	4 1/2
BUILDINGS FOR STORAGE		
STEEL FRAMED	4	6
WOODEN FRAMED	7 1/2	11 1/2
OFFICE MACHINES AND EQUIPMENT	10	15
TRANSPORTATION		
MOTOR VEHICLES	20	30
TRAILERS	15	22 1/2
2.MACHINERY AND EQUIPMENT:		
BUILDING INDUSTRY		
EARTHMOVING PLANT	20	30
CONCRETE MIXERS	15	22 1/2
CRANES	10	15
POWER TOOLS	20	30

Source: Golder Associates. 1980. Country Profile, Papua New Guinea. U.S.Bureau of Mines Minerals Availability System.

renegotiated Bougainville mining agreement when it was felt that too much in the way of windfall profits were being made by the mining firm and too little was being retained by the government in the way of royalties and taxes. The basic structure of this resource rent tax is that once the firm has recaptured its initial investment plus twenty percent per annum on that investment, or if the firm chooses, a return calculated at the U.S. prime rate plus twelve percent, or ten percent above the U.S. prime corporate borrowing rate, additional tax is imposed at a rate equivilent to the difference between the normal rate and seventy percent. There are two ways of calculating the tax burden.

1. Total taxable income is taxed at normal corporate tax rates, and income in excess of that which produces the permitted basic return is then taxed at seventy percent minus the normal corporate tax rate (presently thirty-six and one-half percent for firms incorporated in PNG and fourty-eight percent for foreign companies).

2. Taxable income which produces the permitted basis return is taxed at thirty-six and one-half percent, and the excess is taxed at seventy percent.

Additional taxes imposed by the government can be grouped as withholding taxes, royalties, and import duties.

A description of these taxes follows.

Withholding Tax

Any dividends paid by resident companies in PNG are subject to a withholding tax of fifteen percent whether the dividend is paid to a resident of PNG or to a foreign shareholder. A resident company is allowed a rebate on the tax payable where dividends are included in the firm's assessable income. Two rules apply to the crediting of rebates: 1) a resident public company is entitled to a refund of withholding tax on dividends if the dividends are passed on to shareholders in the same income year, and 2) resident private company is entitled to a refund of withholding tax on dividends to shareholders within seven years of the year of income in which the dividends are derived.

Royalties

An ad valorem royalty tax of one and one-quarter percent of the FOB revenue is assessed from the sale of minerals. From this royalty, the provincial governments each have the right to receive payment from the national government equivalent to one and one-quarter percent of the value of all exports from their province, or the value of royalties on the exports, whichever is greater. Of this one and one-quarter percent, the traditional landowners have

the right to receive five percent of the royalty from the mining operation.

Import Duties

Import duty is two and one-half percent of the value of goods landing in PNG. There are certain exemptions on foods and medical and educational supplies.

5.5 TAXATION SUMMARY

For this thesis the procedures outlined in Table 5-2 will be used in computing cash flows and performing simulations.

Table 5-2
Cash Flow Calculation Summary

GROSS REVENUES

- OPERATING COST
- DEPRECIATION
- EXPLORATION (1/5 PER YEAR)
- DEVELOPMENT (1/10 PER YEAR)
- INTEREST
- LOSS FORWARD

= SUBTOTAL

- TAX (35%)

= SUBTOTAL

- RESOURCE RENT TAX (35%- AFTER RECOVERY)

= SUBTOTAL

+ DEPRECIATION
+ EXPLORATION COSTS
+ PRE-PRODUCTION DEVELOPMENT COSTS
+ LOSS FORWARD
- PRINCIPAL PAYMENTS

= NET CASH FLOW

CHAPTER SIX

MINING AND INVESTMENT CODES OF PERU

6.1 INTRODUCTION

In order to draw comparisons between the tax and investment codes of Peru, Chile, and Papua New Guinea, this chapter presents the components of the Peruvian tax and investment codes that will be used in this thesis.

Peru's codes are more similar in nature to Chile's codes than are Papua New Guinea's, but the Peruvian codes still incorporate significant differences to increase retained value and to increase the amount of domestic control in mineral projects.

6.2 GENERAL BACKGROUND

Peru's mineral industry is dominated by large-scale copper production and has been a major contributor to foreign exchange in the last five to ten years. Recent estimates of the mineral industry show that up to 13 metals and 25 nonmetallic minerals are being mined. Exploration has determined vast, untapped reserves awaiting development and financing which could significantly contribute further to foreign exchange earnings. (As of 1981, only 5 percent of the total reserves were being developed which accounted

for 43.4 percent of exports.)

The major state-owned mining firms, Mineroperu, Centromin, Hierroperu, and Southern Peru Copper Corporation, a consortium company composed of ASARCO, Phelps-Dodge, Newmont, and Cerro Marmon, account for two-thirds of Peru's copper output and employ 40 percent of the mining community.

As a result of the high foreign exchange earning ability of the mining sector, the government has placed a high priority on the development of its mineral sector. With the installation of a military government in 1968, the mineral industry has seen a reversal of a policy of "Peruvianisation" of the mineral sector to a more favorable policy to foreign participation in new or expanding projects.

6.2 NATIONAL MINING CODE

In Peru, mineral substances of all kinds in or under soil of national territory are governed by the General Mining Law and belong to the state. Minerals cannot be alienated or aquired by adverse possession. Mining or exploration within Peru is done either directly by the state or through the granting of concessions to national or foreign persons.

Concessions are divided into subcategories of exploration, exploitation, processing, refining, general works, and

transportation.

Exploration concessions are indivisible and may range from 1 to 1,000 hectares, are rectangular in shape with the sides not exceeding a one to ten ratio. Exploration concessions are granted for five years and can be converted into an exploitation concession at any time. Fees for exploitation concessions are a 4 percent of a Tributary Unit (U.I.T) for registration rights, a fee of 0.025 percent of a U.I.T. per hectare or fraction of hectare. Minimum annual investments for the concession are 0.30 percent of U.I.T in the second year, 0.45 percent of U.I.T in the third year, 0.60 percent of U.I.T in the fourth year, and 0.75 of U.I.T in the fifth year.

Exploitation concessions are granted by the government for an indefinite period of time, but exploitation must commence within five years with some exceptions. Fees for the concession are 0.025 percent of U.I.T. per hectare and 4 percent of U.I.T. for registration rights. To prevent the tying up of land, the General Mining Law stipulates a minimum production rate calculated from total reserves. These rates are given in Table 6-1 for non-ferrous metallic minerals.

Processing concession or refining fees are at a rate of 4 percent of U.I.T. for registration rights and a fee de-

pendent on capacity of production: 0.5 percent of U.I.T. if less than 350 tonnes per day, 1.5 percent of U.I.T. if between 350 and 1,000 tonnes per day, and 2 percent of U.I.T. if over 5,000 tonnes per day.

Table 6-1
Minimum Production Rates

ORE RESERVES (MILLION OF TONNES)	MINIMUM PRODUCTION PER YEAR ('000 TONNES OF ORE)
LESS THAN 10	1/15 OF RESERVES
10 - 20	1/20 OF RESERVES
20 - 50	1/30 OF RESERVES
50 - 100	1/40 OF RESERVES
100 OR MORE	1/60 OF RESERVES

Source: Martindale-Hubble, Inc. 1984. Martindale-Hubbell Law Directory. Vol.7. 116th Edition.

General work and transportation of mineral concessions must pay 4 percent of U.I.T. for registration rights and 0.003 percent of U.I.T. for each lineal meter of projected work.

6.4 TAX CODES

6.4.1 Tax Structure

Under Peruvian law, jurdical persons are subject to taxation. This group includes corporations organized in Peru, limited partnerships, cooperative societies, public corporations, mining and petroleum corporations, mining communties in relation to their nonexempted income, and foreign societies and their branches or agencies of any kind receiving Peruvian income. Also, jurdical persons organized in Peru, and branches and agencies in Peru of foreign concerns are considered residents for tax purposes.

Under Peruvian law, gross income is defined as all taxable income. Depreciation can be deducted from cost whenever a property involved is subject to depreciation. Net income is considered gross income minus all necessary expenses allowed for by the Law.

Three basic categories of tax that are applicable to foreign mining firms are described below:

Income From Dividends And Interest

Under Peruvian law, any distribution, either in cash or in kind, even if the funds are not subject to tax are deemed as dividends. If these dividends are issued as a result of revaluation of capital assets, taxation applies only to the amount exceeding the permissable limit on revaluation, without prejudice to the applicable tax to the corporation when the assets are sold. Any distribution from

industrial and commercial profits not taxed subsequently is considered a dividend. Taxes on dividends are paid through a withholding tax. If these dividends are received by a jurdical person, these dividends are not computed as taxable income, but the withholdings constitute credits on behalf of their shareholders.

Industrial And Commercial Profits

This category includes income from mining firms and other extractive industries. If a corporation distributes dividends in kind, with the exception of its own shares, the difference between the market value and the applicable basis of the distribution is considered profit or loss to the corporation.

Workers Participation

Workers may choose one of two systems of sharing of profits and assets of a corporation. The differences between the two systems are given below:

System I:

1. Ten percent of the profits to be distributed among full-time permanent and temporary employees in proporation to the days worked in the corresponding fiscal year.

2. Thirteen and one half percent of profits to the issuance of labor shares that would be distributed as individual property to workers in proportion to the number

of days worked in the corresponding fiscal year, until these shares represent 50 percent of the corporation's capital stock; and

3. One and one half percent of the profits are allocated for administering the requirements of the Industrial Community.

System II:

1. Seventeen percent of the profits to be distributed to full time permanent or temporary employees in proportion to the days worked in the corresponding fiscal year.

2. The participation in management by electing representatives in proportion to 20 percent of the board of directors.

3. The right to redeem labor shares over a ten-year period with a minimum of 10 percent per year only if the shares were the property of the workers acquired by their own right.

Deductions allowable from gross income are numerous and include normal business expenses, insurance premiums, losses derived from acts of God, business organization expenses, taxes assessed on profit-producing activities, amounts assigned to reserves and deductions ordered by the Superintendency of Banking and Insurance, salaries and renumeration of board members up to 6 percent of net

profits, and finally, depreciation of fixed assets and losses of goods providing they are duly proven.

6.4.2 Deductions and Incentives

Depreciation

Owners of operations are allowed to depreciate at a rate of 100 percent for investments of equipment, machinery, housing, and installation up to an annual amount equal to 300 U.I.T.'s. Major investments up to 900 U.I.T.'s are allowed to be depreciated at an annual rate of 20 percent except in cases where higher rates are allowed. Mining companies are also allowed to revalue the non-depreciated balance when the value of the sole has fluctuated by more than 5 percent. This revaluation is also tax exempt.

Government Guarantees

Through executive power, the government may guarantee by contract tax stability for periods of time to holders of mining concessions to obtain output of 350 tonnes to 5,000 tonnes per day as well as special depreciation rates, revaluation of assets, free capitalization, and free disposability of foreign exchange originated by sale of their products. Guarantee contracts are written for a period sufficient for recovery of investment based on gross profits less income tax and contributions.

Reinvestment

Firms are allowed to reinvest profits in the same project or other mining activities within Peru. Reinvestment of profits may be exempt from tax under certain circumstances.

Special Mining Concerns

When the state participates in a mineral venture with at least 25 percent of the capital of the organization, the organization is considered a "special mining concern". In this case state participation is carried out through the Mining Corporation of Peru. Executive power may grant benefits and warranties to special mining concerns. Under the current tax law, special mining concerns are tax exempt for ten years, except for certain registration rights fees.

Tax Credits

Taxpayers can deduct in their returns withholdings, taxes on salaries, transfer taxes, and advance payments and credits against their tax liability.

Other Special Treatment

Current tax law grants exemptions from income tax on commercial or industrial profits and a complementary fixed-rate tax for a period of 10 years, which can be extended for up to 15 years. Customs and other taxes on the importation of equipment for extractive, agricultural,

cattle, and forest industries established in the region of La Selva are exempt.

6.4.3 Tax and Withholding Rates

Resident corporations and other entities considered juridical persons are subject to the progressive rate tax structure shown in Table 6-2.

Withholding taxes on dividends, if they are paid to nonresident corporations, or interest from bonds and other bearer securities are at a 40 percent rate. Other income paid or credited to nonresidents is taxed at a 30 to 40 percent rate as total payment of the tax.

6.5 TAXATION SUMMARY

For this thesis the procedures outlined in Table 6-3 will be used in computing cash flows and performing simulation.

Table 6-2
Tax Rates

NUMBER OF U.I.T.'s	TAX RATE (percent)
Up to 150	32
On excess up to 1,500	42
On excess up to 3,000	52
On excess up over 3,000	55

Source: Martindale-Hubble, Inc. 1984. Martindale-Hubbell Law Directory. Vol.7. 116th Edition.

Table 6-3
Cash Flow Calculation Summary

GROSS REVENUES
- OPERATING COST
- DEPRECIATION
- INTEREST
- LOSS FORWARD
= SUBTOTAL
- TAX AT 55% OF SUBTOTAL
= NET
- 17% OF NET FOR WORKERS PARTICIPATION
= SUBTOTAL
+ DEPRECIATION
+ LOSS FORWARD
- PRINCIPAL PAYMENTS
= NET CASH FLOW

CHAPTER SEVEN

MINING AND INVESTMENT CODES OF CHILE

7.1 INTRODUCTION

Chile's codes, although in some respects similar to Peru's, has several distinct differences which impact upon retained value from mining projects and the decision to invest by mining firms. In order of computational difficulty and understanding, Chile's codes are simpler than either Peru's or Papua New Guinea's.

7.2 GENERAL BACKGROUND

Chile is composed of a long but narrow strip of land with a length of approximately 2,700 miles and an average width of 110 miles. Chile is bordered on the west by the Pacific Ocean and on the east by the Andes.

Historically, Chile is the second largest producer and accounted for 16 percent of the nonsocialist world's copper mine output in 1980. Copper mining in Chile can be divided into two groups: the large-scale copper mining sector and the small- and medium-scale copper mining sector.

The large-scale mining sector consists of the state-owned mines of Chuquicamata and the El Salvador mines originally owned by Anaconda, the Teniente mine originally

owned by Kennecott, and the Andina mine. These mines have produced a large percentage of all Chilean copper, but do not represent as high a percentage of the mining labor force because of the less labor intensive nature of these operations.

The small- and medium-scale mining sector is composed of several medium-scale mining companies, several which have been nationalized, and many small independents. The state-owned firm, Empresa National de Mineria, which owns several smelters and refineries, purchases ores and concentrates produced by the small- and medium-scale mining sector.

7.3 NATIONAL MINING CODE

In Chile, minerals and surface rights are severable. The state owns all minerals, and private individuals have the right to own the surface. Although mineral rights are distinct from surface rights, mineral rights allow for the occupation of the land for mining purposes.

Concessions, which can be held by foreign firms, include exploration concessions called a pedimento, and exploitation concessions called a manifestacion. Both types of concessions involve fees and taxes. Exploration concessions are granted for two years and can be extended once for an add-

itional two years if the holder gives up half of the land under the original grant. Exploration concessions are limited to a maximum of 5,000 hectares, while exploitation concessions are limited to a maximum of 1,000 hectares.

7.4 TAX AND INVESTMENTS CODES

7.4.1 Foreign Investment Codes

Decree Law number 600 of March 18,1977, which sets forth the general rules applicable to foreign investment, was instituted to eliminate delays in the processing of foreign investment applications. The main points of the investment code are summarized below:

1. Authorization for foreign investment is formalized by a separate contract for each investor. For investments greater than U.S.$5 million, the president of the Executive Secretary of the Foreign Investment Committee must authorize the contract. Contracts stipulate time periods within which foreign investors must bring in capital. The term for mining investments is 8 years, but may be extended to 12 years when previous exploration is required.

2. Natural or jurdical persons, foreign or national, are allowed to bring capital into Chile in foreign currency. The Central Bank grants a certificate to the investor which allows the investor the right to freely sell foreign

currency within the legal and general limitations established by the Central Bank.

3. Foreign investors may transfer capital and net profits to other countries. Although there is no time limit to do so, capital may not be remitted before three years have elapsed. Conditions applicable for the remittance of capital and net profits are set by statute as being no less favorable than those applicable to the coverage of imports. The rate of exchange applied to the transfer has been set at the highest rate in the banking market. By statute, foreign investors are guaranteed access to the bankers' market for the purchase of foreign currency to transfer capital and net profits.

4. Foreign investments are subject to general indirect taxation and customs regulations.

7.4.2 Tax Codes

By statute, taxable income is defined as gross income minus the direct cost of production, interest paid on debts, other Chilean taxes paid on activities of the firm, losses suffered during the fiscal year, depreciation on fixed assets, salaries, and organization and start-up expenses.

Depreciation rates for mining investments as of 1979 are given in Table 7-1.

For foreign investors, two options are offered. The

Table 7-1
Tax Depreciation Rates

EQUIPMENT	NUMBER OF YEARS	
	NORMAL	ACCELERATED
HEAVY MACHINERY	10	3
INSTALLATIONS	5	1
PERMANENT BUILDINGS	25	8
PROVISIONAL BUILDINGS	10	3
TRUCKS	7	2
HEAVY TOOLS	10	3
LIGHT TOOLS	5	1

Source: Price Waterhouse and Co. 1979. Doing Business in Chile. (March).

options are as follows:

1. A fixed tax of 49.5 percent of taxable income is assessed for 10 years. This tax includes income tax, withholding tax and housing tax. Under this choice the government guarantees that this rate will not change. If a firm chooses to change to the standard taxation system, the firm cannot change back to a fixed tax.

2. Foreign investors may choose to be taxed under the normal or standard taxation system.

Table 7-2 illustrates how both choices are calculated under the current tax system.

Table 7-2
Methods of Taxation

STANDARD TAXATION		
	CORPORATION	LIMITED COMPANY
PROFITS BEFORE TAXES	$100.000	$100.000
TAXABLE INCOME (DIVIDING PRETAX PROFITS BY 1.05 - HOUSING TAX DEDUCTIBLE)	95.238	95.238
FIRST CATEGORY TAX (10%)	9.523	9.523
HOUSING TAX (5%)	4.762	4.762
ADDITIONAL TAX (40%)		38.095
ADDITIONAL RATE (40% LEVIED ON CORPORATIONS ON INCOME LESS FIRST CATEGORY TAX)	38.245	
TOTAL INCOME TAX	48.570	52.380
TAXATION ACCORDING TO DL N 600		
PROFITS BEFORE TAXES	100.000	100.000
TAXABLE INCOME (CALCULATED BY DIVIDING PRETAX PROFITS BY 1.05 - HOUSING TAX MAY BE DEDUCTIBLE)	95.238	95.238
FIRST CATEGORY TAX (10%)	9.523	9.523
HOUSING TAX (5%)	4.762	4.762
ADDITIONAL TAX (LOWERED TO 36.965)		35.215
ADDITIONAL RATE (40% LEVIED ON CORPORATIONS ON INCOME LESS FIRST CATEGORY TAX)	34.285	
ADDITIONAL TAX (1.808% ON DISTRIBUTABLE AMOUNT)	0.930	
TOTAL INCOME TAX	49.500	49.500

CHAPTER EIGHT

CASH FLOW SIMULATION: MINING PROJECTS

8.1 INTRODUCTION

Differing tax and investment codes on similar types of deposits in Papua New Guinea, Peru, and Chile required the simulation of cash flows using Monte Carlo techniques. Elements that were simulated were a set of financial measurements and a set of measurements to determine the effects of the project on the domestic economy. These elements were analyzed on a microcomputer to determine the applicability of these techniques in a "non-mainframe" environment. As a result of the difficulty in locating accurate capital and operating data, a number of simplifying assumptions were made on inputed data to complete the analysis.

8.2 METHODOLOGY AND ASSUMPTIONS

8.2.1 Computer Hardware And Software

Simulations for this thesis were performed on an Apple II+ 64K minicomputer using Apple Fortran as the programing language. Hardware used with this minicomputer were two 5 1/4 inch disk drives, monitor, and an Epson MX-80 dot-matrix printer. Listing of the programs can be found in

the Appendix. For point estimates, the printer was used for output; for simulations, data was stored as a text file on disk.

8.2.2 Assumptions For Cash Flows

Data was derived from the U.S. Bureau of Mines computer Cost Estimating System, adjusted for productivity of the labor force, transportation, and other variable factors with country indexes developed by contracted consultants for the U.S. Bureau of Mines. The most recent available data in this system has been updated as of the end of 1983.

Nonetheless,it was necessary to apply a number of simplifying factors to input data in this study because of result-limited current data on operating and capital costs, as well as limited current data defining the various components of both operating and capital components (i.e., labor, domestically supplied capital, power, etc., as a percentage of operating costs).

Assumptions for the generation of cash flows have been described in Chapters 5, 6, and 7 for Papua New Guinea, Peru, and Chile, respectively. For the sake of cash flow simplification, all exploration costs and preproduction development were assumed to occur at time zero. As many deposits contain varying amounts of biproduct credits, gold was considered in revenue generation. Tables 8-1, 8-2,

Table 8-1
Assumptions For Cash Flow - Papua New Guinea

1. ORE BODY TYPE	Disseminated Copper
2. MINING METHOD	Open-Pit
3. MINING RATE	50,000 Tonnes Per Day
4. STRIPPING RATIO	3:1
5. INVESTMENT	$1,500,000,000
6. RESERVES	1,000,000,000 Tonnes
7. OPERATING COSTS (mining and milling)	$8.02 per Tonne
8. COPPER ORE GRADE (recoverable)	1%
9. GOLD ORE GRADE (recoverable)	.02 Tr.ounces per Ton
10. COPPER PRICE	$0.60 per pound
11. GOLD PRICE	$350 Per Troy Ounce
12. AMOUNT OF LOAN (15%)	50% Of Investment
13. ESCALATION RATE FOR REVENUES	10%
14. ESCALATION RATE FOR COSTS	10%
15. EXPLORATION COSTS	$25,000,000
16. PREPRODUCTION DEVELOPMENT	$78,000,000
17. WORKING CAPITAL	$21,000,000

Table 8-2
Assumptions For Cash Flow - Peru

1. ORE BODY TYPE	Disseminated Copper
2. MINING METHOD	Open-Pit
3. MINING RATE	50,000 Tonnes Per Day
4. STRIPPING RATIO	3:1
5. INVESTMENT	$750,000,000
6. RESERVES	1,000,000,000 Tonnes
7. OPERATING COSTS (minimg and milling)	$4.25 per Tonne
8. COPPER ORE GRADE (recoverable)	1%
9. GOLD ORE GRADE (recoverable)	.02 Tr.ounces per ton
10. COPPER PRICE	$0.60 per pound
11. GOLD PRICE	$350 Per Troy Ounce
12. AMOUNT OF LOAN (15%)	50% Of Investment
13. ESCALATION RATE FOR REVENUES	10%
14. ESCALTION RATE FOR COSTS	10%
15. EXPLORATION COSTS	$25,000,000
16. PREPRODUCTION DEVELOPMENT	$78,000,000
17. WORKING CAPITAL	$21,000,000

and 8-3 list the various operational assumptions used in this thesis for Papua New Guinea, Peru, and Chile.

8.2.3 Assumptions For Simulations

Cash flow inputs were simulated using a triangular distribution and a random-number generator incorporated into the APPLE II + microcomputer. Inputs that were adjusted for the simulation were initial investment, reserves, exploration costs, development costs, operating costs, copper grade and price, and gold grade and price. These inputs were varied by plus and minus 10 percent from the point estimate. Other assumptions for cash flow simulations were 1) all production was able to be sold, 2) full production would take place in the first year, and 3) cash flows were based on 250 working days per year.

Table 8-3
Assumptions For Cash Flow - Chile

1. ORE BODY TYPE	Disseminated Copper
2. MINING METHOD	Open-Pit
3. MINING RATE	50,000 Tonnes Per Day
4. STRIPPING RATIO	3:1
5. INVESTMENT	$750,000,000
6. RESERVES	1,000,000,000 Tonnes
7. OPERATING COSTS (mining and milling)	$8.00 per Tonne
8. COPPER ORE GRADE (recoverable)	1%
9. GOLD ORE GRADE (recoverable)	.02 Tr.ounces per ton
10. COPPER PRICE	$0.60 per pound
11. GOLD PRICE	$350 Per Troy Ounce
12. AMOUNT OF LOAN (15%)	50% Of Investment
13. ESCALATION RATE FOR REVENUES:	10%
14. ESCALATION RATE FOR COSTS:	10%
15. EXPLORATION COSTS	$25,000,000
16. PREPRODUCTION DEVELOPMENT	$78,000,000
17. WORKING CAPITAL	$21,000,000

CHAPTER NINE

RESULTS OF SIMULATIONS

9.1 INTRODUCTION

The results of the simulations showed useful values for cash flows with the given input data. The main use of the data generated was for the comparison and relative ranking of the tax codes and not for a comparison of absolute values. A statistical analysis of the data would be of questionable value because of the generalized nature of the inputs which have an unknown amount of inherent error. Also, simulation techniques such as Monte Carlo simulation are limited because of the subjective nature of choosing initial input parameters. Variances of the results were calculated to demonstrate the general spread of possible outcomes and were not meant to show precise ranges of values. Thus, the scope of this analysis is limited to general inferences and comparisons of the tax codes. A comprehensive and detailed study of each of the known deposits in these countries would have to be undertaken to be able to draw specific inferences or conclusions of the effect of changing tax codes. The comparison of the codes that were examined is a twofold problem for both from the government's point of view and from the firm's point of

view. Both the firm and the government must be able to balance higher mean values with the possible increase in the volatility of these values in light of their professed goals.

The results in this chapter were generated from 300 simulations. Additional simulations may cause slight variations in some of the outputed results presented in this chapter. These results are described in the following three sections. In each section, three tax codes are examined with a cost structure of one country and one type of ore deposit. This allows one to examine the effects of three tax codes in a single country.

9.2 SIMULATION OF CHILEAN CASH FLOWS

Tables 9-1, 9-2 and Figures 9-1, 9-2, 9-3, 9-4, 9-5, and 9-6 show the results of performing a series of simulations of cash flows using Chilean inputs with the tax codes of Chile, Peru, and Papua New Guinea. The existing tax code of Chile showed the second highest mean rate of return, longest payback and highest NPV but demonstrated variances higher than with the tax codes of PNG and Peru. In the eyes of the risk-averse investor, a relative ranking in order of preference will depend upon the higher variability and perceived risk of projects of this type. The minor increase in rate of

Table 9-1
Simulation Results - Chilean Inputs

	MEAN	VARIANCE
RATE OF RETURN (percent)		
Chilean tax code/ Chilean inputs	19.04	.7061
Peruvian tax code/ Chilean inputs	20.49	.518
PNG tax code/ Chilean inputs	18.33	.288
PAYBACK PERIOD (years)		
Chilean tax code/ Chilean inputs	7.9	.650
Peruvian tax code/ Chilean inputs	5.03	.0553
PNG tax code/ Chilean inputs	4.35	..078
RETAINED VALUE (U.S.Dollars)		
Chilean tax code/ Chilean inputs	1.24×10^{11}	5.48×10^{19}
Peruvian tax code/ Chilean inputs	1.56×10^{11}	1.95×10^{20}
PNG tax code/ Chilean inputs	1.59×10^{11}	9.53×10^{19}

Table 9-1
(Continued)

	MEAN	VARIANCE
POE (RV/total val. of exports)		
Chilean tax code/ Chilean inputs	.3916	$.77 \times 10^{-5}$
Peruvian tax code/ Chilean inputs	.4732	3.63×10^{-5}
PNG tax code/ Chilean inputs	.5056	2.45×10^{-5}
UPOE (RV/unit val.of exports/total val.of exports)		
Chilean tax code/ Chilean inputs	3.97×10^{-10}	$.536 \times 10^{-22}$
Peruvian tax code/ Chilean inputs	4.71×10^{-10}	$.881 \times 10^{-22}$
PNG tax code/ Chilean inputs	5.1×10^{-10}	$.666 \times 10^{-22}$
NPV (U.S.Dollars)		
Chilean tax code/ Chilean inputs	1.532×10^{9}	3.174×10^{16}
Peruvian tax code/ Chilean inputs	1.363×10^{9}	2.152×10^{16}
PNG tax code/ Chilean inputs	1.025×10^{9}	1.141×10^{16}

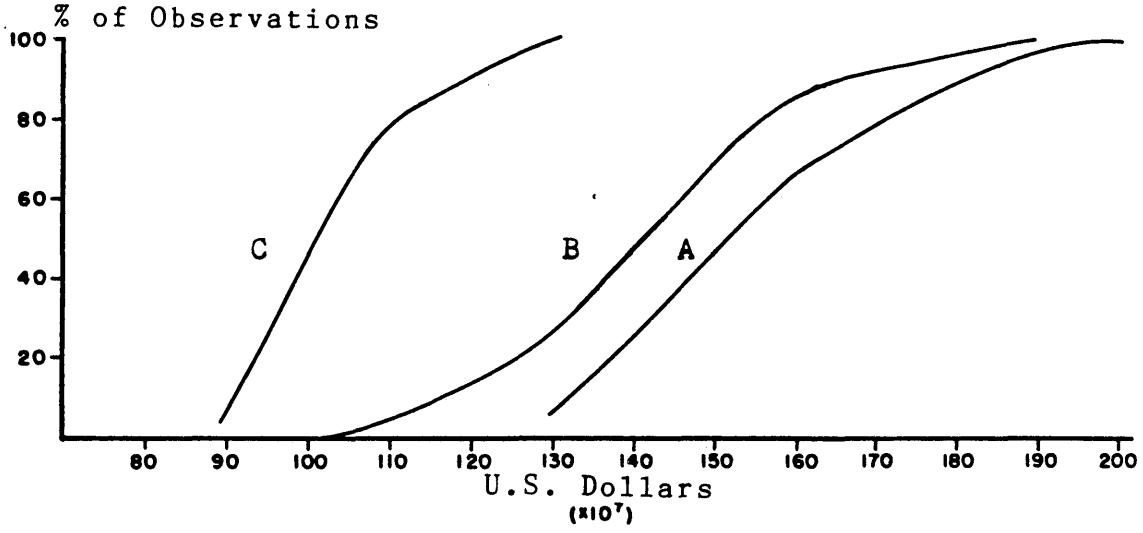


Figure 9-1
Chilean NPV Simulation Results

A - Chilean Codes/ Chilean Inputs
B - Peruvian Codes/ Chilean Inputs
C - PNG Codes/ Chilean Inputs

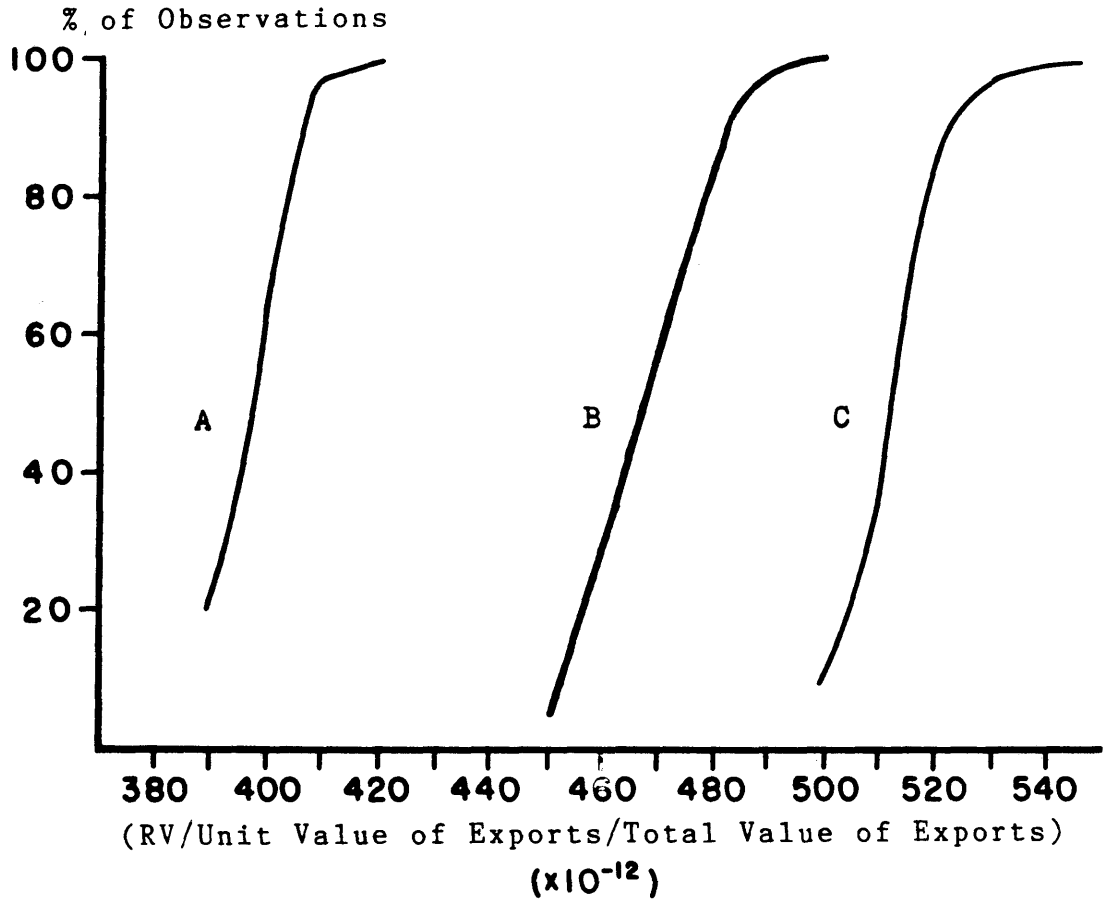


Figure 9-2
Chilean UPOE Simulation Results

A - Chilean Codes/ Chilean Inputs
B - Peruvian Codes/ Chilean Inputs
C - PNG Codes/ Chilean Inputs

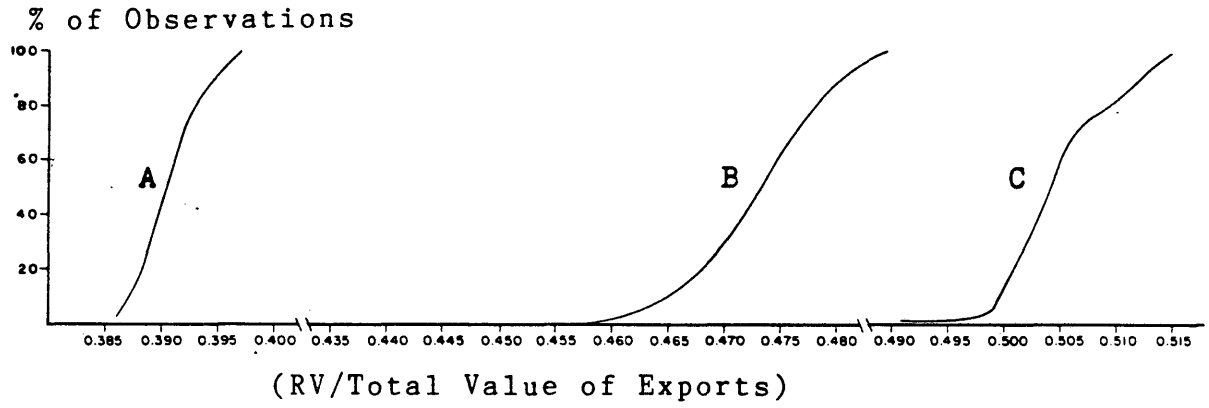


Figure 9-3
Chilean POE Simulation Results

A - Chilean Codes/ Chilean Inputs
B - Peruvian Codes/ Chilean Inputs
C - PNG Codes/ Chilean Inputs

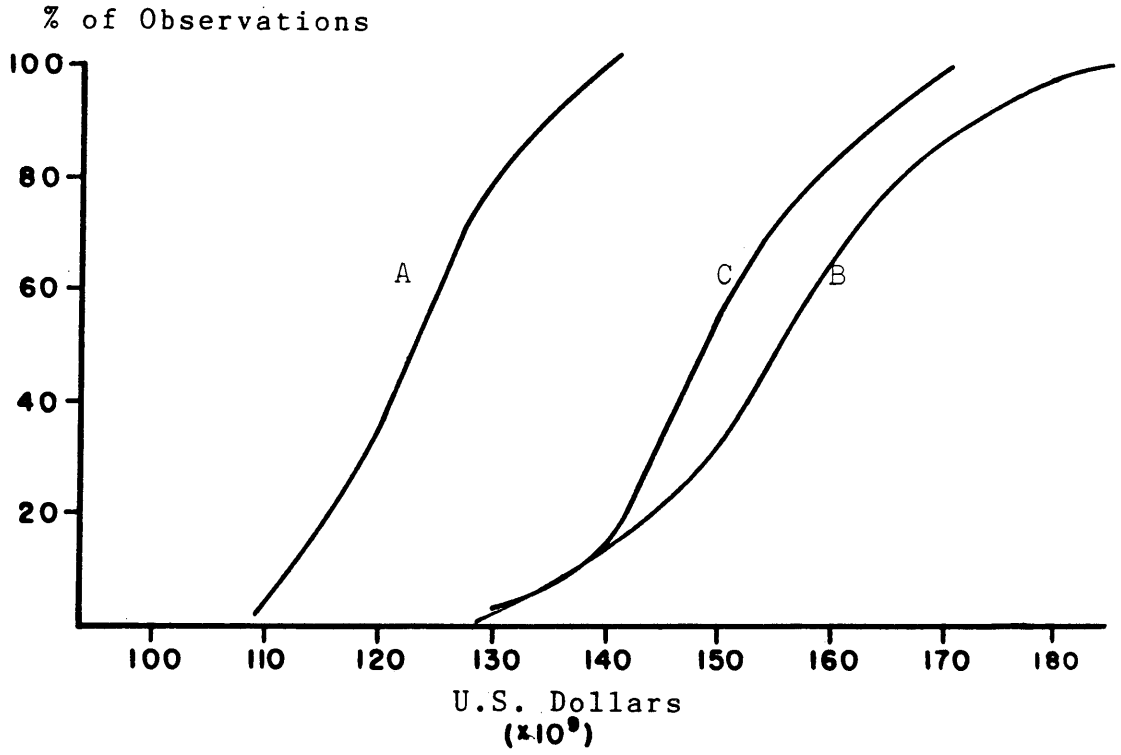


Figure 9-4
Chilean Retained Value Simulation Results

A - Chilean Codes/ Chilean Inputs
B - Peruvian Codes/ Chilean Inputs
C - PNG Codes/ Chilean Inputs

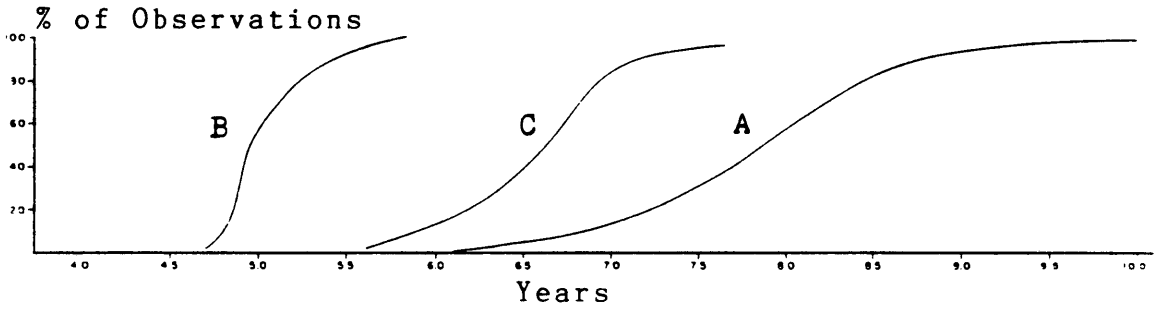


Figure 9-5
Chilean PAYBACK Simulation Results

A - Chilean Codes/ Chilean Inputs
B - Peruvian Codes/ Chilean Inputs
C - PNG Codes/ Chilean Inputs

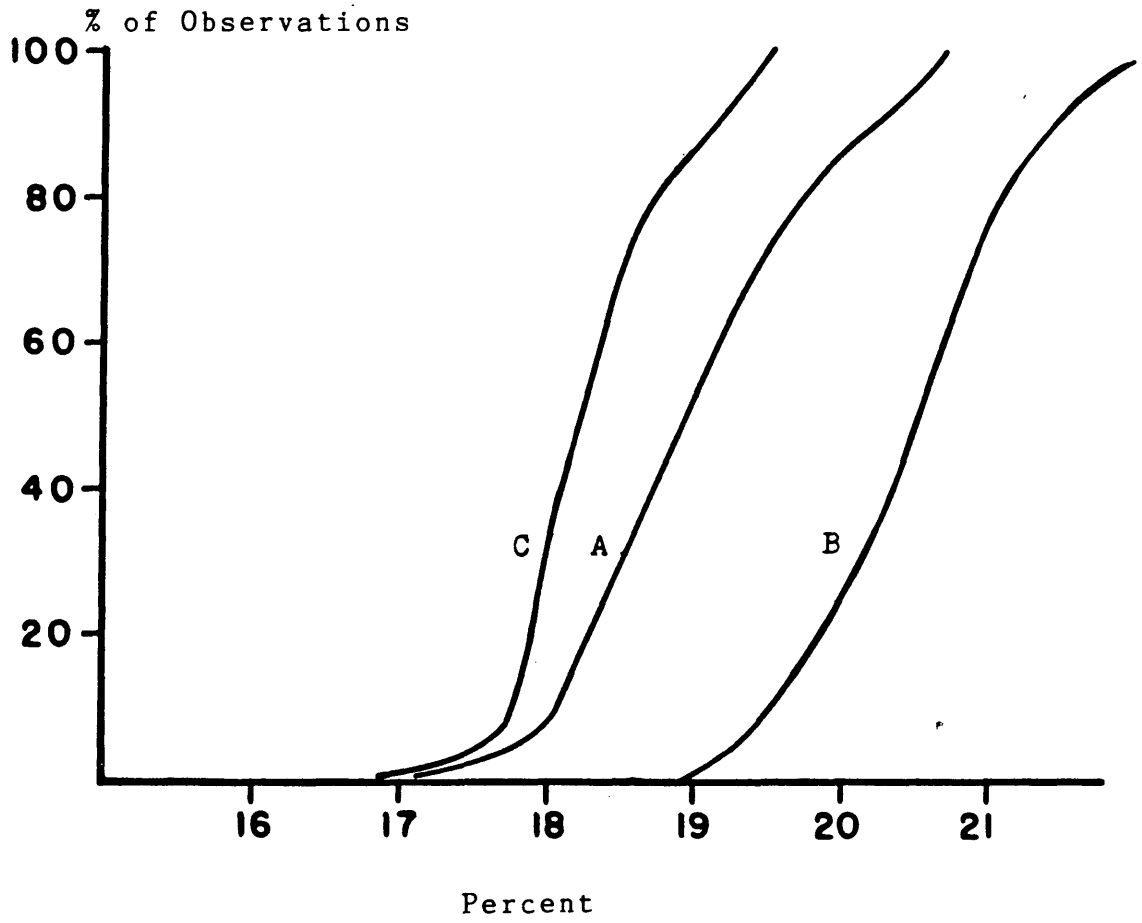


Figure 9-6
Chilean ROR Simulation Results

A - Chilean Codes/ Chilean Inputs
B - Peruvian Codes/ Chilean Inputs
C - PNG Codes/ Chilean Inputs

return and NPV with the use of the Peruvian codes may be preferable considering the decrease in the payback period on the investment.

The explanation for the higher payback period using the Chilean inputs is that by using the Chilean code, the initial years of production produce a smaller net cash flow than the other codes. This result is demonstrated in Tables 9-2, 9-3, and 9-4. After the first five to seven years the Chilean code produces greater cash flows than the other codes. This results in an overall higher NPV and rate of return. This indicates that timing of the cash flows is an important consideration in this type of code evaluation.

With respect to the government's point of view, the mean of retained value (RV) using Chilean inputs with Chilean tax codes are lower than with the PNG and Peruvian codes. For UPOE and POE measurements the use of Chilean inputs with Chilean tax codes resulted in mean values lower than using PNG's codes but higher than using Peruvian codes. This could present a problem for government decision makers who wish to increase the value of projects to the government but keep the variability of these types of measurements low.

9.3 SIMULATION OF PERU CASH FLOWS

Table 9-5 and Figures 9-7, 9-8, 9-9, 9-10, 9-11, and

Table 9-2
Cash Flows - PNG Code/ Chilean Inputs

YEAR	1	2	3	4	5
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	277750000.	305525000.	336078000.	369685800.	406654400.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS (ESC)	110000000.	121000000.	133100000.	146410000.	161051000.
DEPRECIATION	187500000.	187500000.	187500000.	187500000.	0.
INTEREST	56250000.	52500000.	48750000.	45000000.	41250000.
LOSS FORWARD	0.	88800000.	157075000.	203147000.	225172000.
EXPLORATION	5000000.	5000000.	5000000.	5000000.	5000000.
DEVELOPMENT	7800000.	7800000.	7800000.	7800000.	7800000.
SUBTOTAL	-88800000.	-157075000.	-203147000.	-225172000.	-33619400.
FIRST CATEGORY	0.	0.	0.	0.	0.
FIRST TAX	0.	0.	0.	0.	0.
SEC.CATEGORY	0.	0.	0.	0.	0.
SEC. TAX	0.	0.	0.	0.	0.
SUBTOTAL	-88800000.	-157075000.	-203147000.	-225172000.	-33619400.
WRKG. CAP.RET	0.	0.	0.	0.	0.
PRINC.PAYMNTS	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	86500000.	107025000.	129228000.	153275000.	179353000.

YEAR	6	7	8	9	10
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	447319000.	492051000.	541256000.	595382000.	654920000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS (ESC)	177156000.	194872000.	214359000.	235795000.	259374000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	37500000.	33750000.	30000000.	26250000.	22500000.
LOSS FORWARD	33619400.	0.	0.	0.	0.
EXPLORATION	0.	0.	0.	0.	0.
DEVELOPMENT	7800000.	7800000.	7800000.	7800000.	7800000.
SUBTOTAL	191244000.	255629000.	289097000.	325537000.	365246000.
FIRST CATEGORY	191244000.	150000000.	150000000.	150000000.	150000000.
FIRST TAX	66935300.	54750000.	54750000.	54750000.	54750000.
SEC.CATEGORY	0.	105629000.	139097000.	175537000.	215246000.
SEC. TAX	0.	73940600.	97368200.	122876000.	150672000.
SUBTOTAL	124308000.	126939000.	136979000.	147911000.	159824000.
WRKG. CAP.RET	0.	0.	0.	0.	0.
PRINC.PAYMNTS	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	140728000.	109739000.	119779000.	130711000.	142624000.

YEAR	11	12	13	14	15
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	720412000.	792454000.	871699000.	958869000.	1054760000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS (ESC)	285312000.	313843000.	345227000.	379750000.	417725000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	18750000.	15000000.	11250000.	7500000.	3750000.
LOSS FORWARD	0.	0.	0.	0.	0.
EXPLORATION	0.	0.	0.	0.	0.
DEVELOPMENT	0.	0.	0.	0.	0.
SUBTOTAL	416350000.	463611000.	515221000.	571619000.	633281000.
FIRST CATEGORY	150000000.	150000000.	150000000.	150000000.	150000000.
FIRST TAX	54750000.	54750000.	54750000.	54750000.	54750000.
SEC.CATEGORY	266350000.	313611000.	365222000.	421619000.	483281000.
SEC. TAX	186445000.	219527000.	255655000.	295133000.	338296000.
SUBTOTAL	175155000.	189333000.	204816000.	221736000.	240234000.
WRKG. CAP.RET	0.	0.	0.	0.	0.
PRINC.PAYMNTS	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	150155000.	164333000.	179816000.	196736000.	215234000.

YEAR	16	17	18	19	20
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	1160230000.	1276250000.	1403880000.	1544270000.	1698690000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS (ESC)	459497000.	505447000.	555992000.	611591000.	672750000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	0.	0.	0.	0.	0.
LOSS FORWARD	0.	0.	0.	0.	0.
EXPLORATION	0.	0.	0.	0.	0.
DEVELOPMENT	0.	0.	0.	0.	0.
SUBTOTAL	700734000.	770807000.	847888000.	932677000.	1025940000.
FIRST CATEGORY	150000000.	150000000.	150000000.	150000000.	150000000.
FIRST TAX	54750000.	54750000.	54750000.	54750000.	54750000.
SEC.CATEGORY	550734000.	620807000.	697888000.	782677000.	875944000.
SEC. TAX	385514000.	434565000.	488521000.	547874000.	613161000.
SUBTOTAL	260470000.	281492000.	304616000.	330053000.	358033000.
WRKG. CAP.RET	0.	0.	0.	0.	0.
PRINC.PAYMNTS	0.	0.	0.	0.	0.
NET CASH FLOW	260470000.	281492000.	304616000.	330053000.	358033000.

YEAR	21	22	23	24	25
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	1868563000.	2055420000.	2260960000.	2487060000.	2735770000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS (ESC)	740025000.	814028000.	895431000.	984974000.	1083470000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	0.	0.	0.	0.	0.
LOSS FORWARD	0.	0.	0.	0.	0.
EXPLORATION	0.	0.	0.	0.	0.
DEVELOPMENT	0.	0.	0.	0.	0.
SUBTOTAL	1128540000.	1241390000.	1365530000.	1502090000.	1652290000.
FIRST CATEGORY	150000000.	150000000.	150000000.	150000000.	150000000.
FIRST TAX	54750000.	54750000.	54750000.	54750000.	54750000.
SEC.CATEGORY	978539000.	1091390000.	1215530000.	1352090000.	1502290000.
SEC. TAX	684977000.	763973000.	850872000.	946460000.	1051610000.
SUBTOTAL	388912000.	422668000.	459910000.	500876000.	545938000.
WRKG. CAP.RET	0.	0.	0.	0.	0.
PRINC.PAYMNTS	0.	0.	0.	0.	0.
NET CASH FLOW	388912000.	422668000.	459910000.	500876000.	545938000.

Table 9-3
Cash Flows - Chilean Code/ Chilean Inputs

YEAR	1	2	3	4	5
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	277750000.	305525000.	336078000.	369685000.	406654000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS(ESC)	110000000.	121000000.	133100000.	146410000.	161051000.
EXPL.COSTS	500000.	500000.	500000.	500000.	500000.
DEV.COSTS	1560000.	1560000.	1560000.	1560000.	1560000.
DEPRECIATION	250000000.	250000000.	250000000.	0.	0.
INTEREST	56250000.	52500000.	48750000.	45000000.	41250000.
LOSS FORWARD	0.	-140560000.	-260595000.	-358427000.	-182212000.
SUBTOTAL	-140560000.	-260595000.	-358427000.	-182212000.	20080700.
TAX	0.	0.	0.	0.	9939940.
SUBTOTAL	-140560000.	-260595000.	-358427000.	-182212000.	10140700.
WRKG CAP RET	0.	0.	0.	0.	0.
PRINC PAYMENT	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	86500000.	-33535000.	-131367000.	-205152000.	-12799300.

YEAR	6	7	8	9	10
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	447319000.	492051000.	541256000.	595382000.	654920000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS(ESC)	177156000.	194872000.	214359000.	235795000.	259374000.
EXPL.COSTS	500000.	500000.	500000.	500000.	500000.
DEV.COSTS	1560000.	1560000.	1560000.	1560000.	1560000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	37500000.	33750000.	30000000.	26250000.	22500000.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	230603000.	261369000.	294837000.	331277000.	370986000.
TAX	114149000.	129378000.	145945000.	163982000.	183638000.
SUBTOTAL	116455000.	131992000.	148893000.	167295000.	187348000.
WRKG CAP RET	0.	0.	0.	0.	0.
PRINC PAYMENT	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	93514600.	109052000.	125953000.	144355000.	164408000.

YEAR	11	12	13	14	15
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	720412000.	792454000.	871699000.	958869000.	1054760000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS(ESC)	285312000.	313843000.	345227000.	379750000.	417725000.
EXPL.COSTS	500000.	500000.	500000.	500000.	500000.
DEV.COSTS	1560000.	1560000.	1560000.	1560000.	1560000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	18750000.	15000000.	11250000.	7500000.	3750000.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	414290000.	461551000.	513161000.	569559000.	631221000.
TAX	205074000.	228468000.	254015000.	281932000.	312454000.
SUBTOTAL	209217000.	233083000.	259147000.	287627000.	318766000.
WRKG CAP RET	0.	0.	0.	0.	0.
PRINC PAYMENT	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	186277000.	210143000.	236207000.	264687000.	295826000.

YEAR	16	17	18	19	20
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	1160230000.	1276250000.	1403880000.	1544270000.	1698690000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS(ESC)	459497000.	505447000.	555992000.	611591000.	672750000.
EXPL.COSTS	500000.	500000.	500000.	500000.	500000.
DEV.COSTS	1560000.	1560000.	1560000.	1560000.	1560000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	0.	0.	0.	0.	0.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	698674000.	768747000.	845828000.	930617000.	1023880000.
TAX	345844000.	380530000.	418685000.	460655000.	506823000.
SUBTOTAL	352830000.	388217000.	427143000.	469961000.	517062000.
WRKG CAP RET	0.	0.	0.	0.	0.
PRINC PAYMENT	0.	0.	0.	0.	0.
NET CASH FLOW	354890000.	390277000.	429203000.	472021000.	519122000.

YEAR	21	22	23	24	25
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROSS REVS(ESC)	1868560000.	2055420000.	2260960000.	2487060000.	2735770000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP.COSTS(ESC)	740025000.	814028000.	895431000.	984974000.	1083470000.
EXPL.COSTS	500000.	500000.	500000.	500000.	500000.
DEV.COSTS	1560000.	1560000.	1560000.	1560000.	1560000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	0.	0.	0.	0.	0.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	1126480000.	1239330000.	1363470000.	1500030000.	1650230000.
TAX	557607000.	613470000.	674919000.	742512000.	816866000.
SUBTOTAL	568872000.	625863000.	688553000.	757513000.	833368000.
WRKG CAP RET	0.	0.	0.	0.	0.
PRINC PAYMENT	0.	0.	0.	0.	0.
NET CASH FLOW	570932000.	627923000.	690613000.	759573000.	835428000.

Table 9-4
Cash Flows - Peruvian Code/ Chilean Inputs

YEAR	1	2	3	4	5
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROS REVS (ESC)	277750000.	305525000.	336078000.	369685000.	406654000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP COSTS (ESC)	110000000.	121000000.	133100000.	146410000.	161051000.
DEPRECIATION	150000000.	150000000.	150000000.	150000000.	150000000.
INTEREST	56250000.	52500000.	48750000.	45000000.	41250000.
LOSS FORWARD	0.	-38500000.	-56475000.	-52247400.	-23972100.
SUBTOTAL	-38500000.	-56475000.	-52247400.	-23972100.	30380700.
TAX	0.	0.	0.	0.	16709400.
WORKERS.PART.	0.	0.	0.	0.	2324120.
SUBTOTAL	-38500000.	-56475000.	-52247400.	-23972100.	11347200.
WKG CAP.RET.	0.	0.	0.	0.	0.
PRINC PAYMENTS	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	86500000.	107025000.	129228000.	153275000.	160319000.

YEAR	6	7	8	9	10
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROS REVS (ESC)	447319000.	492051000.	541256000.	595382000.	654920000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP COSTS (ESC)	177156000.	194872000.	214359000.	235795000.	259374000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	37500000.	33750000.	30000000.	26250000.	22500000.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	232663000.	263429000.	296897000.	333337000.	373046000.
TAX	127965000.	144886000.	163294000.	183335000.	205175000.
WORKERS PART.	17798700.	20152400.	22712700.	25500300.	28538000.
SUBTOTAL	86899700.	98390900.	110891000.	124501000.	139333000.
WKG CAP.RET.	0.	0.	0.	0.	0.
PRINC PAYMENTS	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	61899700.	73390900.	85891200.	99501400.	114333000.

YEAR	11	12	13	14	15
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROS REVS (ESC)	720412000.	792454000.	871699000.	958869000.	1054760000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP COSTS (ESC)	285312000.	313843000.	345227000.	379750000.	417725000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	18750000.	15000000.	11250000.	7500000.	3750000.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	416350000.	463611000.	515221000.	571619000.	633281000.
TAX	228993000.	254986000.	283372000.	314390000.	348304000.
WORKERS PART.	31850800.	35466200.	39414400.	43728800.	48446000.
SUBTOTAL	155507000.	173159000.	192435000.	213500000.	236530000.
WKG CAP.RET.	0.	0.	0.	0.	0.
PRINC PAYMENTS	25000000.	25000000.	25000000.	25000000.	25000000.
NET CASH FLOW	130507000.	148159000.	167435000.	188500000.	211530000.

YEAR	16	17	18	19	20
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROS REVS (ESC)	1160230000.	1276250000.	1403880000.	1544270000.	1698690000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP COSTS (ESC)	459497000.	505447000.	555992000.	611591000.	672750000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	0.	0.	0.	0.	0.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	700734000.	770807000.	847888000.	932677000.	1025940000.
TAX	385404000.	423944000.	466338000.	512972000.	564269000.
WORKERS PART.	53606100.	58966700.	64863400.	71349800.	78484700.
SUBTOTAL	261724000.	287896000.	316686000.	348355000.	383190000.
WKG CAP.RET.	0.	0.	0.	0.	0.
PRINC PAYMENTS	0.	0.	0.	0.	0.
NET CASH FLOW	261724000.	287896000.	316686000.	348355000.	383190000.

YEAR	21	22	23	24	25
GROSS REVENUES	252500000.	252500000.	252500000.	252500000.	252500000.
GROS REVS (ESC)	1868560000.	2055420000.	2260960000.	2487060000.	2735770000.
OP.COSTS	100000000.	100000000.	100000000.	100000000.	100000000.
OP COSTS (ESC)	740025000.	814028000.	895431000.	984974000.	1083470000.
DEPRECIATION	0.	0.	0.	0.	0.
INTEREST	0.	0.	0.	0.	0.
LOSS FORWARD	0.	0.	0.	0.	0.
SUBTOTAL	1128540000.	1241390000.	1365530000.	1502090000.	1652290000.
TAX	620696000.	682766000.	751043000.	826147000.	908762000.
WORKERS PART.	86333200.	94966500.	104463000.	114910000.	126401000.
SUBTOTAL	421509000.	463660000.	510026000.	561029000.	617132000.
WKG CAP.RET.	0.	0.	0.	0.	0.
PRINC PAYMENTS	0.	0.	0.	0.	0.
NET CASH FLOW	421509000.	463660000.	510026000.	561029000.	617132000.

Table 9-5
Simulation Results - Peruvian Inputs

	MEAN	VARIANCE
RATE OF RETURN (percent)		
Peruvian tax code/ Peruvian inputs	23.24	.5859
Chilean tax code/ Peruvian inputs	25.38	1.132
PNG tax code/ Peruvian inputs	21.94	.326
PAYBACK PERIOD (years)		
Peruvian tax code/ Peruvian inputs	4.47	1.74×10^{-2}
Chilean tax code/ Peruvian inputs	4.922	.1755
PNG yax code/ Peruvian inputs	3.397	.0243
RETAINED VALUE (U.S.Dollars)		
Peruvian tax code/ Peruvian inputs	1.761×10^{11}	2.66×10^{20}
Chilean tax code/ Peruvian inputs	1.39×10^{11}	6.5×10^{20}
PNG tax code/ Peruvian inputs	1.867×10^{11}	1.161×10^{20}

Table 9-5
(Continued)

	MEAN	VARIANCE
POE (RV/total val.of exports)		
Peruvian tax code/ Peruvian inputs	.5449	5.36×10^{-6}
Chilean tax code/ Peruvian inputs	.5459	1.196×10^{-5}
PNG tax code/ Peruvian inputs	.594	7.63×10^{-6}
UPOE (RV/unit val. of exports/total val. of exports)		
Peruvian tax code/ Peruvian inputs	1.0×10^{-9}	1.65×10^{-22}
Chilean tax code/ Peruvian inputs	5.48×10^{-10}	1.73×10^{-22}
PNG tax code/ Peruvian inputs	1.0×10^{-9}	1.75×10^{-22}
NPV (U.S. Dollars)		
Peruvian tax code/ Peruvian inputs	1.89×10^{9}	4.81×10^{16}
Chilean tax code/ Peruvian inputs	2.53×10^{9}	4.62×10^{16}
PNG tax code/ Peruvian inputs	1.57×10^{9}	1.46×10^{16}

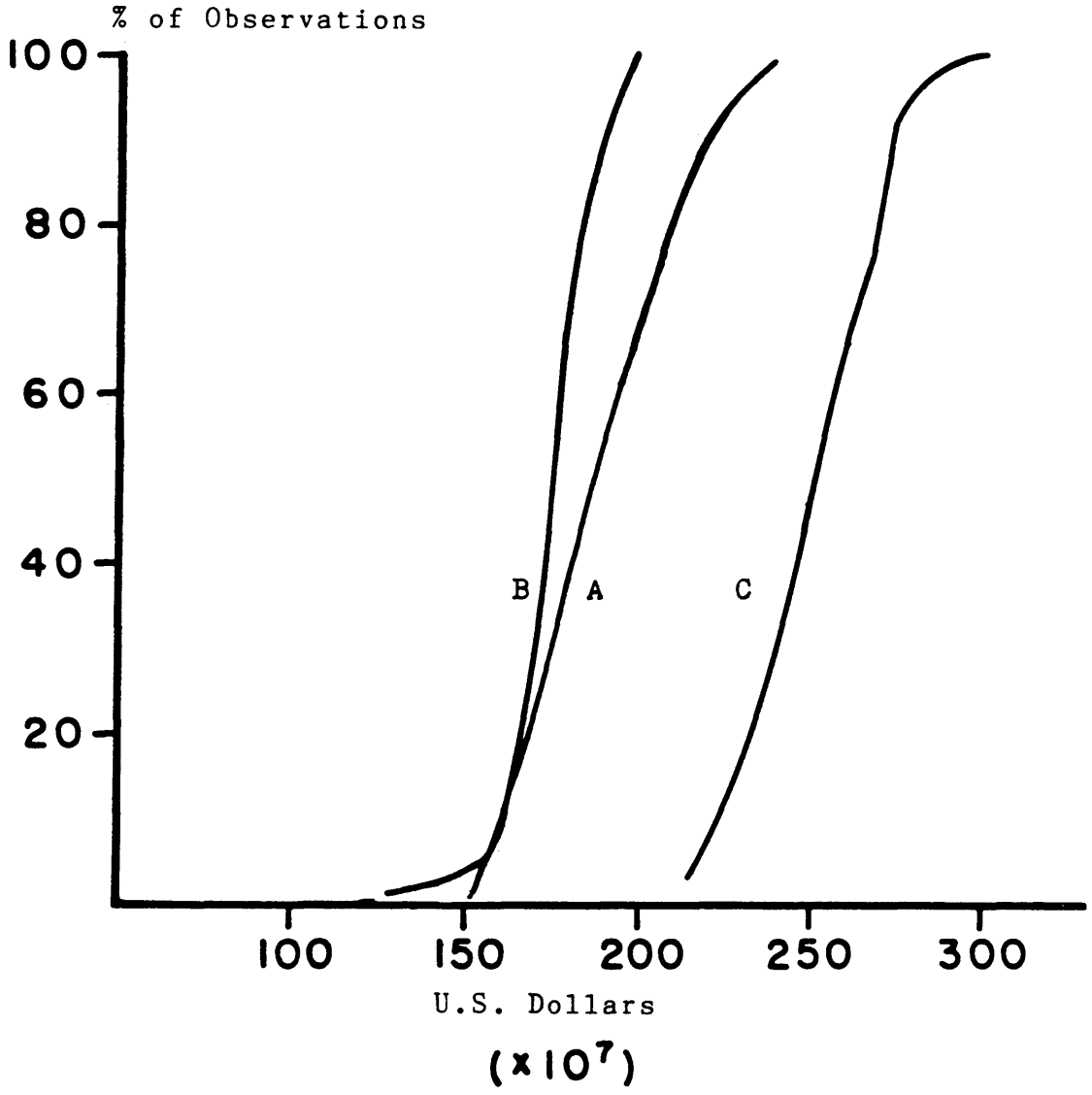


Figure 9-7
Peruvian NPV Simulation Results

A - Peruvian Codes/ Peruvian Inputs
B - PNG Codes/ Peruvian Inputs
C - Chilean Codes/ Peruvian Inputs

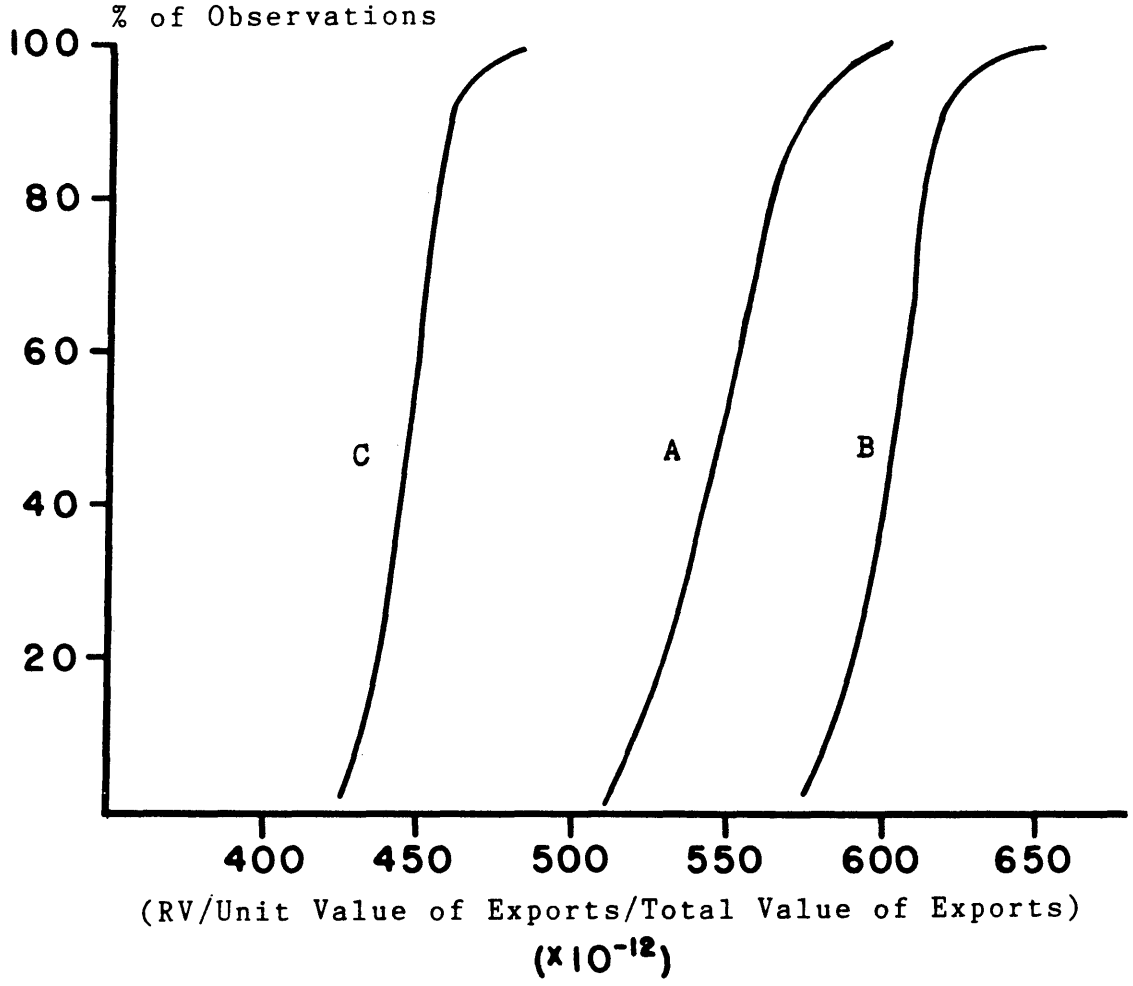


Figure 9-8
Peruvian UPOE Simulation Results

A - Peruvian Codes/ Peruvian Inputs
B - PNG Codes/ Peruvian Inputs
C - Chilean Codes/ Peruvian Inputs

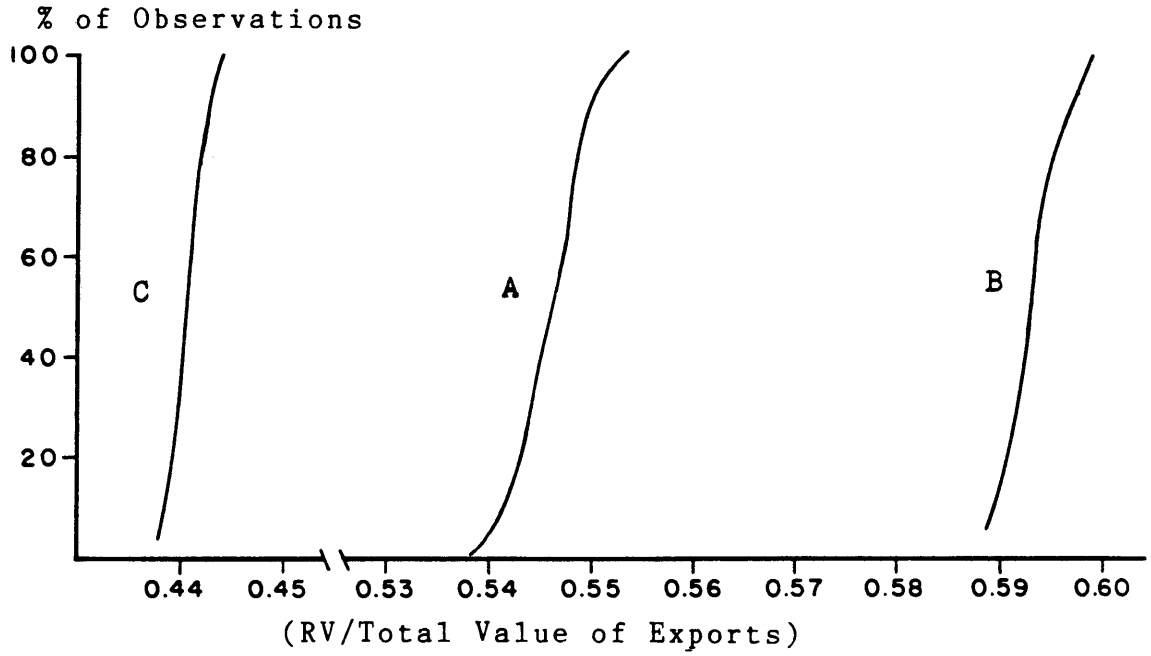


Figure 9-9
Peruvian POE Simulation Results

A - Peruvian Codes/ Peruvian Inputs
B - PNG Codes/ Peruvian Inputs
C - Chilean Codes/ Peruvian Inputs

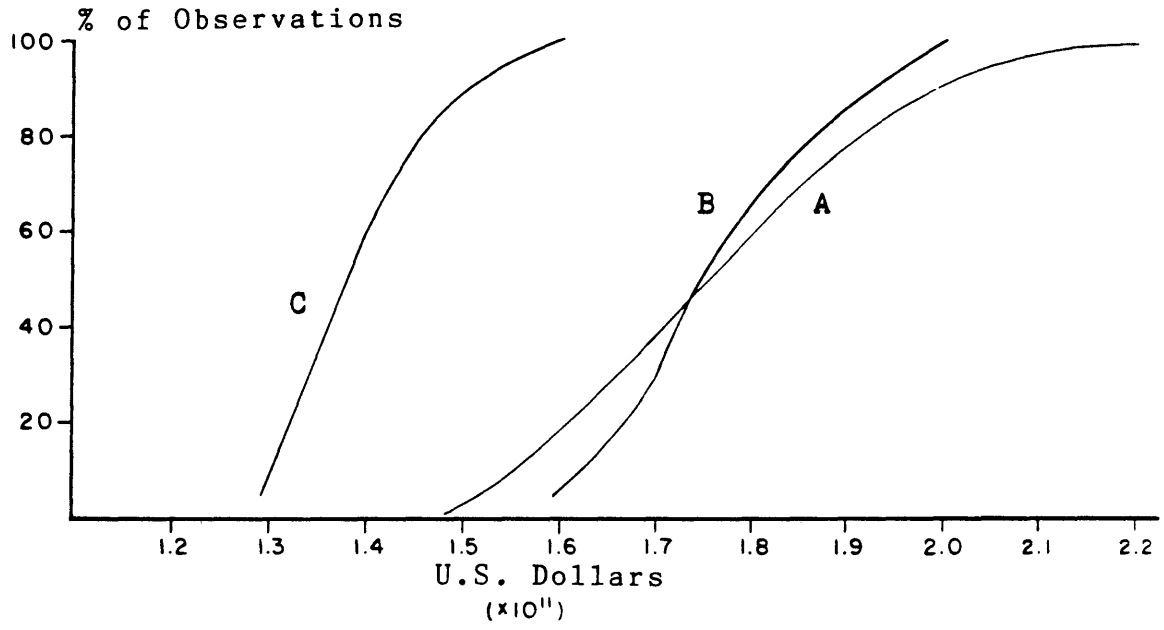


Figure 9-10
Peruvian Retained Value Simulation Results

A - Peruvian Codes/ Peruvian Inputs
B - PNG Codes/ Peruvian Inputs
C - Chilean Codes/ Peruvian Inputs

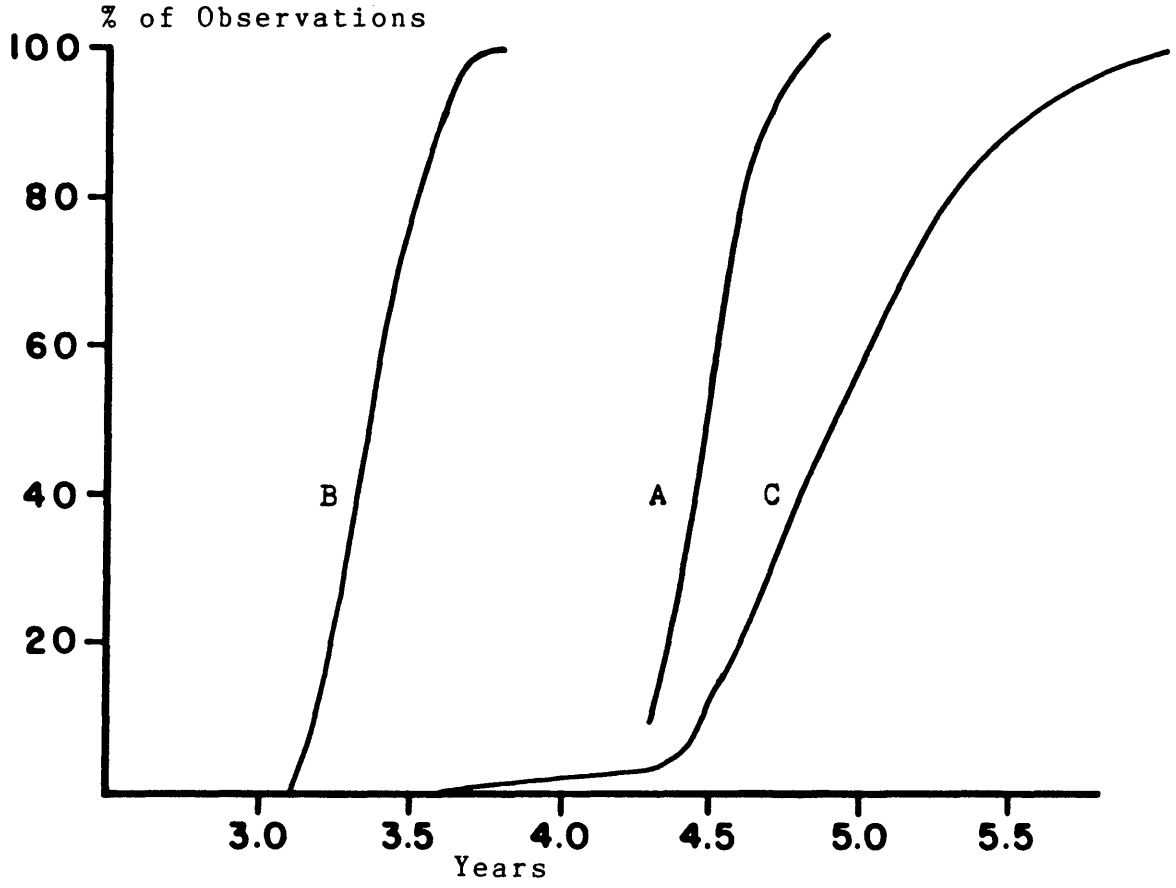


Figure 9-11
Peruvian PAYBACK Simulation Results

A - Peruvian Codes/ Peruvian Inputs
B - PNG Codes/ Peruvian Inputs
C - Chilean Codes/ Peruvian Inputs

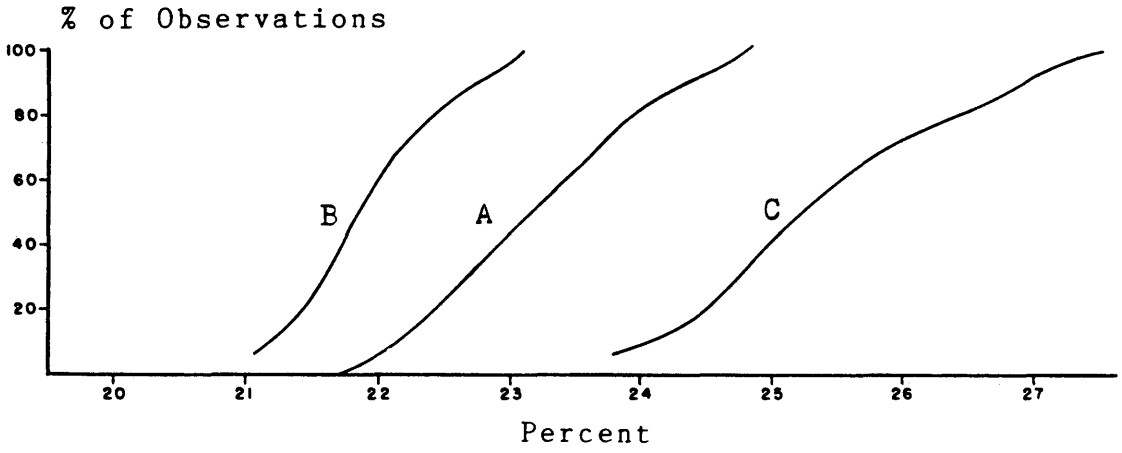


Figure 9-12
Peruvian ROR Simulation Results

A - Peruvian Codes/ Peruvian Inputs
B - PNG Codes/ Peruvian Inputs
C - Chilean Codes/ Peruvian Inputs

9-12 show the results of performing a series of simulations of cash flows using Peruvian inputs with the tax codes of Peru, Chile, and Papua New Guinea. The existing tax code of Peru showed the second highest mean rate of return, but also demonstrated the second lowest variance in results. Payback measurements using the Peruvian codes produced the second lowest mean payback period and a variance lower than using the Chilean codes or the PNG codes. NPV measurements using the Peruvian codes were higher than using the PNG code, but lower than using the Chilean codes. To the risk averse investor, Peru's codes as measured by rate of return, payback, and NPV, represent a middle course between Chilean codes which are only slightly perferable to Peru's codes and PNG's codes which show lower mean values. The use of the Chilean tax code produced a longer payback than using the other codes. This again is the result of smaller cash flows in the initial years of the project than with the other codes. In a similar fashion, the use of the PNG codes porduced a shorter payback than the other codes because of higher cash flow in the initial years of the project.

Retained value measurments were the second highest with the use of the Peruvian code and showed a lower variance than with the use of the Chilean code, only slightly less than with the PNG codes. The measurements POE

and UPOE using the Peruvian codes showed mean values higher than with the use of Chilean codes but also resulted in higher variances than the Chilean codes.

9.4 SIMULATION OF PAPUA NEW GUINEA CASH FLOWS

Table 9-6 and Figures 9-13, 9-14, 9-15, 9-16, 9-17, and 9-18 show the result of performing a series of simulations of cash flows using Papua New Guinea inputs with the tax codes of PNG, Peru, and Chile. The existing tax code of PNG showed a much lower mean rate of return than Peru's code, but also showed a lower variance as well. The use of the Chilean code with PNG inputs resulted in a lower mean rate of return and lower variance than occurred with the use of the PNG codes. Payback period measurements using PNG's codes resulted in mean values higher than when Peru's codes were used, but lower than when Chilean codes were used.

The results generated from cash flow simulations suggest that for the risk averse investor, a relative ranking of preference for the codes examined would be Peru, PNG, and Chile.

One goal of the government in establishing the tax and investment codes was an increase in retained value. The results of the simulation reflected this goal. Mean values

Table 9-6
Simulation Results - PNG Inputs

	MEAN	VARIANCE
RATE OF RETURN (percent)		
PNG tax code/ PNG inputs	12.46	.1827
Chilean tax code/ PNG inputs	10.37	.146
Peruvian tax code/ PNG inputs	15.09	.278
PAYBACK PERIOD (years)		
PNG tax code/ PNG inputs	7.97	.195
Chilean Tax code/ PNG inputs	18.825	1.448
Peruvian tax code/ PNG inputs	7.622	.1613
RETAINED VALUE (U.S.Dollars)		
PNG tax code/ PNG inputs	1.632×10^{11}	1.22×10^{20}
Chilean tax code/ PNG inputs	1.32×10^{11}	5.36×10^{19}
Peruvian tax code/ PNG inputs	1.61×10^{11}	2.17×10^{20}

Table 9-6
(Continued)

	MEAN	VARIANCE
POE (RV/total val.of exports)		
PNG tax code/ PNG inputs	.519	9.35×10^{-5}
Chilean tax code/ PNG inputs	.419	3.85×10^{-6}
Peruvian tax code/ PNG inputs	.498	2.75×10^{-5}
UPOE (RV/unit val. of exports/total val. of exports)		
PNG tax code/ PNG inputs	1.0×10^{-9}	1.14×10^{-22}
Chilean tax code/ PNG inputs	4.25×10^{-10}	8.24×10^{-23}
Peruvian tax code/ PNG inputs	5.0×10^{-9}	5.42×10^{-22}
NPV (U.S. Dollars)		
PNG tax code/ PNG inputs	-1.59×10^{8}	-
Chilean tax code/ PNG inputs	-8.38×10^{8}	-
Peruvian tax code/ PNG inputs	8.24×10^{8}	3.09×10^{16}

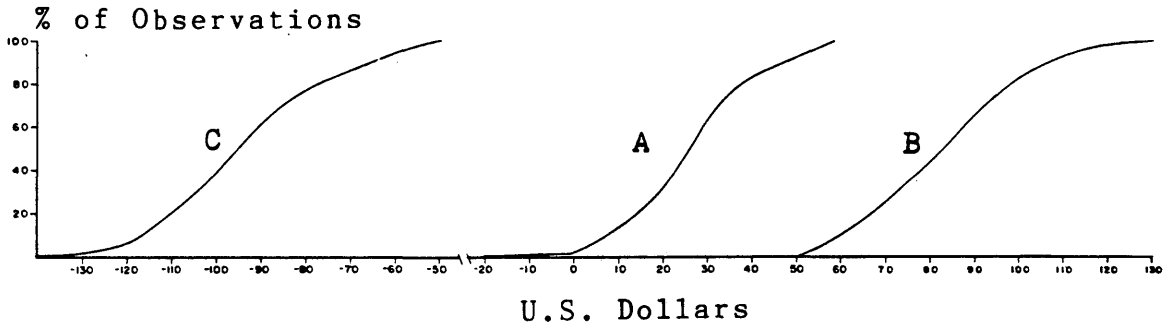


Figure 9-13
Papua New Guinean NPV Simulation Results

A - PNG Codes/ PNG Inputs
B - Peruvian Codes/ PNG Inputs
C - Chilean Codes/ PNG Inputs

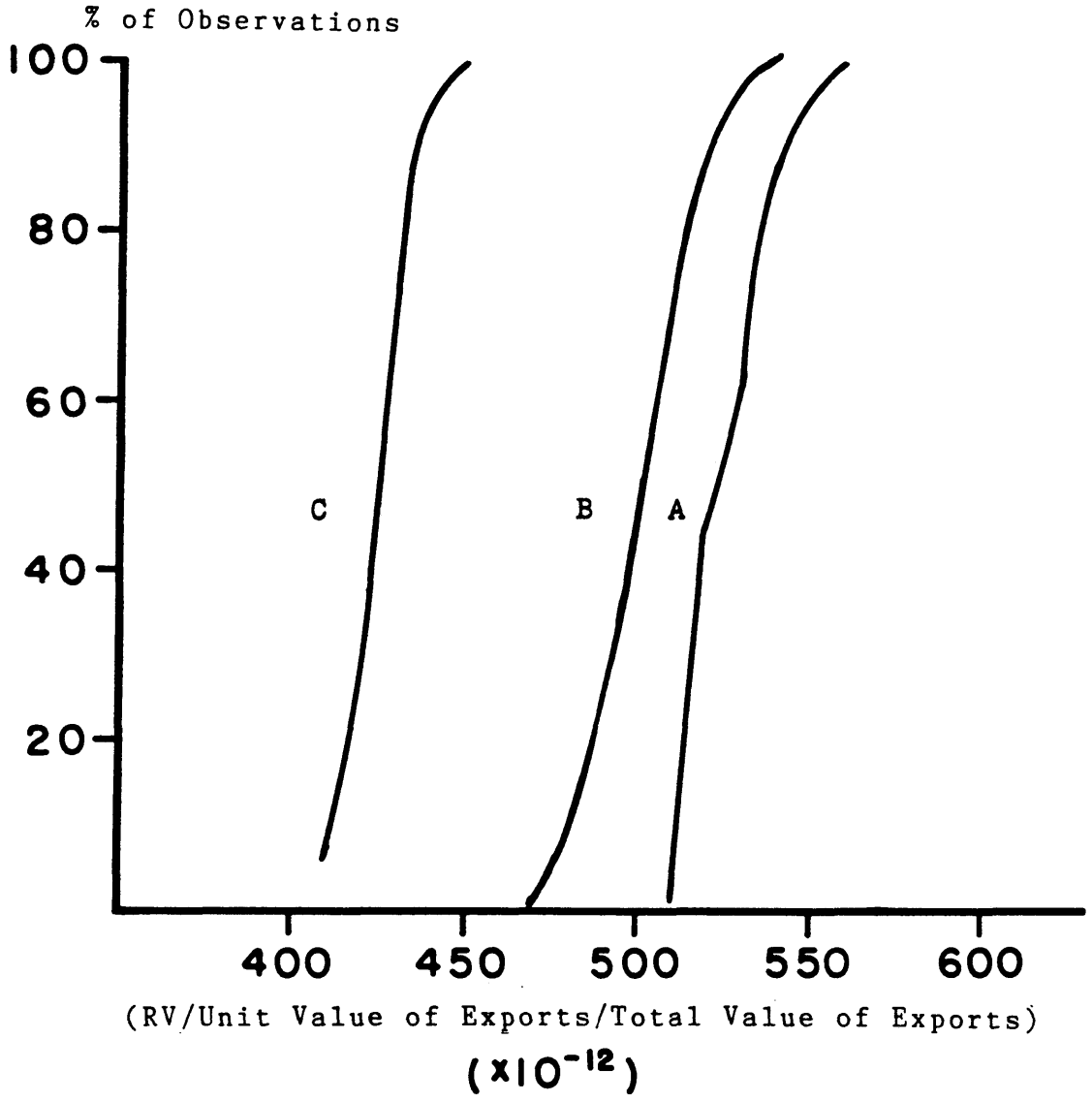


Figure 9-14
Papua New Guinean UPOE Simulation Results

A - PNG Codes/ PNG Inputs
B - Peruvian Codes/ PNG Inputs
C - Chilean Codes/ PNG Inputs

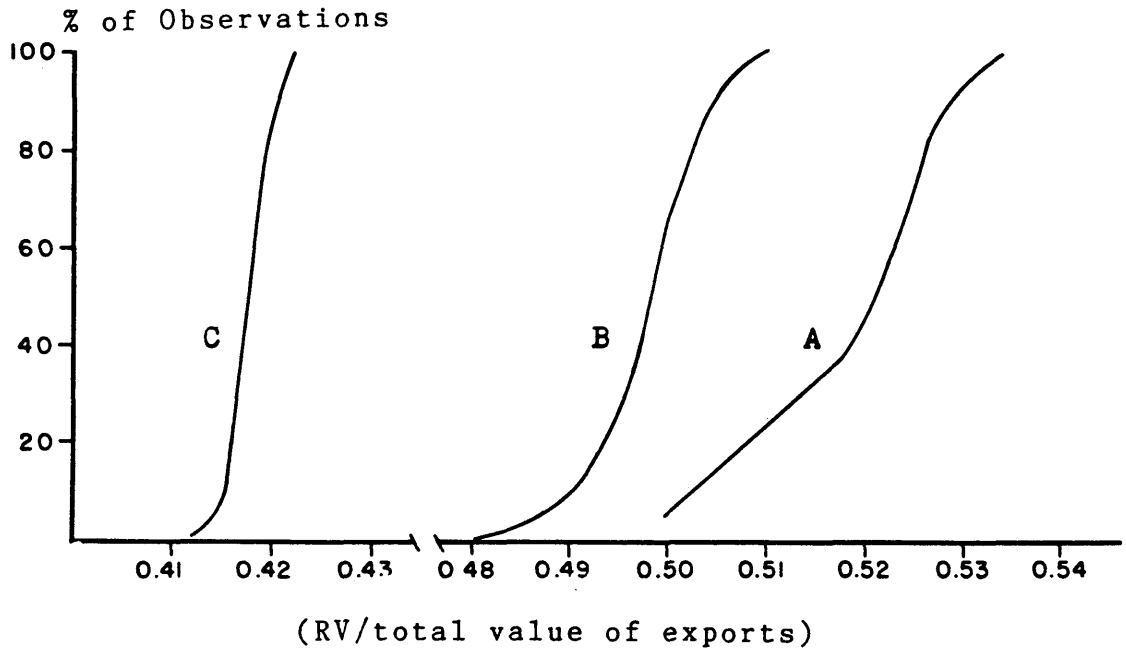


Figure 9-15
Papua New Guinean POE Simulation Results

A - PNG Codes/ PNG Inputs
B - Peruvian Codes/ PNG Inputs
C - Chilean Codes/ PNG Inputs

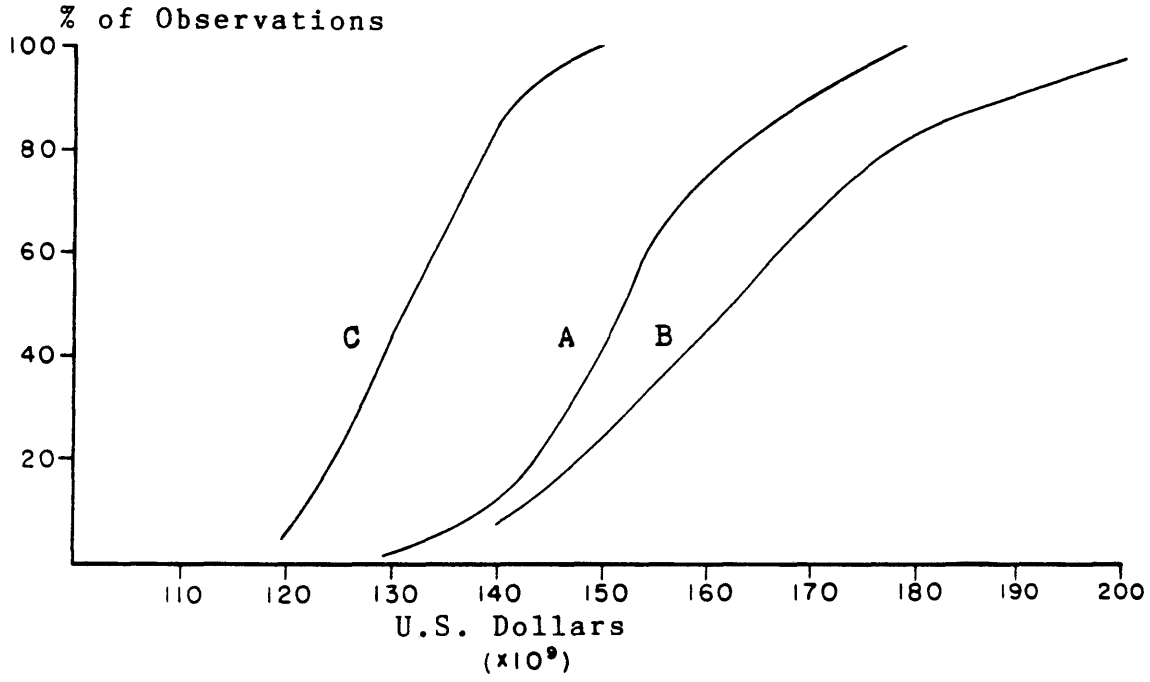


Figure 9-16
Papua New Guinean Retained Value Simulation Results

A - PNG Codes/ PNG Inputs
B - Peruvian Codes/ PNG Inputs
C - Chilean Codes/ PNG Inputs

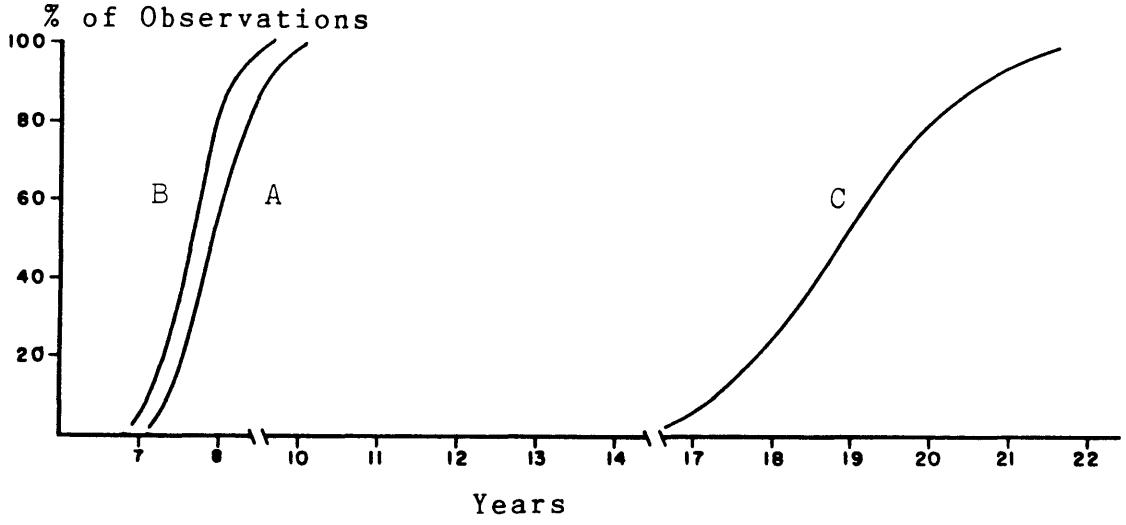


Figure 9-17
Papua New Guinean PAYBACK Simulation Results

A - PNG Codes/ PNG Inputs
B - Peruvian Codes/ PNG Inputs
C - Chilean Codes/ PNG Inputs

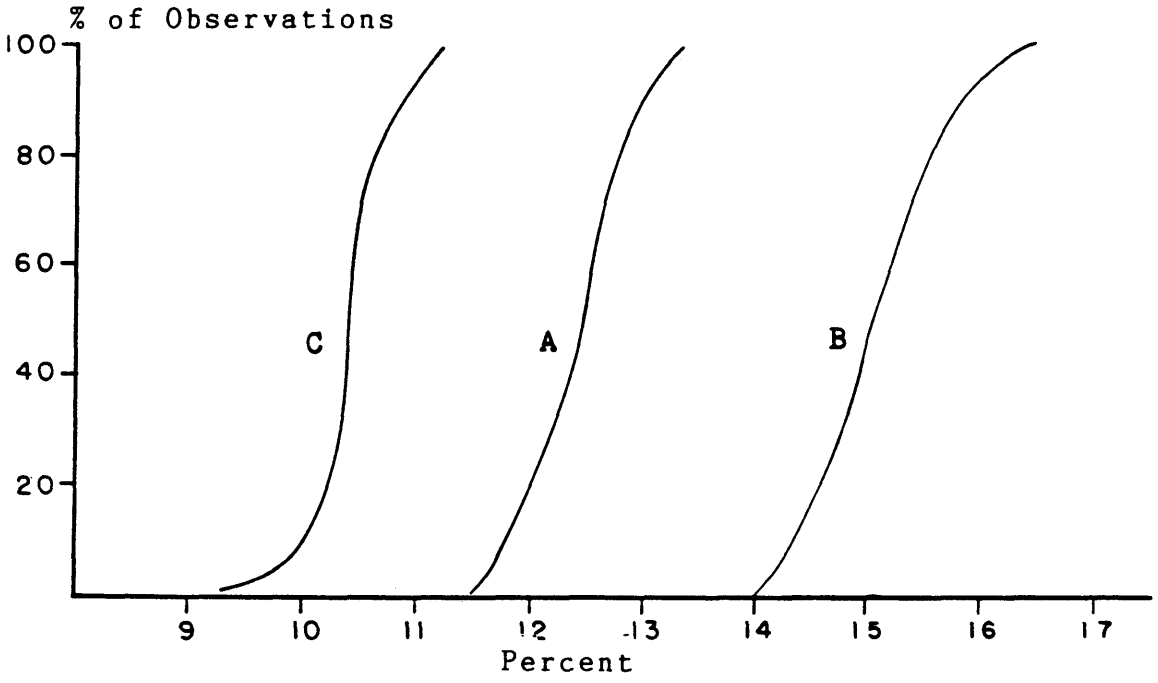


Figure 9-18

Papua New Guinean ROR Simulation Results

A - PNG Codes/ PNG Inputs
B - Peruvian Codes/ PNG Inputs
C - Chilean Codes/ PNG Inputs

for retained value, POE, and UPOE measurements are higher with the use of PNG's codes than with the use of either Peru's or Chile's codes, but at the same time have higher variances for retained value and POE measurements. Since the magnitude of these variances are relatively small, the perferred choice of government decision makers may to retain the PNG codes instead of either the Peruvian or the Chilean codes.

9-5 DETERMINISTIC ANALYSIS OF CHILE

Point stimates were generated for the tax codes of Chile, Peru, and Papua New Guinea using Chilean inputs. This was done to demonstrate the possible effect of all of the codes for one country. Cash flow outputs are shown in Tables 9-3, 9-4, 9-5. The results of this analysis were generally similar to the simulation study in section 9-2. In this case, retained value, POE, and UPOE measurements were highest with the use of PNG's codes. This again indicates that PNG's codes would be the preferred choice of government planners.

Values for rate of return and NPV usong the Chilean codes and the Peruvian codes were slightly lower than the mean values of the simulation study, but this does not significantly change the results based on the simulation

study. By using the Chilean codes, payback was again the highest of all codes and produced slightly lower rate of return and NPV values than the other codes. In this case, from the point of view of the firm, the choice as to which code is preferable would be PNG's code, although Peru's code would be a close competitor. Point estimates for this study is shown in Table 9-7. The differences in several of the results in the point estimates and the mean value of the simulation study is attributable to the number of samples taken for simulation.

Table 9-7
Point Estimates - Chilean Inputs

RETAINED VALUE (U.S.Dollars)	
Chilean Tax Codes/ Chilean Inputs	1.27×10^{11}
Peruvian Tax Codes/ Chilean Inputs	1.54×10^{11}
PNG Tax Codes/ Chilean Inputs	1.74×10^{11}
POE (RV/total value of exports)	
Chilean Tax Codes/ Chilean Inputs	.3924
Peruvian Tax Codes/ Chilean Inputs	.4754
PNG Tax Codes/ Chilean Inputs	.5361
UPOE (RV/unit value of exports/total value of exports)	
Chilean Tax Codes/ Chilean Inputs	3.93×10^{-10}
Peruvian Tax Codes/ Chilean Inputs	4.75×10^{-10}
PNG Tax Codes/ Chilean Inputs	5.36×10^{-10}
NPV (U.S. Dollars)	
Chilean Tax Codes/ Chilean Inputs	9.81×10^{8}
Peruvian Tax Codes/ Chilean Inputs	1.05×10^{9}
PNG Tax Codes/ Chilean Inputs	1.02×10^{9}

Table 9-7
(Continued)

RATE OF RETURN (percent)	
Chilean Tax Codes/ Chilean Inputs	15.2
Peruvian Tax Codes/Chilean Inputs	17.5
PNG Tax Codes/ Chilean Inputs	18.2
PAYBACK PERIOD (years)	
Chilean Tax Codes/Chilean Inputs	12.7
Peruvian Tax Codes/ Chilean Inputs	7.9
PNG Tax Codes/ Chilean Inputs	6.4

CHAPTER TEN

CONCLUSIONS

10.1 INTRODUCTION

In a climate of competition for mineral deposits, developing countries must be able to attract outside investment as a source of foreign exchange. In this environment, firms doing business or contemplating doing business overseas will critically evaluate investments in light of their goals or assumptions. At some point there must be a common ground where both the government and the firms can transact business. To best serve both parties, investment and tax codes should be structured not only for the benefit of the firm but also for the benefit of the government. Governments must be able to rank their codes with respect to other developing countries to attract outside investment.

10.2 TAX CODES IN CHILE

After examining the three sets of codes chosen, the hypothesis that the current tax codes are better for the firm and for the government than the other codes examined was not proven. For the case of the firm, either the PNG codes or the Peruvian codes were better than the Chilean

code, and from the government's point of view, the PNG codes were better. With the use of the Peruvian code and Chilean inputs, results of the simulation rate of return was higher than when using the Chilean code or the PNG code. Point estimates showed only a less than a one percentage point difference between the Peruvian code and the PNG code. With all three codes, using a point estimate NPV showed a roughly similar values for NPV. With the simulation study, there was a greater spread in values for NPV. In either case, the Chilean code did not rank as high as the other codes.

An interesting situation occured with payback period. Chile's codes showed the highest payback period values while its rate of return and NPV values were either higher (simulation study) or approximately the same (point estimate) as for the other codes. This is a result of the timing of the cash flows. The Chilean codes produced less cash flow in the early years of the project than with the use of the Peruvian or PNG codes. This is a critical factor when considering investments in other countries. If investors rank payback period highly, it could then result in choosing an investment with lower rate of return or NPV because of a lower payback period. Figure 10-1 shows this relationship. Curve 1 has a lower initial cash flow but

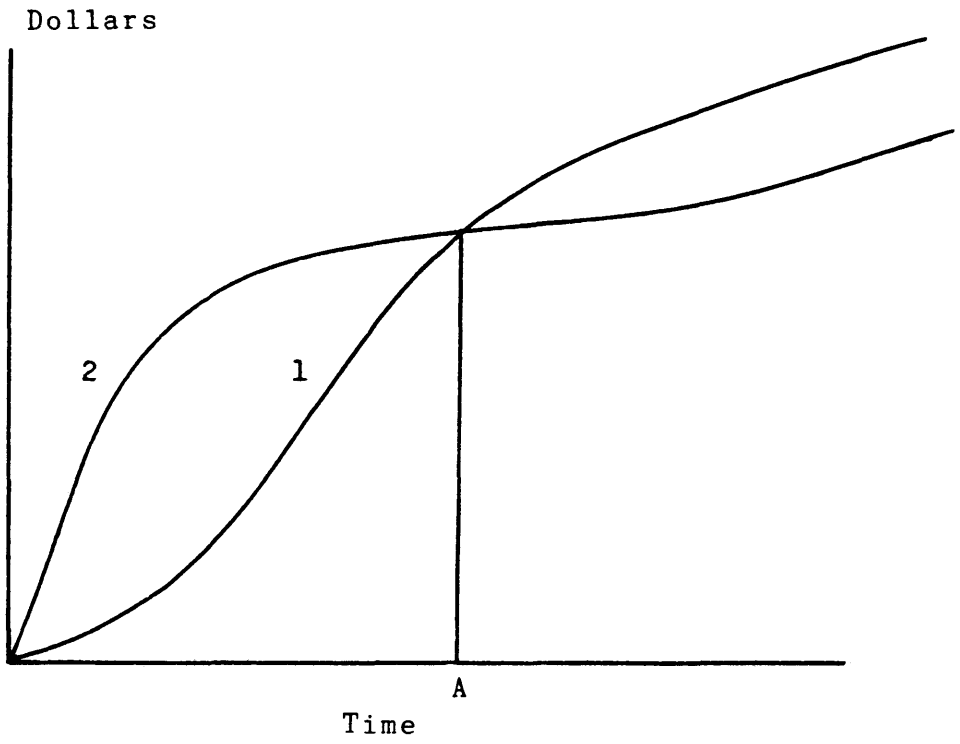


Figure 10-1
Timing of Cash Flows

increasing cash flow with time. Curve 2 has initial high cash flows but throws off less cash flow than Curve 1 at point A. In the case mentioned above, Curve 1 would represent the use of Chilean tax codes with Chilean inputs, and Curve 2 would represent Peruvian tax codes with Chilean inputs.

It is clear by looking at retained value, POE, and UPOE measurements that the Chilean codes rank the lowest and PNG the highest. Therefore, with respect to the goal of the government retaining as much of the value of the deposit as possible, the PNG codes would be the preferred choice.

10.3 TAX CODES IN PERU

In the case of using Peruvian inputs with the three tax codes, the hypothesis that the current tax codes are the best choice from the firm's point of view and the government's point of view was rejected. From the firm's point of view, the results are inconclusive as to which set of codes were better. For all three codes, rate of return and payback measurements showed a narrow range of values between the codes. Chile's codes showed a slightly higher rate of return and NPV values than the other codes but also demonstrated a slightly longer payback period. This is again the result of the timing of the cash flows from the

project.

The measurements used to judge the value of the project to the government showed that Peru's codes were roughly comparable to PNG's codes. This would not prove that the hypothesis is correct, but does indicate that Peru's codes accomplish similar effects on retained value of a resource rent tax for this type of deposit.

10.4 TAX CODES IN PAPUA NEW GUINEA

For the three cases chosen, from the firm's point of view, the hypothesis that the current codes are best was rejected. In comparing the three codes, the Peruvian codes demonstrated better results than the other codes. From the government's point of view, the hypothesis was confirmed that PNG's codes were better, more as a result of smaller variations in results although the codes did demonstrate higher overall values.

10.5 GENERAL CONCLUSION

From the point of view of the government, the existing tax codes may not be the most beneficial. From the point of view of the firm, the existing tax codes also may not be the most beneficial to the firm. In this analysis, one should be careful not to generalize the consequences of the codes

from country to country. One can only examine the effect of the codes within one country at a time. The reason for this is differing capital and operating cost structures for each case. If all cases had the same cost structure, it would have been possible to generalize between countries, but this was not the situation in this thesis.

When one compares all three cases from the firm's point of view, the hypothesis that the current codes for all three countries are the best codes for the circumstances given was rejected. In the case of Chile, the Peruvian codes were better. In the case of Peru, the results did not give a clear-cut answer as to which code was better. In the case of Papua New Guinea, the Peruvian codes demonstrated better financial measurements.

The hypothesis that the existing codes are preferrable from the government's point of view was also rejected except in the case of PNG. For all three countries, the PNG codes were shown to be preferable. In the case of the three countries examined, a resource rent tax would generate the highest amount of benefit for the government. This confirms the reason for establishing this type of taxing structure in PNG in the first place. It is clear from this analysis that the governments of Chile or Peru should consider some form of resource rent tax to capture more of the value from these

types of projects.

To arrive at a point where both the firm and the government would benefit from investments of this nature, a modified resource rent tax would have to be considered to prevent the loss of future investments. An examination of the effects on timing of cash flows by changing segments of tax codes could be one area of further study.

10.6 FURTHER RESEARCH

There are many areas that can be expanded upon that were briefly described in this thesis. A better understanding of the nature of the effects of the tax codes would be accomplished by expanding the simulation study to include more data points.

Further research also could be the updating and defining of the reasons for foreign investment by mining firms, similar to the approach taken by Kelly (1981). This type of study would be beneficial to other firms contemplating investments overseas and those firms who already have existing operations in other countries. Included in this analysis could also be a general evaluation of possible pitfalls in investing overseas.

REFERENCES CITED

Ahroni, Y. 1966. The Foreign Investment Decision Process. Boston: Harvard University. p. 362.

Banks, F. 1974. The World Copper Market: An Economic Analysis. Cambridge, Mass: Ballinger Pub. Co. p. 151.

Batchelder, A. and K. Haitani. 1981. International Economics. Columbus: Grid Pub. p. 471.

Behrman, J. R. 1977. Macroeconomic Policy in a Developing Country. Contribution to Economic Analysis 109. Amsterdam: North-Holland Publ. Co. p. 340.

Bennett, H. J. 1973. "The Mineral Policy of Selected Foreign Nations Considering Direct Foreign Investment in the Mineral Industry". M.S. Thesis. Golden: Colorado School of Mines. p. 85.

Bosson, R. and B. Varon. 1977. The Mining Industry and the Developing Countries. New York: Oxford University Press. p. 292.

Brodsky, D. A. and G. P. Sampson. 1980. "Retained Value and the Export Performance of Developing Countries." The Journal of Development Studies. Vol. 1. (October). pp. 32-47.

Bugnion, J. R. 1972. Capital Budgeting and International Corporations in International Finance for Multinational Business. L.C. Nehrt (ed.). Scranton, N.J.: Intext Educational Pub. 2nd ed. pp. 496-519.

Cobbe, J. H. 1979. Governments and Mining Companies in Developing Countries. Boulder, Co.: Westview Press. p. 332.

Cunningham, S. 1981. The Copper Industry in Zambia. New York: Praeger Pub. p. 343.

Faber, M. L. O. and J. G. Potter. 1971. Towards Economic Independence. Cambridge: Cambridge at the University Press. Occasional Paper 23. p. 134.

Fortin, C. 1980." Changing Roles of MNC'S," Mining for Development for the Third World. Sideri and Johns (eds.). New York: Pergaman Press. p. 360.

Garnaut, R. 1978. "Resource Trade and the Development Process in Developing Countries in Mineral Resources in the Pacific Area." Krause and Patrick (eds.). San Francisco: Federal Reserve Bank of San Francisco. p. 710.

Garnaut, R., and A. C. Ross. 1975. "Uncertainty, Risk Aversion and the Taxing of Natural Resource Projects." The Economic Journal. (June). pp. 272-286.

Garnaut, R. and A. C. Ross. 1983. Taxation of Mineral Rents. Oxford: Clarendon Press. p. 250.

Gillis, M. 1978. Taxation and Mining. Cambridge, Mass.: Ballinger Pub. Co. p. 276.

Gillis, M. and R. E. Beals. 1980. Tax and Investment Policies for Hard Minerals:Public and Multinational Enterprises in Indonesia. Cambridge, Mass.: Ballinger Pub. Co. p. 276.

Girvan, N. 1972. Copper in Chile: A Study in Conflict Between Corporate and National Economy. Kingston, Jamaica: Unwin Bros. p. 86.

Gluschke, W., J. Shaw, B. Varon. 1979. Copper: The Next Fifteen Years. Boston, Mass: D. Reidel Pub. Co. p. 177.

Gluschke, W. and B. Varon. 1980. "Mineral Objectives and Policies of Developing Countries: The Problem of Priorities." Workshop on Mineral Policies to Achieve Development Objectives.(May).

Inge, M. 1982. "A Model for Economic Evaluation of Alternative Mineral Development Strategies in Peru." Ph.D. Dissertation. Golden: Colorado School of Mines. p. 379.

Johnson, C. J. 1981. "Taking the Take But Not the Risk." Materials and Society. Vol.5 No.4. pp. 455-469.

Kelly, M. W. 1981. Foreign Investment Evaluation Practices of U.S. Multinatonal Corporations. Research for Business Decisions No.40. Ann Arbor: UMI Research Press. p. 232.

Khatkhate, D. 1982. "National and International Aspects of Financial Policies in LDC's: a Prologue." World Development. Vol. 10. No. 9. pp. 689-693.

Kirthisingha, P. N. 1982. "Viability of Processing in Copper Mining Areas." Resources Policy. (Dec.). Vol. 8, No. 4. pp. 285-304.

Lasaga, M. 1981. The Copper Industry in the Chilean Economy. Lexington, Mass: Lexington Books. p. 198.

Mamalakis, M. and C. W. Reynolds. 1965. Essays on the Chilean Economy. Homewood, Ill.: Richard D. Irwin, Inc. p. 409.

Mikesell, R. F. 1979. The World Copper Industry. Baltimore, Md.: J.Hopkins Press for Resources For The Future. p. 393.

Mikesell, R. F. 1975. Foreign Investment in Copper Mining. Baltimore, Md.: J.Hopkins Press for Resources for the Future Inc. p. 143.

Mikesell, R. F. 1971. Foreign Investment in the Petroleum and Mining Industries. Baltimore, Md.: J.Hopkins Press. p. 262.

Moran, T. H. 1973. "Transnational Strategies of Protection and Defense by Multinational Corporations: Spreading the Risk and Raising the Cost for Nationalization in Natural Resources." International Organization. (Spring). pp. 273-287.

Prain, R. 1975. Copper (The Anatomy of an Industry). London: Mining Journal Books, Ltd. p. 289.

Shapiro, A. C. 1981. "Managing Political Risk: A Policy Approach." Columbia Journal of World Business. Vol. 16, No.3. pp. 63-70.

Slater, L. C. 1979. "The Andean Pact: Policies and Investment Environment for Mineral Development." M.S. Thesis. Golden: Colorado School of Mines. p. 82.

Stonehill, A. and L. Nathanson. 1968. "Capital Budgeting and the Multinational Corporation." California Management Review. Vol. 10. No.4. (Summer). pp. 39-53.

Wai, U. T. 1975. "Some Economic Concepts and Policy Issues in Developing Countries." Finance and Development. Vol 12. No. 2. pp. 27-30.

Walde, T. W. 1978. "Control of Transnational Corporations by Host Developing Countries. Round Table on Negotiations with Transnational Corporations." United Nations Centre on Transnational Corporations.

Welborn, L. E. 1970. "The Present and Future Role of U.S. Mining Investments in Latin America." M.S. Thesis. Golden: Colorado School of Mines. p. 94.

APPENDIX

Computer Programs

The set of programs included in this thesis use the same parameter names for both the input and output sections of the programs. The user of these programs is given a choice at the beginning of the program of choosing a base case estimate or a sensitivity analysis. In both cases the user is asked for input data to generate cash flows and other financial measurments. After inputing the data required for the program, a subroutine is entered to calculate financial measurements. At this point, output is sent to either the printer or the disk. For the base case estimate, output is sent to a printer. For a simulation analysis, a random number is generated for each parameter to be changed. By a subroutine using a triangular distribution, these parameters are changed for the calculation of the financial measurements examined in this thesis. Output is sent to the second disk drive to a file named datal.text for further analysis with other programs at the disposal of the user. Output for the base case and the simulation analysis is limited to a maximum of 50 years. A list of the parameters used in these programs is given following the listing of the programs.

Computer Program - Papua New Guinea

```
FORTRAN Compiler II.1  [1.1]
    0.      0 $USES URRPV IN FORT1:PNG12B.CODE OVERLAY
    1.      0 $USES UOUT3 IN FORT2:PNG12C.CODE OVERLAY
    2.      0 $USES URAN IN FORT2:PNG12D.CODE OVERLAY
    3.      0 $USES UOUT2 IN FORT2:PNG12E.CODE OVERLAY
    4.      0 $USES APPLESTUFF
    5.      0       PROGRAM PNG
    6.      0       COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
    7.      0       COMMON/LIST/CAR
    8.      0       COMMON/DUP/COL
    9.      0       COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
   10.      0       COMMON/RTV/RV,RV2,TOT,POV
   11.      0       COMMON/THRD/ZZ,Z
   12.      0       CHARACTER*15 CAR(18,1)
   13.      0       CHARACTER*2 COL(1,50)
   14.      0       DIMENSION A(21,50)
   15.      0       DIMENSION B(21,50)
   16.      0       EXTERNAL RAN
   17.      0 C     ---INTRODUCTION---
***18.      0       WRITE(*,50)'**************************************************
   19.      0      C**********************'
   20.    100    50 FORMAT(A72)
   21.    100       WRITE(*,100)'THIS PROGRAM CALCULATES CASH FLOWS FOR MINING
   22.    100      C PROJECTS IN PAPUA NEW'
   23.    195   100 FORMAT(A67)
   24.    195       WRITE(*,105)' '
   25.    223   105 FORMAT(A1)
TUR■6.    223       WRITE(*,110)'GUINEA. THIS PROGRAM REQUESTS INPUTS AND WILL RE
   27.    223      C HARD COPY FOR A '
   28.    319   110 FORMAT(A69)
   29.    319       WRITE(*,115)' '
   30.    347   115 FORMAT(A1)
   31.    347       WRITE(*,120)'SINGLE CASH FLOW OR A DISK FILE FOR A SIMULATION
   32.    347      C STUDY.'
   33.    429   120 FORMAT(A55)
   34.    429       WRITE(*,125)' '
   35.    457   125 FORMAT(A1)
   36.    457       WRITE(*,130)'CASH FLOWS ARE LIMITED TO 50 YEARS.'
   37.    519   130 FORMAT(A35)
   38.    519       WRITE(*,135)' '
   39.    547   135 FORMAT(A1)
***40.    547       WRITE(*,140)'**************************************************
   41.    547      C**********************'
   42.    646   140 FORMAT(A72)
   43.    646       WRITE(*,145)' '
   44.    675   145 FORMAT(A1)
:' 45.    675       WRITE(*,150)'IF YOU WISH SENSITIVITY ENTER 1,IF NOT, ENTER 2.
   46.    751   150 FORMAT(A49)
   47.    751       READ(*,170) IP
   48.    784   170 FORMAT(BN,I2)
   49.    784       IF(IP.EQ.1) GO TO 1400
   50.    791       IF(IF.EQ.2) GO TO 180
   51.    798 C     ---ENTER PARAMETERS FOR CASH FLOW---
   52.    798   180 WRITE(*,200)'ENTER THE MINING RATE PER DAY'
   53.    855   200 FORMAT(A29)
   54.    855       READ(*,250) XRATE
   55.    891   250 FORMAT(F10.0)
   56.    891       WRITE(*,300)'ENTER THE CAPITAL COSTS FOR THIS PROJECT'
   57.    958   300 FORMAT(A40)
   58.    958       READ(*,350) CC
   59.    995   350 FORMAT(F12.0)
   60.    995       WRITE(*,400)'ENTER EXPLORATION COSTS'
   61.   1045   400 FORMAT(A23)
   62.   1045       READ(*,450) EX
   63.   1082   450 FORMAT(F10.0)
   64.   1082       WRITE(*,500)'ENTER DEVELOPMENT COSTS'
   65.   1133   500 FORMAT(A23)
   66.   1133       READ(*,550) DEV
```

```
   67.  1170   550 FORMAT(F10.0)
   68.  1170       WRITE(*,600)'ENTER TOTAL RESERVES FOR THIS PROJECT IN TONS'
   69.  1243   600 FORMAT(A45)
   70.  1243       READ(*,650) RES
   71.  1279   650 FORMAT(F12.0)
   72.  1279       WRITE(*,700)'ENTER OPERATING COSTS PER TON'
   73.  1335   700 FORMAT(A29)
   74.  1335       READ(*,750) OCOST
   75.  1371   750 FORMAT(F6.4)
   76.  1371       WRITE(*,800)'ENTER COPPER ORE GRADE IN PERCENT PER TON'
   77.  1439   800 FORMAT(A34)
   78.  1439       READ(*,850) CUG
   79.  1475   850 FORMAT(F6.4)
   80.  1475       WRITE(*,900)'ENTER GOLD GRADE IN OUNCES PER TON'
   81.  1536   900 FORMAT(A34)
   82.  1536       READ(*,950) AUG
   83.  1573   950 FORMAT(F6.4)
   84.  1573       WRITE(*,1000)'ENTER COPPER PRICE IN DOLLARS'
   85.  1629  1000 FORMAT(A29)
   86.  1629       READ(*,1050) CUP
   87.  1665  1050 FORMAT(F6.4)
   88.  1665       WRITE(*,1100)'ENTER GOLD PRICE PER OUNCE IN DOLLARS'
   89.  1729  1100 FORMAT(A37)
   90.  1729       READ(*,1150) AUP
   91.  1765  1150 FORMAT(F6.4)
 ' 92.  1765       WRITE(*,1153)'ENTER THE AMOUNT OF WORKING CAPITAL FOR PROJECT
   93.  1839  1153 FORMAT(A47)
   94.  1839       READ(*,1155) WC
   95.  1875  1155 FORMAT(F12.0)
   96.  1875       WRITE(*,1160)'ENTER THE DISCOUNT RATE FOR NPV CALCULATIONS'
   97.  1946  1160 FORMAT(A44)
   98.  1946       READ(*,1170) DISRT
   99.  1983  1170 FORMAT(F6.2)
AR$00.  1983       WRITE(*,1180)'ENTER THE PERCENT OF INVESTMENT IS LOAN IN DOLL
  101.  2060  1180 FORMAT(A47)
  102.  2060       READ(*,1185) P1
  103.  2098  1185 FORMAT(F8.3)
  104.  2098       WRITE(*,1190)'ENTER THE INTEREST RATE ON THE LOAN AMOUNT'
  105.  2168  1190 FORMAT(A42)
  106.  2168       READ(*,1195) PIN
  107.  2206  1195 FORMAT(F8.3)
  108.  2206       WRITE(*,1200)'ENTER THE ESCALATION RATE FOR COSTS'
  109.  2269  1200 FORMAT(A35)
  110.  2269       READ(*,1250) ES1
  111.  2306  1250 FORMAT(F10.5)
  112.  2306       WRITE(*,1300)'ENTER THE ESCALATION RATE FOR REVENUES'
  113.  2372  1300 FORMAT(A38)
  114.  2372       READ(*,1350) ES2
  115.  2410  1350 FORMAT(F10.5)
  116.  2410       API=CC*P1
  117.  2434 C     ---LIMIT CASH FLOWS TO 50 YEARS---
  118.  2434       RNUM=RES/(XRATE*250.0)
  119.  2460       NUM=INT(RNUM)
  120.  2473       IF(NUM.GT.50) THEN
  121.  2483       NUM=50
  122.  2491       ENDIF
  123.  2491       CALL RRPV
  124.  2494 C     ---CALL OUTPUT SUBROUTINES---
  125.  2494       CALL OUT
  126.  2496       CALL OUT2
  127.  2499       CALL OUT3
  128.  2502       CALL OUT4
  129.  2505       GO TO 1500
  130.  2507  1400 CALL SIM
  131.  2510  1500 END
  132.     0
  133.     0       SUBROUTINE OUT
  134.     0       COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
  135.     0       COMMON/LIST/CAR
  136.     0       COMMON/DUP/COL
  137.     0       COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
  138.     0       COMMON/RTV/RV,RV2,TOT,POV
  139.     0       CHARACTER*15 CAR(18,1)
  140.     0       CHARACTER*2 COL(1,50)
  141.     0       DIMENSION A(21,50)
```

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  142.      0        DIMENSION B(21,50)
  143.      0 C      ---OUTPUT OF PARAMETERS USED IN CASH FLOW---
  144.      0        OPEN(3,FILE='PRINTER:')
  145.     20        WRITE(3,80)'PARAMETERS USED FOR CASH FLOW'
  146.     77     80 FORMAT(25X,A29,25X)
***147.     77        WRITE(3,90)'**********************************************************
  148.     77       C*****************************'
  149.    184     90 FORMAT(A80)
  150.    184        WRITE(3,95)'MINING RATE=    ',XRATE,'      TONS PER DAY'
  151.    261     95 FORMAT(A15,F8.0,A17)
  152.    261        WRITE(3,115)' '
  153.    289    115 FORMAT(A1)
  154.    289        WRITE(3,120)'INVESTMENT =',CC
  155.    338    120 FORMAT(A12,F13.0)
  156.    338        WRITE(3,125)' '
  157.    367    125 FORMAT(A1)
  158.    367        WRITE(3,130)'RESERVES =',RES,'    TONS'
  159.    429    130 FORMAT(A10,F15.0,A7)
  160.    429        WRITE(3,135)' '
  161.    457    135 FORMAT(A1)
  162.    457        WRITE(3,140)'OPERATING COSTS =',OCOST,' PER TON'
  163.    526    140 FORMAT(A17,F10.2,A8)
  164.    526        WRITE(3,145) ' '
  165.    555    145 FORMAT(A1)
  166.    555        WRITE(3,150)'COPPER ORE GRADE =  ',CUG,' PER TON'
  167.    628    150 FORMAT(A20,F7.2,A8)
  168.    628        WRITE(3,155)' '
  169.    657    155 FORMAT(A1)
  170.    657        WRITE(3,160)'GOLD ORE GRADE =    ',AUG,' OUNCES PER TON'
  171.    735    160 FORMAT(A19,F8.2,A15)
  172.    735        WRITE(3,165)' '
  173.    763    165 FORMAT(A1)
  174.    763        WRITE(3,170)'COPPER PRICE =      ',CUP,' DOLLARS PER POUND'
  175.    844    170 FORMAT(A19,F8.2,A18)
  176.    844        WRITE(3,175) ' '
  177.    873    175 FORMAT(A1)
  178.    873        WRITE(3,180)'GOLD PRICE =      ',AUP,' DOLLARS PER OUNCE'
  179.    952    180 FORMAT(A17,F10.2,A18)
  180.    952        WRITE(3,185)' '
  181.    981    185 FORMAT(A1)
  182.    981        ADISR=100.0*DISRT
  183.   1000        WRITE(3,190)'DISCOUNT RATE =     ',ADISR,' PERCENT'
  184.   1070    190 FORMAT(A20,F7.2,A8)
  185.   1070        WRITE(3,195)' '
  186.   1099    195 FORMAT(A1)
  187.   1099        WRITE(3,200)'THE PAYBACK PERIOD IS =',PAY,' YEARS'
  188.   1174    200 FORMAT(A23,F9.2,A6)
  189.   1174        WRITE(3,202)' '
  190.   1203    202 FORMAT(A1)
  191.   1203        WRITE(3,210)'RV = ',RV
  192.   1245    210 FORMAT(A5,F20.0)
  193.   1245        WRITE(3,215)' '
  194.   1273    215 FORMAT(A1)
  195.   1273        WRITE(3,220)'RV2 =',RV2
  196.   1315    220 FORMAT(A5,F20.0)
  197.   1315        WRITE(3,225)' '
  198.   1343    225 FORMAT(A1)
  199.   1343        WRITE(3,230)'TDT =',TDT
  200.   1385    230 FORMAT(A5,F20.12)
  201.   1385        WRITE(3,235)' '
  202.   1413    235 FORMAT(A1)
  203.   1413        WRITE(3,240)'POV =',POV
  204.   1455    240 FORMAT(A5,F20.12)
  205.   1455        WRITE(3,245)' '
  206.   1483    245 FORMAT(A1)
  207.   1483        WRITE(3,3610)'THE RATE OF RETURN IS =',RATE,' PERCENT'
  208.   1560   3610 FORMAT(A23,F9.1,A8)
  209.   1560        GO TO 4500
  210.   1562   3700 WRITE(3,3710)'THE RATE OF RETURN IS GREATER THAN 100 PERCENT'
  211.   1636   3710 FORMAT(A46)
  212.   1636        GO TO 4500
  213.   1638   3800 WRITE(3,3810)'THE RATE OF RETURN IS LESS THAN 0.0 PERCENT'
  214.   1709   3810 FORMAT(A41)
  215.   1709        GO TO 4500
  216.   1711   4500 CONTINUE
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  217.  1711        WRITE(3,4510)' '
  218.  1739   4510 FORMAT(A1)
  219.  1739        WRITE(3,4600)'THE NET PRESENT VALUE IS = ',PV
  220.  1804   4600 FORMAT(A27,F20.0)
  221.  1804        WRITE(3,4610)' '
  222.  1833   4610 FORMAT(A1)
  223.  1833        WRITE(3,4620)'THE AMOUNT OF THE LOAN IS =',API
  224.  1898   4620 FORMAT(A27,F12.0)
  225.  1898        WRITE(3,4630)' '
  226.  1927   4630 FORMAT(A1)
  227.  1927        WRITE(3,4640)'THE LOAN INTEREST RATE = ',PIN
  228.  1990   4640 FORMAT(A24,F8.3)
  229.  1990        WRITE(3,4645)' '
  230.  2019   4645 FORMAT(A1)
  231.  2019        WRITE(3,4646)'THE ESCALATION RATE FOR REVENUES =',ES2
  232.  2091   4646 FORMAT(A34,F6.2)
  233.  2091        WRITE(3,4647)' '
  234.  2119   4647 FORMAT(A1)
  235.  2119        WRITE(3,4648)'THE ESCALATION RATE FOR COSTS =',ES1
  236.  2188   4648 FORMAT(A31,F6.2)
  237.  2188        WRITE(3,4649)' '
  238.  2217   4649 FORMAT(A1)
  239.  2217        WRITE(3,4655)'**********************************************
  240.  2217       C************************************'
  241.  2324   4655 FORMAT(A80)
  242.  2324        DO 4670 I=1,15
  243.  2332        WRITE(3,4660) ' '
  244.  2361   4660 FORMAT(A1)
  245.  2361   4670 CONTINUE
  246.  2373 C     ---OUTPUT OF CASH FLOWS---
  247.  2373        WRITE(3,4675)'CASH FLOW-PAPUA NEW GUINEA'
  248.  2426   4675 FORMAT(23X,A26,23X)
  249.  2426        WRITE(3,4677)'**********************************************
  250.  2426       C************************************'
  251.  2534   4677 FORMAT(A80)
  252.  2534        CAR(1,1)='GROSS REVENUES '
  253.  2569        CAR(2,1)='GROSS REVS(ESC)'
  254.  2605        CAR(3,1)='OP.COSTS       '
  255.  2641        CAR(4,1)='OP.COSTS (ESC) '
  256.  2677        CAR(5,1)='DEPRECIATION   '
  257.  2713        CAR(6,1)='INTEREST       '
  258.  2749        CAR(7,1)='LOSS FORWARD   '
  259.  2785        CAR(8,1)='EXPLORATION    '
  260.  2821        CAR(9,1)='DEVELOPMENT    '
  261.  2857        CAR(10,1)='SUBTOTAL       '
  262.  2893        CAR(11,1)='FIRST CATEGORY '
  263.  2929        CAR(12,1)='FIRST TAX      '
  264.  2965        CAR(13,1)='SEC.CATEGORY   '
  265.  3001        CAR(14,1)='SEC. TAX       '
  266.  3037        CAR(15,1)='SUBTOTAL       '
  267.  3073        CAR(16,1)='WRKG. CAP.RET  '
  268.  3109        CAR(17,1)='PRINC.PAYMNTS  '
  269.  3145        CAR(18,1)='NET CASH FLOW  '
  270.  3181        END

FORTRAN Compiler II.1  [1.1]
    0.     0        SUBROUTINE OUT2
    1.     0        COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
    2.     0        COMMON/LIST/CAR
    3.     0        COMMON/DUP/COL
    4.     0        COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
    5.     0        COMMON/RTV/RV,RV2,TOT,POV
    6.     0        CHARACTER*15 CAR(18,1)
    7.     0        CHARACTER*2 COL(1,50)
    8.     0        DIMENSION A(21,50)
    9.     0        DIMENSION B(21,50)
   10.     0 C      ---OUTPUT CONTINUED---
   11.     0        COL(1,1)='1'
   12.    19        COL(1,2)='2'
   13.    38        COL(1,3)='3'
   14.    57        COL(1,4)='4'
   15.    76        COL(1,5)='5'
   16.    95        COL(1,6)='6'
   17.   114        COL(1,7)='7 '
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18.    133        COL(1,8)='8 '
19.    152        COL(1,9)='9 '
20.    171        COL(1,10)='10'
21.    190        COL(1,11)='11'
22.    209        COL(1,12)='12'
23.    228        COL(1,13)='13'
24.    247        COL(1,14)='14'
25.    266        COL(1,15)='15'
26.    285        COL(1,16)='16'
27.    304        COL(1,17)='17'
28.    323        COL(1,18)='18'
29.    342        COL(1,19)='19'
30.    361        COL(1,20)='20'
31.    380        COL(1,21)='21'
32.    399        COL(1,22)='22'
33.    418        COL(1,23)='23'
34.    437        COL(1,24)='24'
35.    456        COL(1,25)='25'
36.    475        COL(1,26)='26'
37.    494        COL(1,27)='27'
38.    513        COL(1,28)='28'
39.    532        COL(1,29)='29'
40.    551        COL(1,30)='30'
41.    570        COL(1,31)='31'
42.    589        COL(1,32)='32'
43.    608        COL(1,33)='33'
44.    627        COL(1,34)='34'
45.    646        COL(1,35)='35'
46.    665        COL(1,36)='36'
47.    684        COL(1,37)='37'
48.    703        COL(1,38)='38'
49.    722        COL(1,39)='39'
50.    741        COL(1,40)='40'
51.    760        COL(1,41)='41'
52.    779        COL(1,42)='42'
53.    798        COL(1,43)='43'
54.    817        COL(1,44)='44'
55.    836        COL(1,45)='45'
56.    855        COL(1,46)='46'
57.    874        COL(1,47)='47'
58.    893        COL(1,48)='48'
59.    912        COL(1,49)='49'
60.    931        COL(1,50)='50'
61.    950        IF(NUM.GT.1.AND.NUM.LT.6) GO TO 4680
62.    971        IF(NUM.GT.5) GO TO 4750
63.    983  4680 WRITE(3,4685)'YEAR            ',(COL(1,ICOL),ICOL=1,NUM)
64.   1074  4685 FORMAT(A15,5A12)
65.   1074       DO 4700 IROW=1,18
66.   1082       WRITE(3,4690) CAR(IROW,1),(A(IROW,ICOL),ICOL=1,NUM)
67.   1173  4690 FORMAT(A15,5F12.0)
68.   1173  4700 CONTINUE
69.   1185       WRITE(3,4740)' '
70.   1213  4740 FORMAT(A1)
71.   1213       GO TO 10000
72.   1215  4750 WRITE(3,4760)'YEAR',(COL(1,ICOL),ICOL=1,5)
73.   1290  4760 FORMAT(A4,18X,A2,4(10X,A2))
74.   1290       DO 4780 IROW=1,18
75.   1298       WRITE(3,4770) CAR(IROW,1),(A(IROW,ICOL),ICOL=1,5)
76.   1384  4770 FORMAT(A15,5F12.0)
77.   1384  4780 CONTINUE
78.   1396       WRITE(3,4785)' '
79.   1425  4785 FORMAT(A1)
80.   1425  4790 IF(NUM.GT.5.AND.NUM.LT.11) GO TO 4800
81.   1446       IF(NUM.GT.10)GO TO 5100
82.   1458  4800 WRITE(3,4810)'YEAR',(COL(1,ICOL),ICOL=6,NUM)
83.   1539  4810 FORMAT(A4,18X,A2,4(10X,A2))
84.   1539       DO 5000 IROW=1,18
85.   1547       WRITE(3,4850)CAR(IROW,1),(A(IROW,ICOL),ICOL=6,NUM)
86.   1637  4850 FORMAT(A15,5F12.0)
87.   1637  5000 CONTINUE
88.   1649       WRITE(3,5050)' '
89.   1677  5050 FORMAT(A1)
90.   1677       GO TO 10000
91.   1679  5100 WRITE(3,5110)'YEAR',(COL(1,ICOL),ICOL=6,10)
92.   1754  5110 FORMAT(A4,18X,A2,4(10X,A2))
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    93.  1754        DO 5200 IROW=1,18
    94.  1762        WRITE(3,5150) CAR(IROW,1),(A(IROW,ICOL),ICOL=6,10)
    95.  1848  5150 FORMAT(A15,5F12.0)
    96.  1848  5200 CONTINUE
    97.  1860        WRITE(3,5250)' '
    98.  1889  5250 FORMAT(A1)
    99.  1889 10000 CONTINUE
   100.  1889        RETURN

FORTRAN Compiler 11.1  [1.1]
     0.     0        SUBROUTINE OUT3
     1.     0        COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
     2.     0        COMMON/LIST/CAR
     3.     0        COMMON/DUP/COL
     4.     0        COMMON/RTV/RV,RV2,TOT,POV
     5.     0        CHARACTER*15 CAR(18,1)
     6.     0        CHARACTER*2 COL(1,50)
     7.     0        DIMENSION A(21,50)
     8.     0        DIMENSION B(21,50)
     9.     0 C      ---OUTPUT CONTINUED---
    10.     0        OPEN(3,FILE='PRINTER:')
    11.    20  5300 IF(NUM.GT.10.AND.NUM.LT.16) GO TO 5400
    12.    41        IF(NUM.GT.15) GO TO 5600
    13.    53  5400 WRITE(3,5410)'YEAR',(COL(1,ICOL),ICOL=11,NUM)
    14.   133  5410 FORMAT(A4,18X,A2,4(10X,A2))
    15.   133        DO 5450 IROW=1,18
    16.   141        WRITE(3,5440) CAR(IROW,1),(A(IROW,ICOL),ICOL=11,NUM)
    17.   231  5440 FORMAT(A15,5F12.0)
    18.   231  5450 CONTINUE
    19.   243        WRITE(3,5500)' '
    20.   271  5500 FORMAT(A1)
    21.   271        GO TO 11000
    22.   273  5600 WRITE(3,5610)'YEAR',(COL(1,ICOL),ICOL=11,15)
    23.   348  5610 FORMAT(A4,18X,A2,4(10X,A2))
    24.   348        DO 5700 IROW=1,18
    25.   356        WRITE(3,5640) CAR(IROW,1),(A(IROW,ICOL),ICOL=11,15)
    26.   442  5640 FORMAT(A15,5F12.0)
    27.   442  5700 CONTINUE
    28.   454        WRITE(3,5750)' '
    29.   483  5750 FORMAT(A1)
    30.   483  5800 IF(NUM.GT.15.AND.NUM.LT.21) GO TO 5900
    31.   504        IF(NUM.GT.20) GO TO 6100
    32.   516  5900 WRITE(3,5910)'YEAR',(COL(1,ICOL),ICOL=16,NUM)
    33.   597  5910 FORMAT(A4,18X,A2,4(10X,A2))
    34.   597        DO 6000 IROW=1,18
    35.   605        WRITE(3,5950) CAR(IROW,1),(A(IROW,ICOL),ICOL=16,NUM)
    36.   695  5950 FORMAT(A15,5F12.0)
    37.   695  6000 CONTINUE
    38.   707        WRITE(3,6050)' '
    39.   735  6050 FORMAT(A1)
    40.   735        GO TO 11000
    41.   737  6100 WRITE(3,6110)'YEAR',(COL(1,ICOL),ICOL=16,20)
    42.   812  6110 FORMAT(A4,18X,A2,4(10X,A2))
    43.   812        DO 6200 IROW=1,18
    44.   820        WRITE(3,6150) CAR(IROW,1),(A(IROW,ICOL),ICOL=16,20)
    45.   906  6150 FORMAT(A15,5F12.0)
    46.   906  6200 CONTINUE
    47.   918        WRITE(3,6250)' '
    48.   947  6250 FORMAT(A1)
    49.   947  6300 IF(NUM.GT.20.AND.NUM.LT.26) GO TO 6400
    50.   968        IF(NUM.GT.25) GO TO 6600
    51.   980  6400 WRITE(3,6410)'YEAR',(COL(1,ICOL),ICOL=21,NUM)
    52.  1061  6410 FORMAT(A4,18X,A2,4(10X,A2))
    53.  1061        DO 6500 IROW=1,18
    54.  1069        WRITE(3,6450) CAR(IROW,1),(A(IROW,ICOL),ICOL=21,NUM)
    55.  1160  6450 FORMAT(A15,5F12.0)
    56.  1160  6500 CONTINUE
    57.  1172        WRITE(3,6550)' '
    58.  1201  6550 FORMAT(A1)
    59.  1201        GO TO 11000
    60.  1203  6600 WRITE(3,6610)'YEAR',(COL(1,ICOL),ICOL=21,25)
    61.  1279  6610 FORMAT(A4,18X,A2,4(10X,A2))
    62.  1279        DO 6700 IROW=1,18
    63.  1287        WRITE(3,6650) CAR(IROW,1),(A(IROW,ICOL),ICOL=21,25)
    64.  1373  6650 FORMAT(A15,5F12.0)
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 65.  1373  6700 CONTINUE
 66.  1386       WRITE(3,6750)' '
 67.  1415  6750 FORMAT(A1)
 68.  1415  6800 IF(NUM.GT.25.AND.NUM.LT.31) GO TO 6900
 69.  1436       IF(NUM.GT.30) GO TO 7100
 70.  1448  6900 WRITE(3,6910)'YEAR',(COL(1,ICOL),ICOL=26,NUM)
 71.  1530  6910 FORMAT(A4,18X,A2,4(10X,A2))
 72.  1530       DO 7000 IROW=1,18
 73.  1538       WRITE(3,6950) CAR(IROW,1),(A(IROW,ICOL),ICOL=26,NUM)
 74.  1630  6950 FORMAT(A15,5F12.0)
 75.  1630  7000 CONTINUE
 76.  1643       WRITE(3,7050)' '
 77.  1671  7050 FORMAT(A1)
 78.  1671       GO TO 11000
 79.  1673  7100 WRITE(3,7110)'YEAR',(COL(1,ICOL),ICOL=26,30)
 80.  1749  7110 FORMAT(A4,18X,A2,4(10X,A2))
 81.  1749       DO 7200 IROW=1,18
 82.  1757       WRITE(3,7150) CAR(IROW,1),(A(IROW,ICOL),ICOL=26,30)
 83.  1843  7150 FORMAT(A15,5F12.0)
 84.  1843  7200 CONTINUE
 85.  1856       WRITE(3,7250)' '
 86.  1885  7250 FORMAT(A1)
 87.  1885  7300 IF(NUM.GT.31.AND.NUM.LT.36) GO TO 7400
 88.  1906       IF(NUM.GT.35) GO TO 7600
 89.  1918       IF(NUM.LT.31) GO TO 11000
 90.  1930  7400 WRITE(3,7410)'YEAR',(COL(1,ICOL),ICOL=31,NUM)
 91.  2012  7410 FORMAT(A4,18X,A2,4(10X,A2))
 92.  2012       DO 7500 IROW=1,18
 93.  2020       WRITE(3,7450) CAR(IROW,1),(A(IROW,ICOL),ICOL=31,NUM)
 94.  2112  7450 FORMAT(A15,5F12.0)
 95.  2112  7500 CONTINUE
 96.  2125       WRITE(3,7550)' '
 97.  2153  7550 FORMAT(A1)
 98.  2153       GO TO 11000
 99.  2155  7600 WRITE(3,7610)'YEAR',(COL(1,ICOL),ICOL=31,35)
100.  2231  7610 FORMAT(A4,18X,A2,4(10X,A2))
101.  2231       DO 7700 IROW=1,18
102.  2239       WRITE(3,7650) CAR(IROW,1),(A(IROW,ICOL),ICOL=31,35)
103.  2325  7650 FORMAT(A15,5F12.0)
104.  2325  7700 CONTINUE
105.  2338       WRITE(3,7750)' '
106.  2367  7750 FORMAT(A1)
107.  2367       GO TO 7800
108.  2369  7800 IF(NUM.GT.35.AND.NUM.LT.41) GO TO 7900
109.  2390       IF(NUM.GT.40) GO TO 8100
110.  2402  7900 WRITE(3,7910)'YEAR',(COL(1,ICOL),ICOL=36,NUM)
111.  2484  7910 FORMAT(A4,18X,A2,4(10X,A2))
112.  2484       DO 8000 IROW=1,18
113.  2492       WRITE(3,7950) CAR(IROW,1),(A(IROW,ICOL),ICOL=36,NUM)
114.  2584  7950 FORMAT(A15,5F12.0)
115.  2584  8000 CONTINUE
116.  2597       WRITE(3,8050)' '
117.  2625  8050 FORMAT(A1)
118.  2625       GO TO 11000
119.  2627  8100 WRITE(3,8110)'YEAR',(COL(1,ICOL),ICOL=36,40)
120.  2703  8110 FORMAT(A4,18X,A2,4(10X,A2))
121.  2703       DO 8200 IROW=1,18
122.  2711       WRITE(3,8150) CAR(IROW,1),(A(IROW,ICOL),ICOL=36,40)
123.  2797  8150 FORMAT(A15,5F12.0)
124.  2797  8200 CONTINUE
125.  2810       WRITE(3,8250)' '
126.  2839  8250 FORMAT(A1)
127.  2839 11000 CONTINUE
128.  2839       RETURN
129.  2841       END
130.     0
131.     0       SUBROUTINE OUT4
132.     0       COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
133.     0       COMMON/LIST/CAR
134.     0       COMMON/DUP/COL
135.     0       COMMON/RTV/RV,RV2,TOT,POV
136.     0       CHARACTER*15 CAR(18,1)
137.     0       CHARACTER*2 COL(1,50)
138.     0       DIMENSION A(21,50)
139.     0       DIMENSION B(21,50)
```

```
140.      0 C      ---OUTPUT CONTINUED---
141.      0        OPEN(3,FILE='PRINTER:')
142.     20  8300 IF(NUM.GT.40.AND.NUM.LT.46) GO TO 8400
143.     41        IF(NUM.GT.45) GO TO 8555
144.     53  8400 WRITE(3,8410)'YEAR',(COL(1,ICOL),ICOL=41,NUM)
145.    133  8410 FORMAT(A4,18X,A2,4(10X,A2))
146.    133        DO 8500 IROW=1,18
147.    141        WRITE(3,8450) CAR(IROW,1),(A(IROW,ICOL),ICOL=41,NUM)
148.    231  8450 FORMAT(A15,5F12.0)
149.    231  8500 CONTINUE
150.    243        WRITE(3,8550)' '
151.    271  8550 FORMAT(A1)
152.    271        GO TO 12000
153.    273  8555 WRITE(3,8560)'YEAR',(COL(1,ICOL),ICOL=41,45)
154.    348  8560 FORMAT(A4,18X,A2,4(10X,A2))
155.    348  8600 DO 8700 IROW=1,18
156.    356        WRITE(3,8650) CAR(IROW,1),(A(IROW,ICOL),ICOL=41,45)
157.    442  8650 FORMAT(A15,5F12.0)
158.    442  8700 CONTINUE
159.    454        WRITE(3,8750)' '
160.    483  8750 FORMAT(A1)
161.    483        GO TO 8755
162.    485  8755 WRITE(3,8760)'YEAR',(COL(1,ICOL),ICOL=46,NUM)
163.    565  8760 FORMAT(A4,18X,A2,4(10X,A2))
164.    565  8800 DO 8900 IROW=1,18
165.    573        WRITE(3,8850) CAR(IROW,1),(A(IROW,ICOL),ICOL=46,NUM)
166.    663  8850 FORMAT(A15,5F12.0)
167.    663  8900 CONTINUE
168.    675 12000 CONTINUE
169.    675        RETURN
170.    677        END
  0.      0 $USES APPLESTUFF
  1.      0        SUBROUTINE RRPV
  2.      0        COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
  3.      0        COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
  4.      0        COMMON/RTV/RV,RV2,TOT,POV
  5.      0        COMMON/THRD/ZZ,Z
  6.      0        DIMENSION A(21,50)
  7.      0        DIMENSION B(21,50)
  8.      0 C      ---CALCULATE GROSS REVENUES---
  9.      0        REVS=((CUG*CUP*22.0)+(AUG*AUP))*XRATE*250.0
 10.     59        DO 1200 I=1,NUM
 11.     72        A(1,I)=REVS
 12.     93  1200 CONTINUE
 13.    105        DO 1250 I=1,NUM
 14.    118        A(2,I)=A(1,I)*((1.0+ES2)**I)
 15.    174  1250 CONTINUE
 16.    186        XT1=0.0
 17.    196        DO 1275 I=1,NUM
 18.    209        XT1=XT1+A(2,I)
 19.    235  1275 CONTINUE
 20.    247 C      ---CALCULATE OPERATING COSTS---
 21.    247        YOCOST=250.0*OCOST*XRATE
 22.    274        DO 1300 I=1,NUM
 23.    287        A(3,I)=YOCOST
 24.    308  1300 CONTINUE
 25.    320        DO 1350 I=1,NUM
 26.    333        A(4,I)=A(3,I)*((1.0+ES1)**I)
 27.    390  1350 CONTINUE
 28.    402        XT2A=0.0
 29.    412        DO 1375 I=1,NUM
 30.    425        XT2A=XT2A+A(4,I)
 31.    451  1375 CONTINUE
 32.    463        XT2=XT2A*.31
 33.    479 C      ---CALCULATE DEPRECIATION---
 34.    479        DO 1400 I=1,4
 35.    487        A(5,I)=CC/4.0
 36.    519  1400 CONTINUE
 37.    532        DO 1500 I=5,NUM
 38.    545        A(5,I)=0.0
 39.    568  1500 CONTINUE
 40.    581 C      ---CALCULATE PRINCIPAL PAYMENTS---
 41.    581        P2=API/15.0
 42.    601        DO 1600 I=1,15
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 43.   609        A(17,I)=P2
 44.   630  1600 CONTINUE
 45.   643        DO 1650 I=16,NUM
 46.   656        A(17,I)=0.0
 47.   680  1650 CONTINUE
 48.   693 C      ---CALCULATE INTEREST ON LOAN---
 49.   693        A(6,1)=PIN*API
 50.   727        AA=API
 51.   739        DO 1700 I=2,15
 52.   747        A(6,I)=PIN*(AA-P2)
 53.   782        AA=AA-P2
 54.   795  1700 CONTINUE
 55.   808        DO 1750 I=16,NUM
 56.   821        A(6,I)=0.0
 57.   844  1750 CONTINUE
 58.   857        DO 1800 I=1,5
 59.   865        A(8,I)=EX/5.0
 60.   897  1800 CONTINUE
 61.   910        DO 1850 I=6,NUM
 62.   923        A(8,I)=0.0
 63.   946  1850 CONTINUE
 64.   959        DO 1900 I=1,10
 65.   967        A(9,I)=DEV/10.0
 66.   999  1900 CONTINUE
 67.  1012        DO 1925 I=11,NUM
 68.  1025        A(9,I)=0.0
 69.  1048  1925 CONTINUE
 70.  1061 C      ---CALCULATE LOSS FORWARD AND SUBTOTAL---
 71.  1061        A(7,1)=0.0
 72.  1084        A(10,1)=A(2,1)-A(4,1)-A(5,1)-A(6,1)-A(7,1)-A(8,1)-A(9,1)
 73.  1226        DO 1950 I=2,NUM
 74.  1239        A(7,I)=0.0
 75.  1262        A(10,I)=A(2,I)-A(4,I)-A(5,I)-A(6,I)-A(7,I)-A(8,I)-A(9,I)
 76.  1404        IF(A(10,I-1).LT.0.0) A(7,I)=(-1.0*A(10,I-1))
 77.  1479        A(10,I)=A(2,I)-A(4,I)-A(5,I)-A(6,I)-A(7,I)-A(8,I)-A(9,I)
 78.  1621  1950 CONTINUE
 79.  1634        A(11,1)=A(10,1)
 80.  1668        IF(A(10,1).LT.0.0) A(11,1)=0.0
 81.  1720        A(12,1)=A(11,1)*.35
 82.  1761        A(13,1)=0.0
 83.  1784        A(14,1)=0.0
 84.  1808        A(15,1)=A(10,1)-A(12,1)
 85.  1860        A(16,NUM)=WC
 86.  1889        DO 1960 I=1,NUM-1
 87.  1904        A(16,I)=0.0
 88.  1928  1960 CONTINUE
 89.  1941        A(18,1)=A(15,1)+A(5,1)+A(16,1)-A(17,1)+A(7,1)+A(8,1)+A(9,1)
 90.  2083        Z1=A(18,1)
 91.  2104        DO 2000 I=2,NUM
 92.  2117        IF(Z1.GT.CC) GO TO 1975
 93.  2134        A(11,I)=A(10,I)
 94.  2168        IF(A(10,I).LT.0.0) A(11,I)=0.0
 95.  2220        A(12,I)=A(11,I)*.35
 96.  2261        A(13,I)=0.0
 97.  2284        A(14,I)=0.0
 98.  2308        A(15,I)=A(10,I)-A(12,I)
 99.  2360        A(18,I)=A(15,I)+A(5,I)+A(16,I)-A(17,I)+A(7,I)+A(8,I)+A(9,I)
100.  2502        Z1=Z1+A(18,I)
101.  2528        GO TO 2000
102.  2530  1975 A(11,I)=CC*.2
103.  2561        IF(A(10,I).LT.0.0) A(11,I)=0.0
104.  2612        A(12,I)=A(11,I)*.365
105.  2653        A(13,I)=A(10,I)-A(11,I)
106.  2705        IF(A(10,I).LT.0.0) A(13,I)=0.0
107.  2756        A(14,I)=A(13,I)*.70
108.  2797        A(15,I)=A(10,I)-A(12,I)-A(14,I)
109.  2867        A(18,I)=A(15,I)+A(5,I)+A(16,I)-A(17,I)+A(7,I)+A(8,I)+A(9,I)
110.  3009  2000 CONTINUE
111.  3022        XT3=0.0
112.  3032        DO 2550 I=1,NUM
113.  3045        XT3=XT3+A(12,I)+A(14,I)
114.  3089  2550 CONTINUE
115.  3102 C      ---DISCOUNTED VALUE---
116.  3102        DO 2900 I=1,NUM
117.  3115        A(19,I)=A(18,I)*(1.0/((1.0+DISRT)**I))
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118.  3178  2900 CONTINUE
119.  3191       A(20,1)=0.0
120.  3214       DO 3000 I=1,NUM
121.  3227       A(20,1)=A(20,1)+A(19,I)
122.  3279  3000 CONTINUE
123.  3292 C      ---NET PRESENT VALUE---
124.  3292       PV=A(20,1)-CC-WC-EX-DEV
125.  3351 C      ---CALCULATE RATE OF RETURN---
126.  3351       XA=0.0
127.  3362       PX=0.0
128.  3372       DO 3100 M=1,NUM
129.  3385       PX=PX+A(18,M)*(1.0/((1.0+XA)**M))
130.  3439  3100 CONTINUE
131.  3454       IF(PX.LT.-100.0) GO TO 4800
132.  3471       IF(PX.GT.-100.0) GO TO 3200
133.  3489  3200 DO 4500 K=1,10
134.  3497       RR=K/10.0
135.  3512       P=0.0
136.  3522       DO 3300 J=1,NUM
137.  3535       P=P+A(18,J)*(1.0/((1.0+RR)**J))
138.  3589  3300 CONTINUE
139.  3604       PA=P-CC-WC-EX-DEV
140.  3646       IF(PA.GT.100.0.AND.RR.EQ.1.0) GO TO 4700
141.  3675       IF(PA.GT.100.0) GO TO 4500
142.  3692       IF(PA.LT.-100.0) GO TO 3400
143.  3709       IF(PA.GE.-100.0.AND.PA.LE.100.0) GO TO 4600
144.  3741  3400 DO 4400 J=1,100
145.  3749       ROR=(RR-.1)+(J/100.0)
146.  3777       PS=0.0
147.  3788       DO 3500 L=1,NUM
148.  3801       PS=PS+A(18,L)*(1.0/((1.0+ROR)**L))
149.  3855  3500 CONTINUE
150.  3870       PZ=PS-CC-WC-EX-DEV
151.  3912       IF(PZ.GT.100.0) GO TO 4400
152.  3928       IF(PZ.LT.-100.0) GO TO 3600
153.  3945       IF(PZ.GE.-100.0.AND.PA.LE.100.0) GO TO 4600
154.  3977  3600 DO 4300 IA=1,1000
155.  3987       RROR=(ROR-.01)+(IA/1000.0)
156.  4015       PL=0.0
157.  4026       DO 3700 JI=1,NUM
158.  4039       PL=PL+A(18,JI)*(1.0/((1.0+RROR)**JI))
159.  4093  3700 CONTINUE
160.  4108       PVAL=PL-CC-WC-EX-DEV
161.  4150       IF(PVAL.GT.100.0) GO TO 4300
162.  4166       IF(PVAL.LT.-100.0) GO TO 4230
163.  4183       IF(PVAL.GE.-100.0.AND.PVAL.LE.100.0) GO TO 4600
164.  4215  4230 RROR=(ROR-.01)+((IA-1)/1000.0)
165.  4245       GO TO 4600
166.  4247  4300 CONTINUE
167.  4262  4400 CONTINUE
168.  4277  4500 CONTINUE
169.  4292  4600 RATE =RROR*100
170.  4307       GO TO 4850
171.  4309  4700 RATE = 100.0
172.  4324       GO TO 4850
173.  4326  4800 RATE = 0.0
174.  4340 C      ---CALCULATE PAYBACK---
175.  4340  4850 TO=0.0
176.  4350       DO 4900 I=1,NUM
177.  4363       TA=TO
178.  4371       TO=TO+A(18,I)
179.  4397       T1=CC-TO
180.  4413       IF(T1.GT.0.0) GO TO 4900
181.  4430       IF(T1.LE.0.0) GO TO 5000
182.  4446  4900 CONTINUE
183.  4459  5000 PAY=(I-1)+((CC+EX+DEV-TA)/(TO-TA))
184.  4512       RV=XT2+XT3+(CC*.168)
185.  4544       RV2=XT2+XT3+(CC*.168)
186.  4576       TOT=RV/XT1
187.  4595       POV=(RV/RES)/XT1
188.  4622       RETURN
189.  4624       END
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FORTRAN Compiler II.1  [1.1]
    0.      0 $USES URRPV IN FORT1:PNG12B.CODE
    1.      0 $USES APPLESTUFF
    2.      0       FUNCTION RAN(XH,XL,XM)
    3.      0 C     ---CALCULATE RANDOM VARIABLES---
    4.      0       HI=1.0
    5.     10       LO=0.0
    6.     20       XB=(HI-LO)/32767.0
    7.     39       CALL RANDOI
    8.     42       RESULT=XB*RANDOM()+LO
    9.     60       XX=(XM-XL)/(XH-XL)
   10.     79       Q=(RESULT-XX)
   11.     92       IF(Q.GT.0.0) GO TO 100
   12.    108       RAN=XL+SQRT((XM-XL)*(XH-XL)*RESULT)
   13.    141       GO TO 200
   14.    143   100 RAN=XH-SQRT((XH-XM)*(XH-XL)*(1-RESULT))
   15.    179   200 RETURN
   16.    181       END
   17.      0
   18.      0       SUBROUTINE SIM
   19.      0       COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
   20.      0       COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
   21.      0       COMMON/RTV/RV,RV2,TOT,POV
   22.      0       COMMON/THRD/ZZ,Z
   23.      0       DIMENSION A(21,50)
   24.      0       DIMENSION B(21,50)
   25.      0 C     ---SIMULATE CASH FLOW---
   26.      0       WRITE(*,100)'ENTER THE NUMBER OF SIMULATIONS YOU REQUIRE'
   27.     71   100 FORMAT(A43)
   28.     71       READ(*,200) KOOT
   29.    104   200 FORMAT(BN,I3)
   30.    104       WRITE(*,250)'ENTER THE MINING RATE PER DAY'
   31.    161   250 FORMAT(A29)
   32.    161       READ(*,275) XRATE
   33.    197   275 FORMAT(F10.0)
   34.    197       WRITE(*,277)'ENTER THE DISCOUNT RATE FOR NPV CALCULATIONS'
   35.    268   277 FORMAT(A44)
   36.    268       READ(*,278) DISRT
   37.    305   278 FORMAT(F7.3)
   38.    305       WRITE(*,280)'ENTER THE AMOUNT OF WORKING CAPITAL FOR PROJECT'
   39.    379   280 FORMAT(A47)
   40.    379       READ(*,281) WC
   41.    415   281 FORMAT(F12.0)
   42.    415       WRITE(*,282)'ENTER THE PERCENT OF INVESTMENT IS IN LOAN'
   43.    484   282 FORMAT(A42)
   44.    484       READ(*,283) P1
   45.    522   283 FORMAT(F8.3)
   46.    522       WRITE(*,285)'ENTER THE INTEREST RATE OF THE LOAN AMOUNT'
   47.    592   285 FORMAT(A42)
   48.    592       READ(*,287) PIN
   49.    630   287 FORMAT(F8.3)
   50.    630       WRITE(*,289)'ENTER THE ESCALATION RATE FOR COSTS'
   51.    693   289 FORMAT(A35)
   52.    693       READ(*,291) ES1
   53.    730   291 FORMAT(F10.5)
   54.    730       WRITE(*,293)'ENTER THE ESCALATION RATE FOR REVENUES'
   55.    796   293 FORMAT(A38)
   56.    796       READ(*,295) ES2
   57.    834   295 FORMAT(F10.5)
TAL58.    834       WRITE(*,300)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR CAPI
   59.    834      C COSTS:'
   60.    920   300 FORMAT(A57)
   61.    920       READ(*,400) CHI,CLO,CML
   62.    964   400 FORMAT(F10.0/,F10.0/,F10.0)
   63.    964       WRITE(*,500)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   64.    964      C RESERVES:'
   65.   1045   500 FORMAT(A53)
   66.   1045       READ(*,550) RESHI,RESLO,RESML
   67.   1088   550 FORMAT(F15.0/,F15.0/,F15.0)
   68.   1088       WRITE(*,600)'ENTER EXPLORATION COSTS'
   69.   1139   600 FORMAT(A23)
   70.   1139       READ(*,650) EX
   71.   1176   650 FORMAT(F12.0)
   72.   1176       WRITE(*,700)'ENTER DEVELOPMENT COSTS'
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 73.  1227   700 FORMAT(A23)
 74.  1227       READ(*,750) DEV
 75.  1264   750 FORMAT(F12.0)
 76.  1264       WRITE(*,1100)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
 77.  1264      COP.COSTS:'
 78.  1345  1100 FORMAT(A53)
 79.  1345       READ(*,1200) OPHI,OPLO,OPML
 80.  1388  1200 FORMAT(F7.4/,F7.4/,F7.4)
 81.  1388       WRITE(*,1300)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
 82.  1388      CCOPPER GRADE:'
 83.  1473  1300 FORMAT(A57)
 84.  1473       READ(*,1400) CUHI,CULO,CUML
 85.  1516  1400 FORMAT(F6.4/,F6.4/,F6.4)
 86.  1516       WRITE(*,1500)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
 87.  1516      CGOLD GRADE:'
 88.  1599  1500 FORMAT(A55)
 89.  1599       READ(*,1600) AUHI,AULO,AUML
 90.  1642  1600 FORMAT(F6.4/,F6.4/,F6.4)
 91.  1642       WRITE(*,1700)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
 92.  1642      CCOPPER PRICE:'
 93.  1727  1700 FORMAT(A57)
 94.  1727       READ(*,1800) CUPHI,CUPLO,CUPML
 95.  1770  1800 FORMAT(F7.3/,F7.3/,F7.3)
 96.  1770       WRITE(*,1900)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
 97.  1770      CGOLD PRICE:'
 98.  1853  1900 FORMAT(A55)
 99.  1853       READ(*,2000) AUPHI,AUPLO,AUPML
100.  1896  2000 FORMAT(F5.0/,F5.0/,F5.0)
101.  1896       OPEN(15,FILE='FORT2:DATA1.TEXT',STATUS='NEW')
102.  1924       DO 2100 I=1,KOOT
103.  1932       CC=RAN(CHI,CLO,CML)
104.  1949       RES=RAN(RESHI,RESLO,RESML)
105.  1966       OCOST=RAN(OPHI,OPLO,OPML)
106.  1983       CUG=RAN(CUHI,CULO,CUML)
107.  2000       AUG=RAN(AUHI,AULO,AUML)
108.  2017       CUP=RAN(CUPHI,CUPLO,CUPML)
109.  2034       AUP=RAN(AUPHI,AUPLO,AUPML)
110.  2051       API=CC*P1
111.  2075       RNUM=RES/(XRATE*250.0)
112.  2102       NUM=INT(RNUM)
113.  2115       IF(NUM.GT.50) THEN
114.  2125       NUM=50
115.  2133       ENDIF
116.  2133       CALL RRPV
117.  2136       CALL DATOUT
118.  2138  2100 CONTINUE
119.  2153       CLOSE(15,STATUS='KEEP')
120.  2158       RETURN
121.  2160       END
122.     0
123.     0       SUBROUTINE DATOUT
124.     0       COMMON/SHARE/A,NUM,RATE,PV,B,PAY,P1,PIN,API,DEV,EX,ES1,ES2
125.     0       COMMON/LIST/CAR
126.     0       COMMON/DUP/COL
127.     0       COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
128.     0       COMMON/RTV/RV,RV2,TOT,POV
129.     0       COMMON/THRD/ZZ,Z
130.     0       CHARACTER*15 CAR(18,1)
131.     0       CHARACTER*2 COL(1,50)
132.     0       DIMENSION A(21,50)
133.     0       DIMENSION B(21,50)
134.     0 C     ---OUTPUT SIMULATION RESULTS---
135.     0       WRITE(15,600) RATE
136.    32   600 FORMAT(F9.1)
137.    32       WRITE(15,700) PAY
138.    64   700 FORMAT(F6.1)
139.    64       WRITE(15,800) RV
140.    95   800 FORMAT(F15.0)
141.    95       WRITE(15,900) RV2
142.   125   900 FORMAT(F15.0)
143.   125       WRITE(15,1000) TOT
144.   155  1000 FORMAT(F15.12)
145.   155       WRITE(15,1100) POV
146.   185  1100 FORMAT(F15.12)
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147.   185        WRITE(15,1200) PV
148.   216   1200 FORMAT(F15.0)
149.   216        RETURN
150.   218        END
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Computer Program - Peru

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FORTRAN Compiler II.1  [1.1]
    0.      0 $USES APPLESTUFF
    1.      0 $USES URRPV IN FORT2:PERB.CODE OVERLAY
    2.      0 $USES UEXT IN FORT2:PERC.CODE OVERLAY
    3.      0 $USES URAN IN FORT1:PERD.CODE OVERLAY
    4.      0       PROGRAM PERU
    5.      0       COMMON/SHARE/A,NUM,RATE,PV,PAY,API,P1,PIN,ES1,ES2,/LIST/CAR
    6.      0       COMMON/DUP/COL
    7.      0       COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
    8.      0       COMMON/RTV/RV,RV2,TOT,POV
    9.      0       CHARACTER*15 CAR(14,1)
   10.      0       CHARACTER*2 COL(1,50)
   11.      0       DIMENSION A(18,50)
   12.      0       EXTERNAL RAN
***13.      0       WRITE(*,50)'**************************************************
   14.      0      C**********************'
   15.    100    50 FORMAT(A72)
   16.    100 C      ---INTRODUCTION---
   17.    100       WRITE(*,100)'THIS PROGRAM CALCULATES CASH FLOWS FOR MINING
   18.    100      C PROJECTS IN PERU.THIS PRO'
   19.    199   100 FORMAT(A71)
   20.    199       WRITE(*,105)' '
   21.    227   105 FORMAT(A1)
   22.    227       WRITE(*,110)'GRAM REQUESTS INPUTS AND WILL RETURN
   23.    227      C HARD COPY FOR A SINGLE CASH FLOW,'
   24.    324   110 FORMAT(A70)
   25.    324       WRITE(*,115)' '
   26.    353   115 FORMAT(A1)
   27.    353       WRITE(*,120)'OR A DISK FILE FOR A SIMULATION STUDY.'
   28.    418   120 FORMAT(A38)
   29.    418       WRITE(*,125)' '
   30.    447   125 FORMAT(A1)
   31.    447       WRITE(*,130)'CASH FLOWS ARE LIMITED TO 50 YEARS.'
   32.    509   130 FORMAT(A35)
   33.    509       WRITE(*,135)' '
   34.    537   135 FORMAT(A1)
***35.    537       WRITE(*,140)'**************************************************
   36.    537      C**********************'
   37.    636   140 FORMAT(A72)
   38.    636       WRITE(*,145)' '
   39.    665   145 FORMAT(A1)
:' 40.    665       WRITE(*,150)'IF YOU WISH SENSITIVITY ENTER 1,IF NOT, ENTER 2.
   41.    741   150 FORMAT(A49)
   42.    741       READ(*,170) IP
   43.    774   170 FORMAT(BN,I2)
   44.    774       IF(IP.EQ.1) GO TO 1280
   45.    781       IF(IF.EQ.2) GO TO 180
   46.    788 C      ---ENTER PARAMETERS---
   47.    788   180 WRITE(*,200)'ENTER THE MINING RATE PER DAY'
   48.    845   200 FORMAT(A29)
   49.    845       READ(*,250) XRATE
   50.    881   250 FORMAT(F10.0)
   51.    881       WRITE(*,300)'ENTER THE INVESTMENT FOR THIS PROJECT'
   52.    945   300 FORMAT(A37)
   53.    945       READ(*,350) CC
   54.    981   350 FORMAT(F20.0)
   55.    981       WRITE(*,600)'ENTER TOTAL RESERVES FOR THIS PROJECT IN TONS'
   56.   1053   600 FORMAT(A45)
   57.   1053       READ(*,650) RES
   58.   1089   650 FORMAT(F20.0)
   59.   1089       WRITE(*,700)'ENTER OPERATING COSTS PER TON'
   60.   1145   700 FORMAT(A29)
   61.   1145       READ(*,750) OCOST
   62.   1181   750 FORMAT(F6.2)
   63.   1181       WRITE(*,800)'ENTER COPPER ORE GRADE IN PERCENT PER TON'
   64.   1249   800 FORMAT(A34)
   65.   1249       READ(*,850) CUG
   66.   1285   850 FORMAT(F6.4)
   67.   1285       WRITE(*,900)'ENTER GOLD GRADE IN OUNCES PER TON'
```

```
   68.  1346   900 FORMAT(A34)
   69.  1346       READ(*,950) AUG
   70.  1383   950 FORMAT(F6.4)
   71.  1383       WRITE(*,1000)'ENTER COPPER PRICE IN DOLLARS'
   72.  1439  1000 FORMAT(A29)
   73.  1439       READ(*,1050) CUP
   74.  1475  1050 FORMAT(F6.4)
   75.  1475       WRITE(*,1100)'ENTER GOLD PRICE PER OUNCE IN DOLLARS'
   76.  1539  1100 FORMAT(A37)
   77.  1539       READ(*,1150) AUP
   78.  1575  1150 FORMAT(F6.2)
   79.  1575       WRITE(*,1160)'ENTER THE DISCOUNT RATE FOR NPV CALCULATIONS'
   80.  1646  1160 FORMAT(A44)
   81.  1646       READ(*,1170) DISRT
   82.  1683  1170 FORMAT(F7.5)
*  83.  1683       WRITE(*,1180)'ENTER THE AMOUNT OF WORKING CAPITAL FOR PROJECT
   84.  1757  1180 FORMAT(A47)
   85.  1757       READ(*,1190) WC
   86.  1793  1190 FORMAT(F12.0)
ARS87.  1793       WRITE(*,1200)'ENTER THE PERCENT OF INVESTMENT IS LOAN IN DOLL
   88.  1870  1200 FORMAT(A50)
   89.  1870       READ(*,1210) P1
   90.  1908  1210 FORMAT(F8.3)
   91.  1908       WRITE(*,1220)'ENTER THE INTEREST RATE ON THE LOAN AMOUNT'
   92.  1978  1220 FORMAT(A42)
   93.  1978       READ(*,1230) PIN
   94.  2016  1230 FORMAT(F8.3)
   95.  2016       WRITE(*,1240)'ENTER THE ESCALATION RATE FOR COSTS'
   96.  2079  1240 FORMAT(A35)
   97.  2079       READ(*,1250) ES1
   98.  2116  1250 FORMAT(F10.5)
   99.  2116       WRITE(*,1260)'ENTER THE ESCALATION RATE FOR RESERVES'
  100.  2182  1260 FORMAT(A38)
  101.  2182       READ(*,1270) ES2
  102.  2220  1270 FORMAT(F10.5)
  103.  2220       API=CC*P1
  104.  2244 C      ---LIMIT CASH FLOW TO 50 YEARS---
  105.  2244       RNUM=RES/(XRATE*250.0)
  106.  2270       NUM=INT(RNUM)
  107.  2283       IF(NUM.GT.50) THEN
  108.  2293       NUM=50
  109.  2301       ENDIF
  110.  2301       CALL RRPV
  111.  2304 C      ---OUTPUT SUBROUTINES---
  112.  2304       CALL OUT
  113.  2306       CALL EXT1
  114.  2308       CALL EXT
  115.  2311       CALL EXT2
  116.  2314       GO TO 1300
  117.  2316  1280 CALL SIM
  118.  2319  1300 END

  119.     0
  120.     0       SUBROUTINE OUT
  121.     0       COMMON/SHARE/A,NUM,RATE,PV,PAY,API,P1,PIN,ES1,ES2,/LIST/CAR
  122.     0       COMMON/DUP/COL
  123.     0       COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
  124.     0       COMMON/RTV/RV,RV2,TOT,POV
  125.     0       CHARACTER*15 CAR(14,1)
  126.     0       CHARACTER*2 COL(1,50)
  127.     0       DIMENSION A(18,50)
  128.     0 C     ---OUTPUT RESULTS---
  129.     0       OPEN(3,FILE='PRINTER:')
  130.    20       WRITE(3,80)'PARAMETERS USED FOR CASH FLOW'
  131.    77    80 FORMAT(25X,A29,25X)
  132.    77       WRITE(3,90)'**************************************************
  133.    77      C**********************************'
  134.   184    90  FORMAT(A80)
  135.   184       WRITE(3,95)'MINING RATE=  ',XRATE,'      TONS PER DAY'
  136.   262    95 FORMAT(A14,F8.0,A18)
  137.   262       WRITE(3,115)' '
  138.   291   115 FORMAT(A1)
  139.   291       WRITE(3,120)'INVESTMENT =',CC
  140.   340   120 FORMAT(A12,F20.0)
  141.   340       WRITE(3,125)' '
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142.   369   125 FORMAT(A1)
143.   369       WRITE(3,130)'RESERVES =',RES,'  TONS'
144.   430   130 FORMAT(A10,F16.0,A6)
145.   430       WRITE(3,135)' '
146.   459   135 FORMAT(A1)
147.   459       WRITE(3,140)'OPERATING COSTS =',OCOST,' PER TON'
148.   528   140 FORMAT(A17,F10.2,A8)
149.   528       WRITE(3,145)' '
150.   557   145 FORMAT(A1)
151.   557       WRITE(3,150)'COPPER ORE GRADE =  ',CUG,' PER TON'
152.   630   150 FORMAT(A20,F7.2,A8)
153.   630       WRITE(3,155)' '
154.   659   155 FORMAT(A1)
155.   659       WRITE(3,160)'GOLD ORE GRADE =    ',AUG,' OUNCES PER TON'
156.   739   160 FORMAT(A20,F7.3,A15)
157.   739       WRITE(3,165)' '
158.   767   165 FORMAT(A1)
159.   767       WRITE(3,170)'COPPER PRICE =     ',CUP,' DOLLARS PER POUND'
160.   848   170 FORMAT(A19,F8.2,A18)
161.   848       WRITE(3,175)' '
162.   877   175 FORMAT(A1)
163.   877       WRITE(3,180)'GOLD PRICE =     ',AUP,' DOLLARS PER OUNCE'
164.   956   180 FORMAT(A17,F10.2,A18)
165.   956       WRITE(3,185)' '
166.   985   185 FORMAT(A1)
167.   985       ADISR=100.0*DISRT
168.  1004       WRITE(3,190)'DISCOUNT RATE =     ',ADISR,' PERCENT'
169.  1074   190 FORMAT(A20,F7.2,A8)
170.  1074       WRITE(3,195)' '
171.  1103   195 FORMAT(A1)
172.  1103       WRITE(3,200)'PAYBACK PERIOD IS =',PAY,'  YEARS'
173.  1175   200 FORMAT(A19,F7.2,A7)
174.  1175       WRITE(3,205)' '
175.  1203   205 FORMAT(A1)
176.  1203       WRITE(3,210)'RV = ',RV
177.  1245   210 FORMAT(A5,F20.0)
178.  1245       WRITE(3,215)' '
179.  1273   215 FORMAT(A1)
180.  1273       WRITE(3,220)'RV2 =',RV2
181.  1315   220 FORMAT(A5,F20.0)
182.  1315       WRITE(3,225)' '
183.  1343   225 FORMAT(A1)
184.  1343       WRITE(3,230)'TDT =',TDT
185.  1385   230 FORMAT(A5,F20.12)
186.  1385       WRITE(3,235)' '
187.  1413   235 FORMAT(A1)
188.  1413       WRITE(3,240)'POV =',POV
189.  1455   240 FORMAT(A5,F20.12)
190.  1455       WRITE(3,245)' '
191.  1483   245 FORMAT(A1)
192.  1483       WRITE(3,3610)'THE RATE OF RETURN IS=',RATE,' PERCENT'
193.  1558  3610 FORMAT(A22,F9.4,A8)
194.  1558       GO TO 4500
195.  1560  3700 WRITE(3,3710)'THE RATE OF RETURN IS GREATER THAN 100 PERCENT'
196.  1634  3710 FORMAT(A46)
197.  1634       GO TO 4500
198.  1636  3800 WRITE(3,3810)'THE RATE OF RETURN IS LESS THAN 0.0 PERCENT'
199.  1707  3810 FORMAT(A41)
200.  1707       GO TO 4500
201.  1709  4500 CONTINUE
202.  1709       WRITE(3,4520)' '
203.  1737  4520 FORMAT(A1)
204.  1737       WRITE(3,4600)'THE NET PRESENT VALUE IS =',PV
205.  1801  4600 FORMAT(A26,F15.0)
206.  1801       WRITE(3,4610)' '
207.  1829  4610 FORMAT(A1)
208.  1829       WRITE(3,4620)'THE AMOUNT OF THE LOAN IS =',API
209.  1894  4620 FORMAT(A27,F12.0)
210.  1894       WRITE(3,4630)' '
211.  1923  4630 FORMAT(A1)
212.  1923       APIN=100.0*PIN
213.  1943       WRITE(3,4640)'THE LOAN INTEREST RATE =',APIN
214.  2001  4640 FORMAT(A24,F9.2)
215.  2001       WRITE(3,4645)' '
216.  2029  4645 FORMAT(A1)
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217.  2029       WRITE(3,4646)'THE ESCALATION RATE FOR REVENUES =',ES2
218.  2101  4646 FORMAT(A34,F6.2)
219.  2101       WRITE(3,4647)' '
220.  2129  4647 FORMAT(A1)
221.  2129       WRITE(3,4648)'THE ESCALATION RATE FOR COSTS =',ES1
222.  2198  4648 FORMAT(A31,F6.2)
223.  2198       WRITE(3,4649)' '
224.  2227  4649 FORMAT(A1)
225.  2227       WRITE(3,4655)'***********************************************
226.  2227      C************************************'
227.  2334  4655 FORMAT(A80)
228.  2334       DO 4670 I=1,15
229.  2342       WRITE(3,4660) ' '
230.  2371  4660 FORMAT(A1)
231.  2371  4670 CONTINUE
232.  2383       WRITE(3,4675)'CASH FLOW-PERU'
233.  2424  4675 FORMAT(33X,A14,33X)
234.  2424       WRITE(3,4677)'***********************************************
235.  2424      C************************************'
236.  2532  4677 FORMAT(A80)
237.  2532       CAR(1,1)='GROSS REVENUES '
238.  2567       CAR(2,1)='GROS REVS (ESC)'
239.  2601       CAR(3,1)='OP.COSTS       '
240.  2635       CAR(4,1)='OP COSTS (ESC) '
241.  2669       CAR(5,1)='DEPRECIATION   '
242.  2703       CAR(6,1)='INTEREST       '
243.  2737       CAR(7,1)='LOSS FORWARD   '
244.  2771       CAR(8,1)='SUBTOTAL       '
245.  2805       CAR(9,1)='TAX            '
246.  2839       CAR(10,1)='WORKERS PART. '
247.  2873       CAR(11,1)='SUBTOTAL      '
248.  2907       CAR(12,1)='WKG CAP.RET.  '
249.  2941       CAR(13,1)='PRINC PAYMENTS'
250.  2975       CAR(14,1)='NET CASH FLOW '
251.  3009       COL(1,1)='1 '
252.  3028       COL(1,2)='2 '
253.  3047       COL(1,3)='3 '
254.  3066       COL(1,4)='4 '
255.  3085       COL(1,5)='5 '
256.  3104       COL(1,6)='6 '
257.  3123       COL(1,7)='7 '
258.  3142       COL(1,8)='8 '
259.  3161       COL(1,9)='9 '
260.  3180       COL(1,10)='10'
261.  3199       COL(1,11)='11'
262.  3218       COL(1,12)='12'
263.  3237       COL(1,13)='13'
264.  3256       COL(1,14)='14'
265.  3275       COL(1,15)='15'
266.  3294       COL(1,16)='16'
267.  3313       COL(1,17)='17'
268.  3332       COL(1,18)='18'
269.  3351       COL(1,19)='19'
270.  3370       COL(1,20)='20'
271.  3389       COL(1,21)='21'
272.  3408       COL(1,22)='22'
273.  3427       COL(1,23)='23'
274.  3446       COL(1,24)='24'
275.  3465       COL(1,25)='25'
276.  3484       COL(1,26)='26'
277.  3503       COL(1,27)='27'
278.  3522       COL(1,28)='28'
279.  3541       COL(1,29)='29'
280.  3560       COL(1,30)='30'
281.  3579       COL(1,31)='31'
282.  3598       COL(1,32)='32'
283.  3617       COL(1,33)='33'
284.  3636       COL(1,34)='34'
285.  3655       COL(1,35)='35'
286.  3674       COL(1,36)='36'
287.  3693       COL(1,37)='37'
288.  3712       COL(1,38)='38'
289.  3731       COL(1,39)='39'
290.  3750       COL(1,40)='40'
291.  3769       COL(1,41)='41'
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  292.   3788        COL(1,42)='42'
  293.   3807        COL(1,43)='43'
  294.   3826        COL(1,44)='44'
  295.   3845        COL(1,45)='45'
  296.   3864        COL(1,46)='46'
  297.   3883        COL(1,47)='47'
  298.   3902        RETURN
  299.   3904        END

  300.      0
  301.      0        SUBROUTINE EXT1
  302.      0        COMMON/SHARE/A,NUM,RATE,PV,PAY,P1,ES1,ES2,API,PIN,/LIST/CAR
  303.      0        COMMON/DUP/COL
  304.      0        COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
  305.      0        COMMON/RTV/RV,RV2,TOT,POV
  306.      0        CHARACTER*15 CAR(14,1)
  307.      0        CHARACTER*2 COL(1,50)
  308.      0        DIMENSION A(18,50)
  309.      0 C      ---OUTPUT CONTINUED---
  310.      0        COL(1,48)='48'
  311.     19        COL(1,49)='49'
  312.     38        COL(1,50)='50'
  313.     57        IF(NUM.GT.1.AND.NUM.LT.6) GO TO 4680
  314.     78        IF(NUM.GT.5) GO TO 4750
  315.     90  4680 WRITE(3,4685)'YEAR            ',(COL(1,ICOL),ICOL=1,NUM)
  316.    182  4685 FORMAT(A15,5A12)
  317.    182        DO 4700 IROW=1,14
  318.    190        WRITE(3,4690) CAR(IROW,1),(A(IROW,ICOL),ICOL=1,NUM)
  319.    280  4690 FORMAT(A15,5F12.0)
  320.    280  4700 CONTINUE
  321.    292        WRITE(3,4740)' '
  322.    321  4740 FORMAT(A1)
  323.    321        GO TO 10000
  324.    323  4750 WRITE(3,4760)'YEAR',(COL(1,ICOL),ICOL=1,5)
  325.    398  4760 FORMAT(A4,18X,A2,4(10X,A2))
  326.    398        DO 4780 IROW=1,14
  327.    406        WRITE(3,4770) CAR(IROW,1),(A(IROW,ICOL),ICOL=1,5)
  328.    491  4770 FORMAT(A15,5F12.0)
  329.    491  4780 CONTINUE
  330.    503        WRITE(3,4785)' '
  331.    531  4785 FORMAT(A1)
  332.    531  4790 IF(NUM.GT.5.AND.NUM.LT.11) GO TO 4800
  333.    552        IF(NUM.GT.10)GO TO 5100
  334.    564  4800 WRITE(3,4810)'YEAR',(COL(1,ICOL),ICOL=6,NUM)
  335.    645  4810 FORMAT(A4,18X,A2,4(10X,A2))
  336.    645        DO 5000 IROW=1,14
  337.    653        WRITE(3,4850)CAR(IROW,1),(A(IROW,ICOL),ICOL=6,NUM)
  338.    742  4850 FORMAT(A15,5F12.0)
  339.    742  5000 CONTINUE
  340.    754        WRITE(3,5050)' '
  341.    783  5050 FORMAT(A1)
  342.    783        GO TO 10000
  343.    785  5100 WRITE(3,5110)'YEAR',(COL(1,ICOL),ICOL=6,10)
  344.    860  5110 FORMAT(A4,18X,A2,4(10X,A2))
  345.    860        DO 5200 IROW=1,14
  346.    868        WRITE(3,5150) CAR(IROW,1),(A(IROW,ICOL),ICOL=6,10)
  347.    953  5150 FORMAT(A15,5F12.0)
  348.    953  5200 CONTINUE
  349.    965        WRITE(3,5250)' '
  350.    993  5250 FORMAT(A1)
  351.    993 10000 CONTINUE
  352.    993        RETURN
  353.    995        END

FORTRAN Compiler II.1  [1.1]
    0.      0        SUBROUTINE EXT
    1.      0        COMMON/SHARE/A,NUM,RATE,PV,PAY,P1,PIN,API,ES1,ES2,/LIST/CAR
    2.      0        COMMON/DUP/COL
    3.      0        COMMON/RTV/RV,RV2,TOT,POV
    4.      0        CHARACTER*15 CAR(14,1)
    5.      0        CHARACTER*2 COL(1,50)
    6.      0        DIMENSION A(18,50)
    7.      0        OPEN(3,FILE='PRINTER:')
    8.     20 C      ---OUTPUT CONTINUED---
    9.     20  5300 IF(NUM.GT.10.AND.NUM.LT.16) GO TO 5400
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10.     41        IF(NUM.GT.15) GO TO 5600
11.     53   5400 WRITE(3,5410)'YEAR',(COL(1,ICOL),ICOL=11,NUM)
12.    133   5410 FORMAT(A4,1BX,A2,4(10X,A2))
13.    133        DO 5450 IROW=1,14
14.    141        WRITE(3,5440) CAR(IROW,1),(A(IROW,ICOL),ICOL=11,NUM)
15.    230   5440 FORMAT(A15,5F12.0)
16.    230   5450 CONTINUE
17.    242        WRITE(3,5500)' '
18.    271   5500 FORMAT(A1)
19.    271        GO TO 10000
20.    273   5600 WRITE(3,5610)'YEAR',(COL(1,ICOL),ICOL=11,15)
21.    348   5610 FORMAT(A4,1BX,A2,4(10X,A2))
22.    348        DO 5700 IROW=1,14
23.    356        WRITE(3,5640) CAR(IROW,1),(A(IROW,ICOL),ICOL=11,15)
24.    441   5640 FORMAT(A15,5F12.0)
25.    441   5700 CONTINUE
26.    453        WRITE(3,5750)' '
27.    481   5750 FORMAT(A1)
28.    481        GO TO 5800
29.    483   5800 IF(NUM.GT.15.AND.NUM.LT.21) GO TO 5900
30.    504        IF(NUM.GT.20) GO TO 6100
31.    516   5900 WRITE(3,5910)'YEAR',(COL(1,ICOL),ICOL=16,NUM)
32.    597   5910 FORMAT(A4,1BX,A2,4(10X,A2))
33.    597        DO 6000 IROW=1,14
34.    605        WRITE(3,5950) CAR(IROW,1),(A(IROW,ICOL),ICOL=16,NUM)
35.    694   5950 FORMAT(A15,5F12.0)
36.    694   6000 CONTINUE
37.    706        WRITE(3,6050)' '
38.    735   6050 FORMAT(A1)
39.    735        GO TO 10000
40.    737   6100 WRITE(3,6110)'YEAR',(COL(1,ICOL),ICOL=16,20)
41.    812   6110 FORMAT(A4,1BX,A2,4(10X,A2))
42.    812        DO 6200 IROW=1,14
43.    820        WRITE(3,6150) CAR(IROW,1),(A(IROW,ICOL),ICOL=16,20)
44.    905   6150 FORMAT(A15,5F12.0)
45.    905   6200 CONTINUE
46.    917        WRITE(3,6250)' '
47.    945   6250 FORMAT(A1)
48.    945        GO TO 6300
49.    947   6300 IF(NUM.GT.20.AND.NUM.LT.26) GO TO 6400
50.    968        IF(NUM.GT.25) GO TO 6600
51.    980   6400 WRITE(3,6410)'YEAR',(COL(1,ICOL),ICOL=21,NUM)
52.   1061   6410 FORMAT(A4,1BX,A2,4(10X,A2))
53.   1061        DO 6500 IROW=1,14
54.   1069        WRITE(3,6450) CAR(IROW,1),(A(IROW,ICOL),ICOL=21,NUM)
55.   1159   6450 FORMAT(A15,5F12.0)
56.   1159   6500 CONTINUE
57.   1171        WRITE(3,6550)' '
58.   1199   6550 FORMAT(A1)
59.   1199        GO TO 10000
60.   1201   6600 WRITE(3,6610)'YEAR',(COL(1,ICOL),ICOL=21,25)
61.   1277   6610 FORMAT(A4,1BX,A2,4(10X,A2))
62.   1277        DO 6700 IROW=1,14
63.   1285        WRITE(3,6650) CAR(IROW,1),(A(IROW,ICOL),ICOL=21,25)
64.   1370   6650 FORMAT(A15,5F12.0)
65.   1370   6700 CONTINUE
66.   1383        WRITE(3,6750)' '
67.   1411   6750 FORMAT(A1)
68.   1411        GO TO 6800
69.   1413   6800 IF(NUM.GT.25.AND.NUM.LT.31) GO TO 6900
70.   1434        IF(NUM.GT.30) GO TO 7100
71.   1446   6900 WRITE(3,6910)'YEAR',(COL(1,ICOL),ICOL=26,NUM)
72.   1528   6910 FORMAT(A4,1BX,A2,4(10X,A2))
73.   1528        DO 7000 IROW=1,14
74.   1536        WRITE(3,6950) CAR(IROW,1),(A(IROW,ICOL),ICOL=26,NUM)
75.   1627   6950 FORMAT(A15,5F12.0)
76.   1627   7000 CONTINUE
77.   1640        WRITE(3,7050)' '
78.   1669   7050 FORMAT(A1)
79.   1669        GO TO 10000
80.   1671   7100 WRITE(3,7110)'YEAR',(COL(1,ICOL),ICOL=26,30)
81.   1747   7110 FORMAT(A4,1BX,A2,4(10X,A2))
82.   1747        DO 7200 IROW=1,14
83.   1755        WRITE(3,7150) CAR(IROW,1),(A(IROW,ICOL),ICOL=26,30)
84.   1840   7150 FORMAT(A15,5F12.0)
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 85.  1840  7200 CONTINUE
 86.  1853       WRITE(3,7250)' '
 87.  1881  7250 FORMAT(A1)
 88.  1881 10000 CONTINUE
 89.  1881       RETURN
 90.  1883       END
 92.     0       SUBROUTINE EXT2
 93.     0       COMMON/SHARE/A,NUM,RATE,PV,PAY,P1,PIN,AFI,ES1,ES2,/LIST/CAR
 94.     0       COMMON/DUP/COL
 95.     0       COMMON/RTV/RV,RV2,TOT,POV
 96.     0       CHARACTER*15 CAR(14,1)
 97.     0       CHARACTER*2 COL(1,50)
 98.     0       DIMENSION A(18,50)
 99.     0 C     ---OUTPUT CONTINUED---
100.     0       OPEN(3,FILE='PRINTER:')
101.    20  7300 IF(NUM.GT.31.AND.NUM.LT.36) GO TO 7400
102.    41       IF(NUM.GT.35) GO TO 7600
103.    53       IF(NUM.LT.31) GO TO 11000
104.    65  7400 WRITE(3,7410)'YEAR',(COL(1,ICOL),ICOL=31,NUM)
105.   145  7410 FORMAT(A4,18X,A2,4(10X,A2))
106.   145       DO 7500 IROW=1,14
107.   153       WRITE(3,7450) CAR(IROW,1),(A(IROW,ICOL),ICOL=31,NUM)
108.   242  7450 FORMAT(A15,5F12.0)
109.   242  7500 CONTINUE
110.   254       WRITE(3,7550)' '
111.   283  7550 FORMAT(A1)
112.   283       GO TO 11000
113.   285  7600 WRITE(3,7610)'YEAR',(COL(1,ICOL),ICOL=31,35)
114.   360  7610 FORMAT(A4,18X,A2,4(10X,A2))
115.   360       DO 7700 IROW=1,14
116.   368       WRITE(3,7650) CAR(IROW,1),(A(IROW,ICOL),ICOL=31,35)
117.   453  7650 FORMAT(A15,5F12.0)
118.   453  7700 CONTINUE
119.   465       WRITE(3,7750)' '
120.   493  7750 FORMAT(A1)
121.   493       GO TO 7800
122.   495  7800 IF(NUM.GT.35.AND.NUM.LT.41) GO TO 7900
123.   516       IF(NUM.GT.40) GO TO 8100
124.   528  7900 WRITE(3,7910)'YEAR',(COL(1,ICOL),ICOL=36,NUM)
125.   609  7910 FORMAT(A4,18X,A2,4(10X,A2))
126.   609       DO 8000 IROW=1,14
127.   617       WRITE(3,7950) CAR(IROW,1),(A(IROW,ICOL),ICOL=36,NUM)
128.   706  7950 FORMAT(A15,5F12.0)
129.   706  8000 CONTINUE
130.   718       WRITE(3,8050)' '
131.   747  8050 FORMAT(A1)
132.   747       GO TO 11000
133.   749  8100 WRITE(3,8110)'YEAR',(COL(1,ICOL),ICOL=36,40)
134.   824  8110 FORMAT(A4,18X,A2,4(10X,A2))
135.   824       DO 8200 IROW=1,14
136.   832       WRITE(3,8150) CAR(IROW,1),(A(IROW,ICOL),ICOL=36,40)
137.   917  8150 FORMAT(A15,5F12.0)
138.   917  8200 CONTINUE
139.   929       WRITE(3,8250)' '
140.   957  8250 FORMAT(A1)
141.   957       GO TO 8300
142.   959  8300 IF(NUM.GT.40.AND.NUM.LT.46) GO TO 8400
143.   980       IF(NUM.GT.45) GO TO 8555
144.   992  8400 WRITE(3,8410)'YEAR',(COL(1,ICOL),ICOL=41,NUM)
145.  1073  8410 FORMAT(A4,18X,A2,4(10X,A2))
146.  1073       DO 8500 IROW=1,14
147.  1081       WRITE(3,8450) CAR(IROW,1),(A(IROW,ICOL),ICOL=41,NUM)
148.  1171  8450 FORMAT(A15,5F12.0)
149.  1171  8500 CONTINUE
150.  1183       WRITE(3,8550)' '
151.  1211  8550 FORMAT(A1)
152.  1211       GO TO 11000
153.  1213  8555 WRITE(3,8560)'YEAR',(COL(1,ICOL),ICOL=41,45)
154.  1289  8560 FORMAT(A4,18X,A2,4(10X,A2))
155.  1289  8600 DO 8700 IROW=1,14
156.  1297       WRITE(3,8650) CAR(IROW,1),(A(IROW,ICOL),ICOL=41,45)
157.  1382  8650 FORMAT(A15,5F12.0)
158.  1382  8700 CONTINUE
159.  1395       WRITE(3,8750)' '
160.  1423  8750 FORMAT(A1)
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  161.  1423        GO TO 8755
  162.  1425  8755 WRITE(3,8760)'YEAR',(COL(1,ICOL),ICOL=46,NUM)
  163.  1506  8760 FORMAT(A4,18X,A2,4(10X,A2))
  164.  1506  8800 DO 8900 IROW=1,14
  165.  1514        WRITE(3,8850) CAR(IROW,1),(A(IROW,ICOL),ICOL=46,NUM)
  166.  1605  8850 FORMAT(A15,5F12.0)
  167.  1605  8900 CONTINUE
  168.  1618 11000 RETURN
  169.  1620        END
FORTRAN Compiler II.1  [1.1]
    0.     0 $USES APPLESTUFF
    1.     0 $USES URRPV IN FORT2:PERB.CODE
    2.     0       FUNCTION RAN(XH,XL,XM)
    3.     0 C     ---CALCULATE RANDOM VARIABLES---
    4.     0       HI=1.0
    5.    10       LO=0.0
    6.    20       X=(HI-LO)/32767.0
    7.    39       CALL RANDOI
    8.    42       RESULT=X*RANDOM()+LO
    9.    60       XX=(XM-XL)/(XH-XL)
   10.    79       Q=(RESULT-XX)
   11.    92       IF(Q.GT.0.0) GO TO 100
   12.   108       RAN=XL+SQRT((XM-XL)*(XH-XL)*RESULT)
   13.   141       GO TO 200
   14.   143   100 RAN=XH-SQRT((XH-XM)*(XH-XL)*(1-RESULT))
   15.   179   200 RETURN
   16.   181       END
FORTRAN Compiler II.1  [1.1]
    0.     0       SUBROUTINE RRPV
    1.     0       COMMON/SHARE/A,NUM,RATE,PV,PAY,API,P1,PIN,ES1,ES2
    2.     0       COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
    3.     0       COMMON/RTV/RV,RV2,TOT,POV
    4.     0       DIMENSION A(18,50)
    5.     0 C     ---CALCULATE GROSS REVENUES---
    6.     0       REVS=((CUG*CUP*22.0)+(AUG*AUP))*XRATE*250.0
    7.    59       DO 1200 I=1,NUM
    8.    72       A(1,I)=REVS
    9.    93  1200 CONTINUE
   10.   105       DO 1225 I=1,NUM
   11.   118       A(2,I)=A(1,I)*((1.0+ES2)**I)
   12.   174  1225 CONTINUE
   13.   186       XT1=0.0
   14.   196       DO 1230 I=1,NUM
   15.   209       XT1=XT1+A(2,I)
   16.   235  1230 CONTINUE
   17.   247 C     ---CALCULATE OPERATING COSTS---
   18.   247       YOCOST=250.0*OCOST*XRATE
   19.   274       DO 1300 I=1,NUM
   20.   287       A(3,I)=YOCOST
   21.   308  1300 CONTINUE
   22.   320       DO 1325 I=1,NUM
   23.   333       A(4,I)=A(3,I)*((1.0+ES1)**I)
   24.   390  1325 CONTINUE
   25.   402       XT2A=0.0
   26.   412       DO 1330 I=1,NUM
   27.   425       XT2A=XT2A+A(4,I)
   28.   451  1330 CONTINUE
   29.   463       XT2=XT2A*.25
   30.   479 C     ---CALCULATE DEPRECIATION---
   31.   479       DO 1400 I=1,5
   32.   487       A(5,I)=CC/5.0
   33.   519  1400 CONTINUE
   34.   532       DO 1500 I=6,NUM
   35.   545       A(5,I)=0.0
   36.   568  1500 CONTINUE
   37.   581 C     ---CALCULATE PRINCIPAL PAYMENTS---
   38.   581       P2=API/15.0
   39.   601       DO 1600 I=1,15
   40.   609       A(13,I)=P2
   41.   630  1600 CONTINUE
   42.   643       DO 1700 I=16,NUM
   43.   656       A(13,I)=0.0
   44.   680  1700 CONTINUE
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 45.   693 C      ---CALCULATE INTEREST PAYMENTS---
 46.   693        A(6,1)=PIN*API
 47.   727        AA=API
 48.   739        DO 1800 I=2,15
 49.   747        A(6,I)=PIN*(AA-P2)
 50.   782        AA=AA-P2
 51.   795  1800 CONTINUE
 52.   808        DO 1900 I=16,NUM
 53.   821        A(6,I)=0.0
 54.   844  1900 CONTINUE
 55.   857 C      ---CALCULATE SUBTOTAL AND LOSS FORWARD---
 56.   857        A(7,1)=0.0
 57.   880        A(8,1)=A(2,1)-A(4,1)-A(5,1)-A(6,1)+A(7,1)
 58.   986        DO 1950 I=2,NUM
 59.   999        A(7,I)=0.0
 60.  1022        A(8,I)=A(2,I)-A(4,I)-A(5,I)-A(6,I)+A(7,I)
 61.  1128        IF(A(8,I-1).LT.0.0) A(7,I)=A(8,I-1)
 62.  1194        A(8,I)=A(2,I)-A(4,I)-A(5,I)-A(6,I)+A(7,I)
 63.  1300  1950 CONTINUE
 64.  1313 C      ---CALCULATE TAX---
 65.  1313        DO 2210 I=1,NUM
 66.  1326        A(9,I)=A(8,I)*.55
 67.  1367        IF(A(8,I).LT.0.0) A(9,I)=0.0
 68.  1418  2210 CONTINUE
 69.  1431 C      ---CALCULATE WORKERS PARTICIPATION---
 70.  1431        DO 2220 I=1,NUM
 71.  1444        A(10,I)=(A(8,I)-A(9,I))*.17
 72.  1503        IF(A(8,I).LT.0.0) A(10,I)=0.0
 73.  1554  2220 CONTINUE
 74.  1567        XT3=0.0
 75.  1578        DO 2225 I=1,NUM
 76.  1591        XT3=XT3+A(9,I)+A(10,I)
 77.  1635  2225 CONTINUE
 78.  1648 C      ---SUBTOTAL---
 79.  1648        DO 2230 I=1,NUM
 80.  1661        A(11,I)=A(8,I)-A(9,I)-A(10,I)
 81.  1731  2230 CONTINUE
 82.  1744 C      ---ENTER WORKING CAPITAL---
 83.  1744        A(12,NUM)=WC
 84.  1773        DO 2250 I=1,NUM-1
 85.  1788        A(12,I)=0.0
 86.  1812  2250 CONTINUE
 87.  1825 C      ---CALCULATE NET CASH FLOW---
 88.  1825        DO 2260 I=1,NUM
 89.  1838        A(14,I)=A(11,I)+A(5,I)-A(7,I)+A(12,I)-A(13,I)
 90.  1944  2260 CONTINUE
 91.  1957 C      ---CALCULATE DISCOUNTED VALUES---
 92.  1957        DO 2300 I=1,NUM
 93.  1970        A(15,I)=A(14,I)*(1.0/((1.0+DISRT)**I))
 94.  2032  2300 CONTINUE
 95.  2045 C      ---SUM DISCOUNTED VALUES---
 96.  2045        A(16,1)=0.0
 97.  2068        DO 2400 I=1,NUM
 98.  2081        A(16,1)=A(16,1)+A(15,I)
 99.  2133  2400 CONTINUE
100.  2146        DO 2420 I=2,NUM
101.  2159        A(16,I)=0.0
102.  2182  2420 CONTINUE
103.  2195 C      ---NET PRESENT VALUE---
104.  2195        PV=A(16,1)-CC-WC-103000000.
105.  2243 C      --- CALCULATE RATE OF RETURN---
106.  2243        X=0.0
107.  2254        PX=0.0
108.  2264        DO 2500 M=1,NUM
109.  2277        PX=PX+A(14,M)*(1.0/((1.0+X)**M))
110.  2331  2500 CONTINUE
111.  2346        IF(PX.LT.-100.0) GO TO 3800
112.  2363        IF(PX.GT.-100.0) GO TO 2900
113.  2381  2900 DO 3500 K=1,10
114.  2389        RR=K/10.0
115.  2404        P=0.0
116.  2414        DO 3000 J=1,NUM
117.  2427        P=P+A(14,J)*(1.0/((1.0+RR)**J))
118.  2481  3000 CONTINUE
119.  2496        PA=P-CC-WC-103000000.
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120.  2527        IF(PA.GT.100.0.AND.RR.EQ.1.0) GO TO 3700
121.  2557        IF(PA.GT.100.0) GO TO 3500
122.  2574        IF(PA.LT.-100.0) GO TO 3100
123.  2591        IF(PA.GE.-100.0.AND.PA.LE.100.0) GO TO 3600
124.  2623  3100  DO 3400 J=1,100
125.  2631        ROR=(RR-.1)+(J/100.0)
126.  2659        PS=0.0
127.  2670        DO 3200 L=1,NUM
128.  2683        PS=PS+A(14,L)*(1.0/((1.0+ROR)**L))
129.  2737  3200  CONTINUE
130.  2752        PZ=PS-CC-WC-103000000.
131.  2783        IF(PZ.GT.100.0) GO TO 3400
132.  2800        IF(PZ.LT.-100.0) GO TO 3210
133.  2817        IF(PZ.GE.-100.0.AND.PA.LE.100.0) GO TO 3600
134.  2849  3210  DO 3300 IA=1,1000
135.  2859        RROR=(ROR-.01)+(IA/1000.0)
136.  2887        PL=0.0
137.  2898        DO 3220 JI=1,NUM
138.  2911        PL=PL+A(14,JI)*(1.0/((1.0+RROR)**JI))
139.  2965  3220  CONTINUE
140.  2980        PVAL=PL-CC-WC-103000000.
141.  3011        IF(PVAL.GT.100.0) GO TO 3300
142.  3028        IF(PVAL.LT.-100.0) GO TO 3230
143.  3045        IF(PVAL.GE.-100.0.AND.PVAL.LE.100.0) GO TO 3600
144.  3077  3230  RROR=(ROR-.01)+((IA-1)/1000.0)
145.  3107        GO TO 3600
146.  3109  3300  CONTINUE
147.  3124  3400  CONTINUE
148.  3139  3500  CONTINUE
149.  3154  3600  RATE =RROR*100
150.  3169        GO TO 4610
151.  3171  3700  RATE = 100.0
152.  3186        GO TO 4610
153.  3188  3800  RATE = 0.0
154.  3202 C      ---CALCULATE PAYBACK---
155.  3202  4610  TO=0.0
156.  3212        DO 4700 I=1,NUM
157.  3225        TA=TO
158.  3233        TO=TO+A(14,I)
159.  3259        T1=CC+103000000.-TO
160.  3282        IF(T1.GT.0.0) GO TO 4700
161.  3298        IF(T1.LT.0.0) GO TO 5000
162.  3314  4700  CONTINUE
163.  3327  5000  PAY=(I-1)+((CC+103000000.-TA)/(TO-TA))
164.  3370        RV=XT2+XT3+(CC*.127)
165.  3402        RV2=XT2+XT3+(CC*.127)
166.  3434        TOT=RV/XT1
167.  3453        POV=(RV/RES)/XT1
168.  3480        RETURN
169.  3482        END
 17.     v
 18.     0        SUBROUTINE SIM
 19.     0        COMMON/SHARE/A,NUM,RATE,PV,PAY,P1,API,PIN,ES1,ES2
 20.     0        COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
 21.     0        COMMON/RTV/RV,RV2,TOT,POV
 22.     0        DIMENSION A(18,50)
 23.     0 C      ---SIMULATE CASH FLOWS---
 24.     0        WRITE(*,10)'ENTER THE DISCOUNT RATE FOR NPV CALCULATIONS'
 25.    72    10  FORMAT(A44)
 26.    72        READ(*,15) DISRT
 27.   109    15  FORMAT(F7.3)
 28.   109        WRITE(*,20)'ENTER THE AMOUNT OF WORKING CAPITAL FOR PROJECT'
 29.   183    20  FORMAT(A47)
 30.   183        READ(*,25) WC
 31.   219    25  FORMAT(F12.0)
 32.   219        WRITE(*,30)'ENTER THE PERCENT OF INVESTMENT IS IN LOAN'
 33.   288    30  FORMAT(A42)
 34.   288        READ(*,35) P1
 35.   326    35  FORMAT(F8.3)
 36.   326        WRITE(*,40)'ENTER THE INTEREST RATE OF THE LOAN AMOUNT'
 37.   396    40  FORMAT(A42)
 38.   396        READ(*,45) PIN
 39.   434    45  FORMAT(F8.3)
 40.   434        WRITE(*,50)'ENTER THE ESCALATION RATE FOR REVENUES'
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   41.   500    50 FORMAT(A38)
   42.   500       READ(*,55) ES2
   43.   538    55 FORMAT(F10.5)
   44.   538       WRITE(*,60)'ENTER THE ESCALATION RATE FOR COSTS'
   45.   601    60 FORMAT(A35)
   46.   601       READ(*,65) ES1
   47.   638    65 FORMAT(F10.5)
   48.   638       WRITE(*,265)'ENTER THE NUMBER OF SIMULATIONS YOU REQUIRE'
   49.   709   265 FORMAT(A43)
   50.   709       READ(*,275) KOOT
   51.   742   275 FORMAT(BN,I3)
   52.   742       WRITE(*,285)'ENTER THE MINING RATE PER DAY'
   53.   799   285 FORMAT(A29)
   54.   799       READ(*,295) XRATE
   55.   835   295 FORMAT(F10.0)
TAL56.   835       WRITE(*,300)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR CAPI
   57.   835      C COSTS:'
   58.   920   300 FORMAT(A57)
   59.   920       READ(*,400) CHI,CLO,CML
   60.   964   400 FORMAT(F10.0/,F10.0/,F10.0)
   61.   964       WRITE(*,900)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   62.   964      C RESERVES:'
   63.  1045   900 FORMAT(A53)
   64.  1045       READ(*,1000) RESHI,RESLO,RESML
   65.  1088  1000 FORMAT(F12.0/,F12.0/,F12.0)
   66.  1088       WRITE(*,1100)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   67.  1088      COP.COSTS:'
   68.  1169  1100 FORMAT(A53)
   69.  1169       READ(*,1200) OPHI,OPLO,OPML
   70.  1212  1200 FORMAT(F6.4/,F6.4/,F6.4)
   71.  1212       WRITE(*,1300)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   72.  1212      CCOPPER GRADE:'
   73.  1297  1300 FORMAT(A57)
   74.  1297       READ(*,1400) CUHI,CULO,CUML
   75.  1340  1400 FORMAT(F6.4/,F6.4/,F6.4)
   76.  1340       WRITE(*,1500)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   77.  1340      CGOLD GRADE:'
   78.  1423  1500 FORMAT(A55)
   79.  1423       READ(*,1600) AUHI,AULO,AUML
   80.  1466  1600 FORMAT(F6.4/,F6.4/,F6.4)
   81.  1466       WRITE(*,1700)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   82.  1466      CCOPPER PRICE:'
   83.  1551  1700 FORMAT(A57)
   84.  1551       READ(*,1800) CUPHI,CUPLO,CUPML
   85.  1594  1800 FORMAT(F7.3/,F7.3/,F7.3)
   86.  1594       WRITE(*,1900)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   87.  1594      CGOLD PRICE:'
   88.  1677  1900 FORMAT(A55)
   89.  1677       READ(*,2000) AUPHI,AUPLO,AUPML
   90.  1720  2000 FORMAT(F5.0/,F5.0/,F5.0)
   91.  1720       OPEN(5,FILE='FORT2:DATA1.TEXT',STATUS='NEW')
   92.  1748       DO 2100 I=1,KOOT
   93.  1756       CC=RAN(CHI,CLO,CML)
   94.  1773       RES=RAN(RESHI,RESLO,RESML)
   95.  1790       OCOST=RAN(OPHI,OPLO,OPML)
   96.  1807       CUG=RAN(CUHI,CULO,CUML)
   97.  1824       AUG=RAN(AUHI,AULO,AUML)
   98.  1841       CUP=RAN(CUPHI,CUPLO,CUPML)
   99.  1858       AUP=RAN(AUPHI,AUPLO,AUPML)
  100.  1875       RNUM=RES/(XRATE*250.0)
  101.  1902       NUM=INT(RNUM)
  102.  1915       IF(NUM.GT.50) THEN
  103.  1925       NUM=50
  104.  1933       ENDIF
  105.  1933       API=CC*P1
  106.  1957       CALL RRPV
  107.  1960       CALL DATOUT
  108.  1962  2100 CONTINUE
  109.  1977       CLOSE(5,STATUS='KEEP')
  110.  1982       RETURN
  111.  1984       END

  112.     0
  113.     0       SUBROUTINE DATOUT
  114.     0       COMMON/SHARE/A,NUM,RATE,PV,PAY,P1,API,PIN,ES1,ES2,/LIST/CAR
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115.      0         COMMON/DUP/COL
116.      0         COMMON/SEC/XRATE,CC,RES,OCOST,CUG,AUG,CUP,AUP,DISRT,WC
117.      0         COMMON/RTV/RV,RV2,TOT,POV
118.      0         CHARACTER*15 CAR(14,1)
119.      0         CHARACTER*2 COL(1,50)
120.      0         DIMENSION A(18,50)
121.      0 C       ---OUTPUT SIMULATION DATA---
122.      0         WRITE(5,100) OCOST
123.     31    100 FORMAT(F10.5)
124.     31         WRITE(5,200) CUP
125.     61    200 FORMAT(F10.5)
126.     61         WRITE(5,300) CUG
127.     91    300 FORMAT(F10.5)
128.     91         WRITE(5,400) AUP
129.    121    400 FORMAT(F10.5)
130.    121         WRITE(5,500) AUG
131.    151    500 FORMAT(F10.5)
132.    151         WRITE(5,600) RATE
133.    182    600 FORMAT(F9.1)
134.    182         WRITE(5,700) PAY
135.    214    700 FORMAT(F4.2)
136.    214         WRITE(5,800) RV
137.    245    800 FORMAT(F15.0)
138.    245         WRITE(5,900) RV2
139.    275    900 FORMAT(F15.0)
140.    275         WRITE(5,1000) TOT
141.    305   1000 FORMAT(F15.12)
142.    305         WRITE(5,1100) POV
143.    335   1100 FORMAT(F15.12)
144.    335         WRITE(5,1200) PV
145.    366   1200 FORMAT(F15.0)
146.    366         RETURN
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Computer Program - Chile

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FORTRAN Compiler II.1  [1.1]
    0.      0 $USES APPLESTUFF
    1.      0 $USES URRPV IN FORT2:CHB.CODE OVERLAY
    2.      0 $USES UEXT IN FORT2:CHC.CODE OVERLAY
    3.      0 $USES USIM2 IN FORT2:CHD.CODE OVERLAY
    4.      0       PROGRAM CHILE
    5.      0       COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2,/LIST/CAR
    6.      0       COMMON/DUP/COL
RT,W2.      0       COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
    8.      0       COMMON/RTV/RV,RV2,TOT,POV
.   9.      0       COMMON/MOOS/KOOT,CHI,CLO,CML,EXHI,EXLO,EXML,DEVHI,DEVLO,DEVML
   10.      0      CRESHI,RESLO,RESML
   11.      0       CHARACTER*15 CAR(15,1)
   12.      0       CHARACTER*2 COL(1,50)
   13.      0       DIMENSION A(18,50)
   14.      0       EXTERNAL RAN
   15.      0 C     ---INTRODUCTION---
***16.      0       WRITE(*,50)'**************************************************
   17.      0      C*********************'
   18.    100     50 FORMAT(A72)
   19.    100        WRITE(*,100)'THIS PROGRAM CALCULATES CASH FLOWS FOR MINING
   20.    100       C PROJECTS IN CHILE.THIS PRO'
   21.    200    100 FORMAT(A72)
   22.    200        WRITE(*,105)' '
   23.    229    105 FORMAT(A1)
   24.    229        WRITE(*,110)'GRAM REQUESTS INPUTS AND WILL RETURN
   25.    229       C HARD COPY FOR A SINGLE CASH FLOW,'
   26.    326    110 FORMAT(A70)
   27.    326        WRITE(*,115)' '
   28.    355    115 FORMAT(A1)
   29.    355        WRITE(*,120)'OR A DISK FILE FOR A SIMULATION STUDY.'
   30.    420    120 FORMAT(A38)
   31.    420        WRITE(*,125)' '
   32.    449    125 FORMAT(A1)
   33.    449        WRITE(*,130)'CASH FLOWS ARE LIMITED TO 50 YEARS.'
   34.    511    130 FORMAT(A35)
   35.    511        WRITE(*,135)' '
   36.    539    135 FORMAT(A1)
***37.    539        WRITE(*,140)'**************************************************
   38.    539       C*********************'
   39.    638    140 FORMAT(A72)
   40.    638        WRITE(*,145)' '
   41.    667    145 FORMAT(A1)
:' 42.    667        WRITE(*,150)'IF YOU WISH SENSITIVITY ENTER 1,IF NOT, ENTER 2.
   43.    743    150 FORMAT(A49)
   44.    743        READ(*,170) IP
   45.    776    170 FORMAT(BN,I2)
   46.    776        IF(IP.EQ.1) GO TO 1250
   47.    783        IF(IP.EQ.2) GO TO 180
   48.    790 C      ---INPUT PARAMETERS---
   49.    790    180 WRITE(*,200)'ENTER THE MINING RATE PER DAY'
   50.    847    200 FORMAT(A29)
   51.    847        READ(*,250) XRATE
   52.    883    250 FORMAT(F10.0)
   53.    883        WRITE(*,300)'ENTER THE INVESTMENT FOR THIS PROJECT'
   54.    947    300 FORMAT(A37)
   55.    947        READ(*,350) CC
   56.    983    350 FORMAT(F10.4)
   57.    983        WRITE(*,400)'ENTER TOTAL EXPLORATION COSTS'
   58.   1039    400 FORMAT(A29)
   59.   1039        READ(*,450) EXCST
   60.   1075    450 FORMAT(F10.4)
   61.   1075        WRITE(*,500)'ENTER DEVELOPMENT COSTS FOR THIS PROJECT'
   62.   1142    500 FORMAT(A40)
   63.   1142        READ(*,550) DVCST
   64.   1179    550 FORMAT(F10.4)
   65.   1179        WRITE(*,600)'ENTER TOTAL RESERVES FOR THIS PROJECT IN TONS'
   66.   1251    600 FORMAT(A45)
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 67.  1251        READ(*,650) RES
 68.  1287    650 FORMAT(F12.4)
 69.  1287        WRITE(*,700)'ENTER OPERATING COSTS PER TON'
 70.  1343    700 FORMAT(A29)
 71.  1343        READ(*,750) OCOST
 72.  1379    750 FORMAT(F5.4)
 73   1379        WRITE(*,800)'ENTER COPPER ORE GRADE IN PERCENT PER TON'
 74.  1447    800 FORMAT(A34)
 75.  1447        READ(*,850) CUG
 76.  1483    850 FORMAT(F5.4)
 77.  1483        WRITE(*,900)'ENTER GOLD GRADE IN OUNCES PER TON'
 78.  1544    900 FORMAT(A34)
 79.  1544        READ(*,950) AUG
 80.  1581    950 FORMAT(F5.4)
 81.  1581        WRITE(*,1000)'ENTER COPPER PRICE IN DOLLARS'
 82.  1637   1000 FORMAT(A29)
 83.  1637        READ(*,1050) CUP
 84.  1673   1050 FORMAT(F5.4)
 85.  1673        WRITE(*,1100)'ENTER GOLD PRICE PER OUNCE IN DOLLARS'
 86.  1737   1100 FORMAT(A37)
 87.  1737        READ(*,1150) AUP
 88.  1773   1150 FORMAT(F5.4)
 89.  1773        WRITE(*,1160)'ENTER THE DISCOUNT RATE FOR NPV CALCULATIONS'
 90.  1844   1160 FORMAT(A44)
 91.  1844        READ(*,1170) DISRT
 92.  1881   1170 FORMAT(F5.5)
 93.  1881        WRITE(*,1180)'ENTER THE AMOUNT OF WORKING CAPITAL FOR PROJECT
 94.  1955   1180 FORMAT(A47)
 95.  1955        READ(*,1185) WC
 96.  1991   1185 FORMAT(F12.0)
 97.  1991        WRITE(*,1190)'ENTER THE PERCENT OF INVESTMENT IS IN DOLLARS'
 98.  2063   1190 FORMAT(A45)
 99.  2063        READ(*,1200) P1
100.  2100   1200 FORMAT(F8.3)
101.  2100        WRITE(*,1210)'ENTER THE INTEREST RATE OF THE LOAN AMOUNT'
102.  2170   1210 FORMAT(A42)
103.  2170        READ(*,1215) PIN
104.  2208   1215 FORMAT(F8.3)
105.  2208        WRITE(*,1220)'ENTER THE ESCALATION RATE FOR COSTS'
106.  2271   1220 FORMAT(A35)
107.  2271        READ(*,1225) ES1
108.  2308   1225 FORMAT(F10.5)
109.  2308        WRITE(*,1230)'ENTER THE ESCALATION RATE FOR REVENUES'
110.  2374   1230 FORMAT(A38)
111.  2374        READ(*,1235) ES2
112.  2412   1235 FORMAT(F10.5)
113.  2412        API=CC*P1
114.  2436 C      ---LIMIT CASH FLOWS TO 50 YEARS---
115.  2436        RNUM=RES/(XRATE*250.0)
116.  2462        NUM=INT(RNUM)
117.  2475        IF(NUM.GT.50) THEN
118.  2485        NUM=50
119.  2493        ENDIF
120.  2493        CALL RRPV
121.  2496 C      ---CALL OUTPUT SUBROUTINES---
122.  2496        CALL OUT
123.  2498        CALL OUT1
124.  2500        CALL EXT1
125.  2502        CALL EXT1A
126.  2504        CALL EXT
127.  2507        GO TO 1300
128.  2509   1250 CALL SIM
129.  2512        CALL SIM2
130.  2515   1300 END
131.     0
132.     0        SUBROUTINE OUT
133.     0        COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2,/LIST/CAR
134.     0        COMMON/DUP/COL
RT 135.  0        COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
136.     0        COMMON/RTV/RV,RV2,TOT,POV
137.     0        CHARACTER*15 CAR(15,1)
138.     0        CHARACTER*2 COL(1,50)
139.     0        DIMENSION A(18,50)
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140.      0 C      ---OUTPUT PARAMETERS---
141.      0        OPEN(3,FILE='PRINTER:')
142.     20        WRITE(3,80)'PARAMETERS USED FOR CASH FLOW'
143.     77     80 FORMAT(25X,A29,25X)
144.     77        WRITE(3,90)'**************************************************
145.     77       C*******************************'
146.    184     90 FORMAT(A80)
147.    184        WRITE(3,95)'MINING RATE=    ',XRATE,'      TONS PER DAY'
148.    261     95 FORMAT(A15,F8.0,A17)
149.    261        WRITE(3,115)' '
150.    289    115 FORMAT(A1)
151.    289        WRITE(3,120)'INVESTMENT =',CC
152.    338    120 FORMAT(A12,F13.0)
153.    338        WRITE(3,125)' '
154.    367    125 FORMAT(A1)
155.    367        WRITE(3,130)'RESERVES =',RES,'   TONS'
156.    429    130 FORMAT(A10,F15.0,A7)
157.    429        WRITE(3,135)' '
158.    457    135 FORMAT(A1)
159.    457        WRITE(3,140)'OPERATING COSTS =',OCOST,' PER TON'
160.    526    140 FORMAT(A17,F10.2,A8)
161.    526        WRITE(3,145)' '
162.    555    145 FORMAT(A1)
163.    555        WRITE(3,150)'COPPER ORE GRADE =  ',CUG,'PER TON'
164.    627    150 FORMAT(A20,F7.2,A8)
165.    627        WRITE(3,155)' '
166.    655    155 FORMAT(A1)
167.    655        WRITE(3,160)'GOLD ORE GRADE =   ',AUG,' OUNCES PER TON'
168.    733    160 FORMAT(A19,F8.2,A15)
169.    733        WRITE(3,165)' '
170.    761    165 FORMAT(A1)
171.    761        WRITE(3,170)'COPPER PRICE =     ',CUP,' DOLLARS PER POUND'
172.    842    170 FORMAT(A19,F8.2,A18)
173.    842        WRITE(3,175)' '
174.    871    175 FORMAT(A1)
175.    871        WRITE(3,180)'GOLD PRICE =     ',AUP,'DOLLARS PER OUNCE'
176.    949    180 FORMAT(A17,F10.2,A18)
177.    949        WRITE(3,185)' '
178.    977    185 FORMAT(A1)
179.    977        ADISR=100.0*DISRT
180.    996        WRITE(3,190)'DISCOUNT RATE =     ',ADISR,' PERCENT'
181.   1066    190 FORMAT(A20,F7.2,A8)
182.   1066        WRITE(3,195)' '
183.   1095    195 FORMAT(A1)
184.   1095        WRITE(3,200)'THE PAYBACK PERIOD IS =',PAY,' YEARS'
185.   1170    200 FORMAT(A23,F9.2,A6)
186.   1170        WRITE(3,202)' '
187.   1199    202 FORMAT(A1)
188.   1199        WRITE(3,210)'RV = ',RV
189.   1241    210 FORMAT(A4,F15.0)
190.   1241        WRITE(3,215)' '
191.   1269    215 FORMAT(A1)
192.   1269        WRITE(3,220)'RV2 =',RV2
193.   1311    220 FORMAT(A5,F15.0)
194.   1311        WRITE(3,225)' '
195.   1339    225 FORMAT(A1)
196.   1339        WRITE(3,230)'TDT =',TDT
197.   1381    230 FORMAT(A5,F15.5)
198.   1381        WRITE(3,235)' '
199.   1409    235 FORMAT(A1)
200.   1409        WRITE(3,240)'PDV =',PDV
201.   1451    240 FORMAT(A5,F15.12)
202.   1451        WRITE(3,245)' '
203.   1479    245 FORMAT(A1)
204.   1479        WRITE(3,3610)'THE RATE OF RETURN IS     ',RATE,'     PERCENT'
205.   1562   3610 FORMAT(A26,F9.1,A12)
206.   1562        GO TO 4500
207.   1564   3700 WRITE(3,3710)'THE RATE OF RETURN IS GREATER THAN 100 PERCENT'
208.   1638   3710 FORMAT(A46)
209.   1638        GO TO 4500
210.   1640   3800 WRITE(3,3810)'THE RATE OF RETURN IS LESS THAN 0.0 PERCENT'
211.   1711   3810 FORMAT(A41)
212.   1711        GO TO 4500
213.   1713   4500 CONTINUE
214.   1713        WRITE(3,4550)' '
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 215.  1741  4550 FORMAT(A1)
 216.  1741       WRITE(3,4600)'THE NET PRESENT VALUE IS     ',PV
 217.  1808  4600 FORMAT(A29,F15.0)
 218.  1808       WRITE(3,4610)' '
 219.  1837  4610 FORMAT(A1)
 220.  1837       WRITE(3,4620)'THE AMOUNT OF THE LOAN IS =',API
 221.  1902  4620 FORMAT(A27,F12.0)
 222.  1902       WRITE(3,4630)' '
 223.  1931  4630 FORMAT(A1)
 224.  1931       APIN=PIN*100.0
 225.  1951       WRITE(3,4640)'THE LOAN INTEREST RATE = ',APIN,' PERCENT'
 226.  2026  4640 FORMAT(A24,F8.3,A8)
 227.  2026       WRITE(3,4645)' '
 228.  2055  4645 FORMAT(A1)
 229.  2055       WRITE(3,4646)'THE ESCALATION RATE FOR REVENUES =',ES2
 230.  2127  4646 FORMAT(A34,F6.2)
 231.  2127       WRITE(3,4647)' '
 232.  2155  4647 FORMAT(A1)
 233.  2155       WRITE(3,4648)'THE ESCALATION RATE FOR COSTS =',ES1
 234.  2224  4648 FORMAT(A30,F6.2)
 235.  2224       WRITE(3,4649)' '
 236.  2253  4649 FORMAT(A1)
 237.  2253 C     ---OUTPUT CASH FLOWS---
 238.  2253       WRITE(3,4650)'**********************************************
 239.  2253      C************************************'
 240.  2360  4650 FORMAT(A80)
 241.  2360       DO 4670 I=1,15
 242.  2368       WRITE(3,4660) ' '
 243.  2397  4660 FORMAT(A1)
 244.  2397  4670 CONTINUE
 245.  2409       WRITE(3,4675)'CASH FLOW-CHILE'
 246.  2451  4675 FORMAT(32X,A15,33X)
 247.  2451       WRITE(3,4677)'**********************************************
 248.  2451      C************************************'
 249.  2558  4677 FORMAT(A80)
 250.  2558       CAR(1,1)='GROSS REVENUES '
 251.  2593       CAR(2,1)='GROSS REVS(ESC)'
 252.  2627       CAR(3,1)='OP.COSTS       '
 253.  2661       CAR(4,1)='OP.COSTS(ESC)  '
 254.  2695       CAR(5,1)='EXPL.COSTS     '
 255.  2729       CAR(6,1)='DEV.COSTS      '
 256.  2763       CAR(7,1)='DEPRECIATION   '
 257.  2797       CAR(8,1)='INTEREST       '
 258.  2831       CAR(9,1)='LOSS FORWARD   '
 259.  2865       CAR(10,1)='SUBTOTAL       '
 260.  2899       CAR(11,1)='TAX            '
 261.  2933       CAR(12,1)='SUBTOTAL       '
 262.  2967       CAR(13,1)='WRKG CAP RET   '
 263.  3001       CAR(14,1)='PRINC PAYMENT  '
 264.  3035       CAR(15,1)='NET CASH FLOW  '
 265.  3069       COL(1,1)='1 '
 266.  3088       COL(1,2)='2 '
 267.  3107       COL(1,3)='3 '
 268.  3126       COL(1,4)='4 '
 269.  3145       COL(1,5)='5 '
 270.  3164       COL(1,6)='6 '
 271.  3183       COL(1,7)='7 '
 272.  3202       COL(1,8)='8 '
 273.  3221       COL(1,9)='9 '
 274.  3240       COL(1,10)='10'
 275.  3259       COL(1,11)='11'
 276.  3278       COL(1,12)='12'
 277.  3297       COL(1,13)='13'
 278.  3316       COL(1,14)='14'
 279.  3335       COL(1,15)='15'
 280.  3354       COL(1,16)='16'
 281.  3373       COL(1,17)='17'
 282.  3392       COL(1,18)='18'
 283.  3411       COL(1,19)='19'
 284.  3430       COL(1,20)='20'
 285.  3449       COL(1,21)='21'
 286.  3468       COL(1,22)='22'
 287.  3487       COL(1,23)='23'
 288.  3506       COL(1,24)='24'
 289.  3525       COL(1,25)='25'
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 290.  3544        COL(1,26)='26'
 291.  3563        COL(1,27)='27'
 292.  3582        COL(1,28)='28'
 293.  3601        COL(1,29)='29'
 294.  3620        COL(1,30)='30'
 295.  3639        COL(1,31)='31'
 296.  3658        COL(1,32)='32'
 297.  3677        COL(1,33)='33'
 298.  3696        COL(1,34)='34'
 299.  3715        COL(1,35)='35'
 300.  3734        COL(1,36)='36'
 301.  3753        COL(1,37)='37'
 302.  3772        COL(1,38)='38'
 303.  3791        COL(1,39)='39'
 304.  3810        COL(1,40)='40'
 305.  3829        COL(1,41)='41'
 306.  3848        COL(1,42)='42'
 307.  3867        COL(1,43)='43'
 308.  3886        COL(1,44)='44'
 309.  3905        COL(1,45)='45'
 310.  3924        COL(1,46)='46'
 311.  3943        RETURN
 312.  3945        END
 313.     0
 314.     0        SUBROUTINE OUT1
 315.     0        COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2
 316.     0        COMMON/LIST/CAR
 317.     0        COMMON/DUP/COL
RT 318.     0        COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
 319.     0        COMMON/RTV/RV,RV2,TOT,POV
 320.     0        CHARACTER*15 CAR(15,1)
 321.     0        CHARACTER*2 COL(1,50)
 322.     0        DIMENSION A(18,50)
 323.     0        COL(1,47)='47'
 324.    19        COL(1,48)='48'
 325.    38        COL(1,49)='49'
 326.    57        COL(1,50)='50'
 327.    76 C      ---OUTPUT CONTINUED---
 328.    76        OPEN(3,FILE='PRINTER:')
 329.    96        IF(NUM.GT.1.AND.NUM.LT.6) GO TO 4680
 330.   117        IF(NUM.GT.5) GO TO 4750
 331.   129  4680 WRITE(3,4685)'YEAR',(COL(1,ICOL),ICOL=1,NUM)
 332.   209  4685 FORMAT(A4,18X,A2,4(10X,A2))
 333.   209        DO 4700 IROW=1,15
 334.   217        WRITE(3,4690) CAR(IROW,1),(A(IROW,ICOL),ICOL=1,NUM)
 335.   306  4690 FORMAT(A15,5F12.0)
 336.   306  4700 CONTINUE
 337.   318        WRITE(3,4740)' '
 338.   347  4740 FORMAT(A1)
 339.   347        GO TO 10000
 340.   349  4750 WRITE(3,4760)'YEAR',(COL(1,ICOL),ICOL=1,5)
 341.   424  4760 FORMAT(A4,18X,A2,4(10X,A2))
 342.   424        DO 4780 IROW=1,15
 343.   432        WRITE(3,4770) CAR(IROW,1),(A(IROW,ICOL),ICOL=1,5)
 344.   517  4770 FORMAT(A15,5F12.0)
 345.   517  4780 CONTINUE
 346.   529        WRITE(3,4785)' '
 347.   557  4785 FORMAT(A1)
 348.   557 10000 CONTINUE
 349.   557        RETURN
 350.   559        END

 351.     0
 352.     0        SUBROUTINE EXT1
 353.     0        COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2,/LIST/CAR
 354.     0        COMMON/DUP/COL
RT 355.     0        COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
 356.     0        COMMON/RTV/RV,RV2,TOT,POV
 357.     0        CHARACTER*15 CAR(15,1)
 358.     0        CHARACTER*2 COL(1,50)
 359.     0        DIMENSION A(18,50)
 360.     0 C      --- OUTPUT CONTINUED---
 361.     0        OPEN(3,FILE='PRINTER:')
 362.    20  4790 IF(NUM.GT.5.AND.NUM.LT.11) GO TO 4800
 363.    41        IF(NUM.GT.10)GO TO 5100
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364.    53  4800 WRITE(3,4810)'YEAR',(COL(1,ICOL),ICOL=6,NUM)
365.   133  4810 FORMAT(A4,18X,A2,4(10X,A2)))
366.   133       DO 5000 IROW=1,15
367.   141       WRITE(3,4850)CAR(IROW,1),(A(IROW,ICOL),ICOL=6,NUM)
368.   230  4850 FORMAT(A15,5F12.0)
369.   230  5000 CONTINUE
370.   242       WRITE(3,5050)' '
371.   271  5050 FORMAT(A1)
372.   271       GO TO 10000
373.   273  5100 WRITE(3,5110)'YEAR',(COL(1,ICOL),ICOL=6,10)
374.   348  5110 FORMAT(A4,18X,A2,4(10X,A2))
375.   348       DO 5200 IROW=1,15
376.   356       WRITE(3,5150) CAR(IROW,1),(A(IROW,ICOL),ICOL=6,10)
377.   441  5150 FORMAT(A15,5F12.0)
378.   441  5200 CONTINUE
379.   453       WRITE(3,5250)' '
380.   481  5250 FORMAT(A1)
381.   481       GO TO 5300
382.   483  5300 IF(NUM.GT.10.AND.NUM.LT.16) GO TO 5400
383.   504       IF(NUM.GT.15) GO TO 5600
384.   516  5400 WRITE(3,5410)'YEAR',(COL(1,ICOL),ICOL=11,NUM)
385.   597  5410 FORMAT(A4,18X,A2,4(10X,A2))
386.   597       DO 5450 IROW=1,15
387.   605       WRITE(3,5440) CAR(IROW,1),(A(IROW,ICOL),ICOL=11,NUM)
388.   694  5440 FORMAT(A15,5F12.0)
389.   694  5450 CONTINUE
390.   706       WRITE(3,5500)' '
391.   735  5500 FORMAT(A1)
392.   735       GO TO 10000
393.   737  5600 WRITE(3,5610)'YEAR',(COL(1,ICOL),ICOL=11,15)
394.   812  5610 FORMAT(A4,18X,A2,4(10X,A2))
395.   812       DO 5700 IROW=1,15
396.   820       WRITE(3,5640) CAR(IROW,1),(A(IROW,ICOL),ICOL=11,15)
397.   905  5640 FORMAT(A15,5F12.0)
398.   905  5700 CONTINUE
399.   917       WRITE(3,5750)' '
400.   945  5750 FORMAT(A1)
401.   945       GO TO 5800
402.   947  5800 IF(NUM.GT.15.AND.NUM.LT.21) GO TO 5900
403.   968       IF(NUM.GT.20) GO TO 6100
404.   980  5900 WRITE(3,5910)'YEAR',(COL(1,ICOL),ICOL=16,NUM)
405.  1061  5910 FORMAT(A4,18X,A2,4(10X,A2))
406.  1061       DO 6000 IROW=1,15
407.  1069       WRITE(3,5950) CAR(IROW,1),(A(IROW,ICOL),ICOL=16,NUM)
408.  1159  5950 FORMAT(A15,5F12.0)
409.  1159  6000 CONTINUE
410.  1171       WRITE(3,6050)' '
411.  1199  6050 FORMAT(A1)
412.  1199       GO TO 10000
413.  1201  6100 WRITE(3,6110)'YEAR',(COL(1,ICOL),ICOL=16,20)
414.  1277  6110 FORMAT(A4,18X,A2,4(10X,A2))
415.  1277       DO 6200 IROW=1,15
416.  1285       WRITE(3,6150) CAR(IROW,1),(A(IROW,ICOL),ICOL=16,20)
417.  1370  6150 FORMAT(A15,5F12.0)
418.  1370  6200 CONTINUE
419.  1383       WRITE(3,6250)' '
420.  1411  6250 FORMAT(A1)
421.  1411       GO TO 6300
422.  1413  6300 IF(NUM.GT.20.AND.NUM.LT.26) GO TO 6400
423.  1434       IF(NUM.GT.25) GO TO 6600
424.  1446  6400 WRITE(3,6410)'YEAR',(COL(1,ICOL),ICOL=21,NUM)
425.  1528  6410 FORMAT(A4,18X,A2,4(10X,A2))
426.  1528       DO 6500 IROW=1,15
427.  1536       WRITE(3,6450) CAR(IROW,1),(A(IROW,ICOL),ICOL=21,NUM)
428.  1627  6450 FORMAT(A15,5F12.0)
429.  1627  6500 CONTINUE
430.  1640       WRITE(3,6550)' '
431.  1669  6550 FORMAT(A1)
432.  1669       GO TO 10000
433.  1671  6600 WRITE(3,6610)'YEAR',(COL(1,ICOL),ICOL=21,25)
434.  1747  6610 FORMAT(A4,18X,A2,4(10X,A2))
435.  1747       DO 6700 IROW=1,15
436.  1755       WRITE(3,6650) CAR(IROW,1),(A(IROW,ICOL),ICOL=21,25)
437.  1840  6650 FORMAT(A15,5F12.0)
438.  1840  6700 CONTINUE
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   439.  1853        WRITE(3,6750)' '
   440.  1881   6750 FORMAT(A1)
   441.  1881  10000 CONTINUE
   442.  1881        RETURN
   443.  1883        END

   444.     0
   445.     0        SUBROUTINE EXT1A
   446.     0        COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2,/LIST/CAR
   447.     0        COMMON/DUP/COL
   448.     0        COMMON/RTV/RV,RV2,TOT,POV
RT@@@8.     0        COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
   450.     0        CHARACTER*15 CAR(15,1)
   451.     0        CHARACTER*2 COL(1,50)
   452.     0        DIMENSION A(18,50)
   453.     0        OPEN(3,FILE='PRINTER:')
   454.    20 C      ---OUTPUT CONTINUED---
   455.    20   6800 IF(NUM.GT.25.AND.NUM.LT.31) GO TO 6900
   456.    41        IF(NUM.GT.30) GO TO 7100
   457.    53   6900 WRITE(3,6910)'YEAR',(COL(1,ICOL),ICOL=26,NUM)
   458.   133   6910 FORMAT(A4,18X,A2,4(10X,A2))
   459.   133        DO 7000 IROW=1,15
   460.   141        WRITE(3,6950) CAR(IROW,1),(A(IROW,ICOL),ICOL=26,NUM)
   461.   230   6950 FORMAT(A15,5F12.0)
   462.   230   7000 CONTINUE
   463.   242        WRITE(3,7050)' '
   464.   271   7050 FORMAT(A1)
   465.   271        GO TO 10000
   466.   273   7100 WRITE(3,7110)'YEAR',(COL(1,ICOL),ICOL=26,30)
   467.   348   7110 FORMAT(A4,18X,A2,4(10X,A2))
   468.   348        DO 7200 IROW=1,15
   469.   356        WRITE(3,7150) CAR(IROW,1),(A(IROW,ICOL),ICOL=26,30)
   470.   441   7150 FORMAT(A15,5F12.0)
   471.   441   7200 CONTINUE
   472.   453        WRITE(3,7250)' '
   473.   481   7250 FORMAT(A1)
   474.   481  10000 CONTINUE
   475.   481        RETURN
   476.   483        END

FORTRAN Compiler II.1  [1.1]
     0.     0 $USES APPLESTUFF
     1.     0        SUBROUTINE EXT
     2.     0        COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2,/LIST/CAR
     3.     0        COMMON/DUP/COL
     4.     0        COMMON/RTV/RV,RV2,TOT,POV
,    5.     0        COMMON/MOOS/KOOT,EXHI,EXLO,EXML,CHI,CLO,CML,DEVHI,DEVLO,DEVML
     6.     0       CRESHI,RESLO,RESML
     7.     0        CHARACTER*15 CAR(15,1)
     8.     0        CHARACTER*2 COL(1,50)
     9.     0        DIMENSION A(18,50)
    10.     0 C      ---OUTPUT CONTINUED---
    11.     0        OPEN(3,FILE='PRINTER:')
    12.    20   7300 IF(NUM.GT.31.AND.NUM.LT.36) GO TO 7400
    13.    41        IF(NUM.GT.35) GO TO 7600
    14.    53        IF(NUM.LT.31) GO TO 11000
    15.    65   7400 WRITE(3,7410)'YEAR',(COL(1,ICOL),ICOL=31,NUM)
    16.   145   7410 FORMAT(A4,18X,A2,4(10X,A2))
    17.   145        DO 7500 IROW=1,15
    18.   153        WRITE(3,7450) CAR(IROW,1),(A(IROW,ICOL),ICOL=31,NUM)
    19.   242   7450 FORMAT(A15,5F12.0)
    20.   242   7500 CONTINUE
    21.   254        WRITE(3,7550)' '
    22.   283   7550 FORMAT(A1)
    23.   283        GO TO 11000
    24.   285   7600 WRITE(3,7610)'YEAR',(COL(1,ICOL),ICOL=31,35)
    25.   360   7610 FORMAT(A4,18X,A2,4(10X,A2))
    26.   360        DO 7700 IROW=1,15
    27.   368        WRITE(3,7650) CAR(IROW,1),(A(IROW,ICOL),ICOL=31,35)
    28.   453   7650 FORMAT(A15,5F12.0)
    29.   453   7700 CONTINUE
    30.   465        WRITE(3,7750)' '
    31.   493   7750 FORMAT(A1)
    32.   493        GO TO 7800
    33.   495   7800 IF(NUM.GT.35.AND.NUM.LT.41) GO TO 7900
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    34.   516        IF(NUM.GT.40) GO TO 8100
    35.   528   7900 WRITE(3,7910)'YEAR',(COL(1,ICOL),ICOL=36,NUM)
    36.   609   7910 FORMAT(A4,18X,A2,4(10X,A2))
    37.   609        DO 8000 IROW=1,15
    38.   617        WRITE(3,7950) CAR(IROW,1),(A(IROW,ICOL),ICOL=36,NUM)
    39.   706   7950 FORMAT(A15,5F12.0)
    40.   706   8000 CONTINUE
    41.   718        WRITE(3,8050)' '
    42.   747   8050 FORMAT(A1)
    43.   747        GO TO 11000
    44.   749   8100 WRITE(3,8110)'YEAR',(COL(1,ICOL),ICOL=36,40)
    45.   824   8110 FORMAT(A4,18X,A2,4(10X,A2))
    46.   824        DO 8200 IROW=1,15
    47.   832        WRITE(3,8150) CAR(IROW,1),(A(IROW,ICOL),ICOL=36,40)
    48.   917   8150 FORMAT(A15,5F12.0)
    49.   917   8200 CONTINUE
    50.   929        WRITE(3,8250)' '
    51.   957   8250 FORMAT(A1)
    52.   957        GO TO 8300
    53.   959   8300 IF(NUM.GT.40.AND.NUM.LT.46) GO TO 8400
    54.   980        IF(NUM.GT.45) GO TO 8555
    55.   992   8400 WRITE(3,8410)'YEAR',(COL(1,ICOL),ICOL=41,NUM)
    56.  1073   8410 FORMAT(A4,18X,A2,4(10X,A2))
    57.  1073        DO 8500 IROW=1,15
    58.  1081        WRITE(3,8450) CAR(IROW,1),(A(IROW,ICOL),ICOL=41,NUM)
    59.  1171   8450 FORMAT(A15,5F12.0)
    60.  1171   8500 CONTINUE
    61.  1183        WRITE(3,8550)' '
    62.  1211   8550 FORMAT(A1)
    63.  1211        GO TO 11000
    64.  1213   8555 WRITE(3,8560)'YEAR',(COL(1,ICOL),ICOL=41,45)
    65.  1289   8560 FORMAT(A4,18X,A2,4(10X,A2))
    66.  1289   8600 DO 8700 IROW=1,15
    67.  1297        WRITE(3,8650) CAR(IROW,1),(A(IROW,ICOL),ICOL=41,45)
    68.  1382   8650 FORMAT(A15,5F12.0)
    69.  1382   8700 CONTINUE
    70.  1395        WRITE(3,8750)' '
    71.  1423   8750 FORMAT(A1)
    72.  1423        GO TO 8755
    73.  1425   8755 WRITE(3,8760)'YEAR',(COL(1,ICOL),ICOL=46,NUM)
    74.  1506   8760 FORMAT(A4,18X,A2,4(10X,A2))
    75.  1506   8800 DO 8900 IROW=1,15
    76.  1514        WRITE(3,8850) CAR(IROW,1),(A(IROW,ICOL),ICOL=46,NUM)
    77.  1605   8850 FORMAT(A15,5F12.0)
    78.  1605   8900 CONTINUE
    79.  1618  11000 RETURN
    80.  1620        END

FORTRAN Compiler II.1  [1.1]
     0.     0        SUBROUTINE RRPV
     1.     0        COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2
RT,WQ.      0        COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
     3.     0        COMMON/RTV/RV,RV2,TOT,POV
     4.     0        DIMENSION A(18,50)
     5.     0 C      ---CALCULATE GROSS REVENUES---
     6.     0        REVS=((CUG*CUP*22.0)+(AUG*AUP))*XRATE*250.0
     7.    59        DO 1200 I=1,NUM
     8.    72        A(1,I)=REVS
     9.    93   1200 CONTINUE
    10.   105        DO 1225 I=1,NUM
    11.   118        A(2,I)=A(1,I)*((1.0+ES2)**I)
    12.   174   1225 CONTINUE
    13.   186        XT1=0.0
    14.   196        DO 1250 I=1,NUM
    15.   209        XT1=XT1+A(2,I)
    16.   235   1250 CONTINUE
    17.   247 C      ---CALCULATE OPERATING COSTS---
    18.   247        YOCOST=250.0*OCOST*XRATE
    19.   274        DO 1300 I=1,NUM
    20.   287        A(3,I)=YOCOST
    21.   308   1300 CONTINUE
    22.   320        DO 1325 I=1,NUM
    23.   333        A(4,I)=A(3,I)*((1.0+ES1)**I)
    24.   390   1325 CONTINUE
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25.   402        XT2A=0.0
26.   412        DO 1350 I=1,NUM
27.   425        XT2A=XT2A+A(4,I)
28.   451  1350 CONTINUE
29.   463        XT2=XT2A*.24
30.   479 C      ---AMORTIZE EXPLORATION COSTS---
31.   479        DO 1400 I=1,NUM
32.   492        A(5,I)=EXCST/NUM
33.   524  1400 CONTINUE
34.   537 C      ---AMORTIZE DEVELOPMENT COSTS---
35.   537        DO 1500 I=1,NUM
36.   550        A(6,I)=DVCST/NUM
37.   582  1500 CONTINUE
38.   595 C      --- CALCULATE DEPRECIATION---
39.   595        DO 1600 I=1,3
40.   603        A(7,I)=CC/3.0
41.   635  1600 CONTINUE
42.   648        DO 1700 I=4,NUM
43.   661        A(7,I)=0.0
44.   684  1700 CONTINUE
45.   697 C      ---CALCULATE PRINCIPAL PAYMENTS---
46.   697        P2=API/15.0
47.   717        DO 1710 I=1,15
48.   725        A(14,I)=P2
49.   746  1710 CONTINUE
50.   759        DO 1720 I=16,NUM
51.   772        A(14,I)=0.0
52.   796  1720 CONTINUE
53.   809 C      ---CALCULATE INTEREST ON LOAN---
54.   809        A(8,1)=PIN*API
55.   843        AA=API
56.   855        DO 1730 I=2,15
57.   863        A(8,I)=PIN*(AA-P2)
58.   898        AA=AA-P2
59.   911  1730 CONTINUE
60.   924        DO 1740 I=16,NUM
61.   937        A(8,I)=0.0
62.   960  1740 CONTINUE
63.   973 C      ---CALCULATE SUBTOTAL WITH LOSS FORWARD---
64.   973        A(9,1)=0.0
65.   996        A(10,1)=A(2,1)-A(4,1)-A(5,1)-A(6,1)-A(7,1)-A(8,1)+A(9,1)
66.  1138        DO 1850 I=2,NUM
67.  1151        A(9,I)=0.0
68.  1174 *      A(10,I)=A(2,I)-A(4,I)-A(5,I)-A(6,I)-A(7,I)-A(8,I)+A(9,I)
69.  1316        IF(A(10,I-1).LT.0.0) A(9,I)=A(10,I-1)
70.  1382        A(10,I)=A(2,I)-A(4,I)-A(5,I)-A(6,I)-A(7,I)-A(8,I)+A(9,I)
71.  1524  1850 CONTINUE
72.  1537 C      ---CALCULATE TAX---
73.  1537        DO 1900 I=1,NUM
74.  1550        A(11,I)=A(10,I)*.495
75.  1591        IF(A(10,I).LT.0.0) A(11,I)=0.0
76.  1642  1900 CONTINUE
77.  1655        XT3=0.0
78.  1666        DO 1950 I=1,NUM
79.  1679        XT3=XT3+A(11,I)
80.  1705  1950 CONTINUE
81.  1718 C      ---SUBTOTAL---
82.  1718        DO 2000 I=1,NUM
83.  1731        A(12,I)=A(10,I)-A(11,I)
84.  1783  2000 CONTINUE
85.  1796 C      ---WORKING CAPITAL---
86.  1796        A(13,NUM)=WC
87.  1825        DO 2100 I=1,NUM-1
88.  1840        A(13,I)=0.0
89.  1864  2100 CONTINUE
90.  1877 C      ---NET CASH FLOW---
91.  1877        DO 2200 I=1,NUM
92.  1890        A(15,I)=A(12,I)+A(7,I)+A(6,I)+A(5,I)+A(13,I)-A(14,I)
93.  2014  2200 CONTINUE
94.  2027 C      ---DISCOUNTED VALUES---
95.  2027        DO 2300 I=1,NUM
96.  2040        A(16,I)=A(15,I)*(1.0/((1.0+DISRT)**I))
97.  2102  2300 CONTINUE
98.  2115        A(17,1)=0.0
99.  2138        DO 2400 I=1,NUM
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100.  2151        A(17,1)=A(17,1)+A(16,I)
101.  2203   2400 CONTINUE
102.  2216        DO 2450 I=2,NUM
103.  2229        A(17,I)=0.0
104.  2252   2450 CONTINUE
105.  2265 C      ---CALCULATE NET PRESENT VALUE---
106.  2265        PV=A(17,1)-CC-WC-EXCST-DVCST
107.  2322 C      ---CALCULATE RATE OF RETURN---
108.  2322        X=0.0
109.  2332        PX=0.0
110.  2342        DO 2500 M=1,NUM
111.  2355        PX=PX+A(15,M)*(1.0/((1.0+X)**M))
112.  2409   2500 CONTINUE
113.  2424        IF(PX.LT.-100.0) GO TO 3800
114.  2441        IF(PX.GT.-100.0) GO TO 2900
115.  2459   2900 DO 3500 K=1,10
116.  2467        RR=K/10.0
117.  2482        P=0.0
118.  2492        DO 3000 J=1,NUM
119.  2505        P=P+A(15,J)*(1.0/((1.0+RR)**J))
120.  2559   3000 CONTINUE
121.  2574        PA=P-CC-WC-EXCST-DVCST
122.  2614        IF(PA.GT.100.0.AND.RR.EQ.1.0) GO TO 3700
123.  2643        IF(PA.GT.100.0) GO TO 3500
124.  2660        IF(PA.LT.-100.0) GO TO 3100
125.  2677        IF(PA.GE.-100.0.AND.PA.LE.100.0) GO TO 3600
126.  2709   3100 DO 3400 J=1,100
127.  2717        ROR=(RR-.1)+(J/100.0)
128.  2745        PS=0.0
129.  2756        DO 3200 L=1,NUM
130.  2769        PS=PS+A(15,L)*(1.0/((1.0+ROR)**L))
131.  2823   3200 CONTINUE
132.  2838        PZ=PS-CC-WC-EXCST-DVCST
133.  2878        IF(PZ.GT.100.0) GO TO 3400
134.  2894        IF(PZ.LT.-100.0) GO TO 3210
135.  2911        IF(PZ.GE.-100.0.AND.PA.LE.100.0) GO TO 3600
136.  2943 .3210 DO 3300 IA=1,1000
137.  2953        RROR=(ROR-.01)+(IA/1000.0)
138.  2981        PL=0.0
139.  2992        DO 3220 JI=1,NUM
140.  3005        PL=PL+A(15,JI)*(1.0/((1.0+RROR)**JI))
141.  3059   3220 CONTINUE
142.  3074        PVAL=PL-CC-WC-EXCST-DVCST
143.  3114        IF(PVAL.GT.100.0) GO TO 3300
144.  3130        IF(PVAL.LT.-100.0) GO TO 3230
145.  3147        IF(PVAL.GE.-100.0.AND.PVAL.LE.100.0) GO TO 3600
146.  3179   3230 RROR=(ROR-.01)+((IA-1)/1000.0)
147.  3209        GO TO 3600
148.  3211   3300 CONTINUE
149.  3226   3400 CONTINUE
150.  3241   3500 CONTINUE
151.  3256   3600 RATE =RROR*100
152.  3271        GO TO 4610
153.  3273   3700 RATE = 100.0
154.  3288        GO TO 4610
155.  3290   3800 RATE = 0.0
156.  3304 C      ---CALCULATE PAYBACK---
157.  3304   4610 T0=0.0
158.  3314        DO 4900 I=1,NUM
159.  3327        TA=T0
160.  3335        T0=T0+A(15,I)
161.  3361        T1=CC+EXCST+DVCST-T0
162.  3393        IF(T1.GT.0.0) GO TO 4900
163.  3410        IF(T1.LE.0.0) GO TO 5000
164.  3426   4900 CONTINUE
165.  3439   5000 PAY=(I-1)+((CC+EXCST+DVCST-TA)/(T0-TA))
166.  3490        RV=XT2+XT3+(CC*.141)
167.  3522        RV2=XT2+XT3+(CC*.141)
168.  3554        TOT=RV/XT1
169.  3573        POV=(RV/RES)/XT1
170.  3600        RETURN
171.  3602        END
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    94.      0
    95.      0       FUNCTION RAN(XH,XL,XM)
    96.      0 C     ---CALCULATE RANDOM VARIABLES---
    97.      0       HI=1.0
    98.     10       LO=0.0
    99.     20       X=(HI-LO)/32767.0
   100.     39       CALL RANDOI
   101.     42       RESULT=X*RANDOM()
   102.     57       XX=(XM-XL)/(XH-XL)
   103.     76       Q=(RESULT-XX)
   104.     89       IF(Q.GT.0.0) GO TO 100
   105.    106       RAN=XL+SQRT((XM-XL)*(XH-XL)*RESULT)
   106.    139       GO TO 200
   107.    141   100 RAN=XH-SQRT((XH-XM)*(XH-XL)*(1-RESULT))
   108.    177   200 RETURN

    81.      0
    82.      0       SUBROUTINE SIM
    83.      0       COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2
RT,  84.      0       COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
    85.      0       COMMON/RTV/RV,RV2,TOT,POV
,   86.      0       COMMON/MOOS/KOOT,CHI,CLO,CML,EXHI,EXLO,EXML,DEVHI,DEVLO,DEVML
    87.      0      CRESHI,RESLO,RESML
    88.      0       DIMENSION A(18,50)
    89.      0 C     ---SIMULATE CASH FLOWS---
    90.      0       WRITE(*,100)'ENTER THE NUMBER OF SIMULATIONS YOU REQUIRE'
    91.     71   100 FORMAT(A43)
    92.     71       READ(*,200) KOOT
    93.    107   200 FORMAT(BN,I3)
    94.    107       WRITE(*,250)'ENTER THE MINING RATE PER DAY'
    95.    163   250 FORMAT(A29)
    96.    163       READ(*,275) XRATE
    97.    199   275 FORMAT(F10.0)
    98.    199       WRITE(*,277)'ENTER THE DISCOUNT RATE FOR NPV CALCULATIONS'
    99.    270   277 FORMAT(A44)
   100.    270       READ(*,278) DISRT
   101.    307   278 FORMAT(F5.5)
   102.    307       WRITE(*,280)'ENTER THE AMOUNT OF WORKING CAPITAL FOR PROJECT'
   103.    381   280 FORMAT(A47)
   104.    381       READ(*,281) WC
   105.    417   281 FORMAT(F12.0)
   106.    417       WRITE(*,282)'ENTER THE PERCENT OF INVESTMENT IS IN LOAN'
   107.    486   282 FORMAT(A42)
   108.    486       READ(*,283) P1
   109.    524   283 FORMAT(F8.3)
   110.    524       WRITE(*,285)'ENTER THE INTEREST RATE OF THE LOAN AMOUNT'
   111.    594   285 FORMAT(A42)
   112.    594       READ(*,287) PIN
   113.    632   287 FORMAT(F8.3)
   114.    632       WRITE(*,289)'ENTER THE ESCALATION RATE FOR COSTS'
   115.    695   289 FORMAT(A35)
   116.    695       READ(*,291) ES1
   117.    732   291 FORMAT(F10.5)
   118.    732       WRITE(*,293)'ENTER THE ESCALATION RATE FOR REVENUES'
   119.    798   293 FORMAT(A38)
   120.    798       READ(*,295) ES2
   121.    836   295 FORMAT(F10.5)
TA122.    836       WRITE(*,300)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR CAPI
   123.    836      C COSTS:'
   124.    922   300 FORMAT(A57)
   125.    922       READ(*,400) CHI,CLO,CML
   126.    975   400 FORMAT(F10.0/,F10.0/,F10.0)
   127.    975       WRITE(*,500)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   128.    975      CEXPLORATION COSTS:'
   129.   1064   500 FORMAT(A62)
   130.   1064       READ(*,600) EXHI,EXLO,EXML
   131.   1117   600 FORMAT(F10.0/,F10.0/,F10.0)
   132.   1117       WRITE(*,700)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   133.   1117      CDEVELOPMENT COSTS:'
   134.   1206   700 FORMAT(A62)
   135.   1206       READ(*,800) DEVHI,DEVLO,DEVML
   136.   1259   800 FORMAT(F10.0/,F10.0/,F10.0)
   137.   1259       WRITE(*,900)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
   138.   1259      C RESERVES:'
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   139.  1339   900 FORMAT(A53)
   140.  1339       READ(*,1000) RESHI,RESLO,RESML
   141.  1391  1000 FORMAT(F12.0/,F12.0/,F12.0)
   142.  1391       RETURN
   143.  1393       END

FORTRAN Compiler II.1  [1.1]
     0.     0 $USES APPLESTUFF
     1.     0 $USES URRPV IN FORT2:CHB.CODE
     2.     0       SUBROUTINE SIM2
     3.     0       COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2
RT,WB.      0       COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
     5.     0       COMMON/RTV/RV,RV2,TOT,POV
     6.     0       COMMON/MOOS/KOOT,CHI,CLO,CML,EXHI,EXLO,EXML,DEVHI,DEVLO,DEVML
     7.     0      CRESHI,RESLO,RESML
     8.     0       DIMENSION A(18,50)
     9.     0       EXTERNAL RAN
    10.     0       WRITE(*,1100)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
    11.     0      COP.COSTS:'
    12.    81  1100 FORMAT(A53)
    13.    81       READ(*,1200) OPHI,OPLO,OPML
    14.   124  1200 FORMAT(F6.4/,F6.4/,F6.4)
    15.   124       WRITE(*,1300)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
    16.   124      CCOPPER GRADE:'
    17.   209  1300 FORMAT(A57)
    18.   209       READ(*,1400) CUHI,CULO,CUML
    19.   252  1400 FORMAT(F6.4/,F6.4/,F6.4)
    20.   252       WRITE(*,1500)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
    21.   252      CGOLD GRADE:'
    22.   335  1500 FORMAT(A55)
    23.   335       READ(*,1600) AUHI,AULO,AUML
    24.   378  1600 FORMAT(F6.4/,F6.4/,F6.4)
    25.   378       WRITE(*,1700)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
    26.   378      CCOPPER PRICE:'
    27.   463  1700 FORMAT(A57)
    28.   463       READ(*,1800) CUPHI,CUPLO,CUPML
    29.   506  1800 FORMAT(F7.3/,F7.3/,F7.3)
    30.   506       WRITE(*,1900)'ENTER HIGH, LOW, AND MOST LIKELY VALUES FOR
    31.   506      CGOLD PRICE:'
    32.   589  1900 FORMAT(A55)
    33.   589       READ(*,2000) AUPHI,AUPLO,AUPML
    34.   632  2000 FORMAT(F5.0/,F5.0/,F5.0)
    35.   632       API=CC*P1
    36.   656       OPEN(5,FILE='FORT2:DATA1.TEXT',STATUS='NEW')
    37.   684       DO 2100 I=1,KOOT
    38.   696       CC=RAN(CHI,CLO,CML)
    39.   722       EXCST=RAN(EXHI,EXLO,EXML)
    40.   748       DVCST=RAN(DEVHI,DEVLO,DEVML)
    41.   774       RES=RAN(RESHI,RESLO,RESML)
    42.   800       OCOST=RAN(OPHI,OPLO,OPML)
    43.   817       CUG=RAN(CUHI,CULO,CUML)
    44.   834       AUG=RAN(AUHI,AULO,AUML)
    45.   851       CUP=RAN(CUPHI,CUPLO,CUPML)
    46.   868       AUP=RAN(AUPHI,AUPLO,AUPML)
    47.   885       RNUM=RES/(XRATE*250.0)
    48.   912       NUM=INT(RNUM)
    49.   925       IF(NUM.GT.50) THEN
    50.   935       NUM=50
    51.   943       ENDIF
    52.   943       CALL RRPV
    53.   946       CALL DATOUT
    54.   948  2100 CONTINUE
    55.   963       CLOSE(5,STATUS='KEEP')
    56.   968       RETURN
    57.   970       END

    58.     0
    59.     0       SUBROUTINE DATOUT
    60.     0       COMMON/SHARE/A,NUM,RATE,PV,PAY,PIN,P1,API,ES1,ES2,/LIST/CAR
    61.     0       COMMON/DUP/COL
RT,WB.      0       COMMON/SEC/XRATE,CC,EXCST,DVCST,RES,OCOST,CUG,AUG,CUP,AUP,DIS
    63.     0       COMMON/RTV/RV,RV2,TOT,POV
    64.     0       CHARACTER*15 CAR(15,1)
    65.     0       CHARACTER*2 COL(1,50)
```

```
66.      0        DIMENSION A(18,50)
67.      0 C      ---OUTPUT SIMULATION VALUES---
68.      0        WRITE(5,100) DCOST
69.     31    100 FORMAT(F10.5)
70.     31        WRITE(5,200) CUP
71.     61    200 FORMAT(F10.5)
72.     61        WRITE(5,300) CUG
73.     91    300 FORMAT(F10.5)
74.     91        WRITE(5,400) AUP
75.    121    400 FORMAT(F10.5)
76.    121        WRITE(5,500) AUG
77.    151    500 FORMAT(F10.5)
78.    151        WRITE(5,600) RATE
79.    182    600 FORMAT(F9.1)
80.    182        WRITE(5,700) PAY
81.    214    700 FORMAT(F6.1)
82.    214        WRITE(5,800) RV
83.    245    800 FORMAT(F15.0)
84.    245        WRITE(5,900) RV2
85.    275    900 FORMAT(F15.0)
86.    275        WRITE(5,1000) TOT
87.    305   1000 FORMAT(F15.12)
88.    305        WRITE(5,1100) POV
89.    335   1100 FORMAT(F15.12)
90.    335        WRITE(5,1200) PV
91.    366   1200 FORMAT(F15.0)
92.    366        RETURN
93.    368        END
```

Main Program Parameters

Input Parameters

XRATE	Mining rate per day
CC	Investment in project *
RES	Reserves of the project in tonnes *
OCOST	Operating cost per tonne *
CUG	Copper ore grade in concentrate *
AUG	Gold ore grade in concentrate *
CUP	Copper price in dollars per pound *
AUP	Gold price in dollars per troy ounce *
DISRT	Discount rate for NPV calculations
WC	Working capital
P1	Percent of investment is in loan
PIN	Interest rate of loan
ES1	Escalation rate for costs
ES2	Escalation rate for revenues
KOOT	Number of simulations
NUM	Number of years

Output Parameters

RATE	Discounted rate of return
RV	Retained value
PAY	Payback period

* - Values that were varied for simulation

Main Program Parameters (Continued)

TOT	UPOE measurement
POV	POE measurement
WC	Working capital
PV	Net present value