

# Developments in Business Simulation & Experiential Exercises, Volume 13, 1986

## A PEDAGOGICAL ANALYSIS OF ALTERNATIVE TAX ELECTIONS FOR EXPLORATION COSTS IN THE MINING INDUSTRY

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### ABSTRACT

Students and faculty typically prefer to deal with situational problems that are easily related to real world settings. This appears to be even more pronounced in upper division and professional graduate programs. This paper provides complex and environmentally realistic decision models for use in corporate taxation or extractive industries accounting courses. The models can provide the student with an appreciation for decision making with a significant number of variables, most of which are beyond the control of management, and under uncertainty. The decision models are suitable for analysis using Lotus 1-2-3, Multiplan, Interactive Financial Planning System (IFPS), other comparable softwares, or manual manipulation.

### INTRODUCTION

The mining industry spans three phases in producing a marketable product: the exploration stage, development stage, and the production stage. Exploration encompasses a broad range of activities and may occur prior to or subsequent to acquisition of mineral rights. Exploration costs are typically incurred in connection with the probing of an area of likely mineralization for the purpose of evaluating the desirability of its commercial exploitation. The exploration stage ends when a determination is made concerning the existence of exploitable reserves [1, pp. 93-94].

The exploration stage is followed by the development stage of the mine. Development activities consist of providing access to the main ore body and building plant and equipment facilities for ore handling.

For taxation purposes, one must examine the Code, Regulations, or Revenue Rulings for guidance in distinguishing between stages. However, delineation of the stages is not clear-cut. Determination of the exact stage at which a cost is incurred is important due to various tax elections that are available to the taxpayer.

Generally, exploration costs are capitalized as part of the property's depletable base while development and production expenditures are treated as current deductions in the determination of taxable income. An election is available under Sec. 617(a) of the Internal Revenue Code that allows the taxpayer to deduct exploration costs in the year incurred.

The decision process modeled in this paper concerns management's choice among the available tax elections. Specifically, a discounted cash flow analysis of the different elections is utilized to guide the student to the rational economic election path.

### SECTION 617(a) ELECTION

Taxpayers may elect under Sec. 617(a) to expense all exploration costs incurred on a mine during the year and all subsequent years. This election is made by simply deducting exploration costs on the return. The election applies for the election year and thereafter unless the taxpayer obtains permission to revoke the election.

The Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) requires corporate taxpayers to capitalize, rather than expense, 20 percent of the exploration expenditures incurred after 1984. These capitalized expenditures are written off using ACRS rates for five year property and are eligible for investment tax credit (ITC).

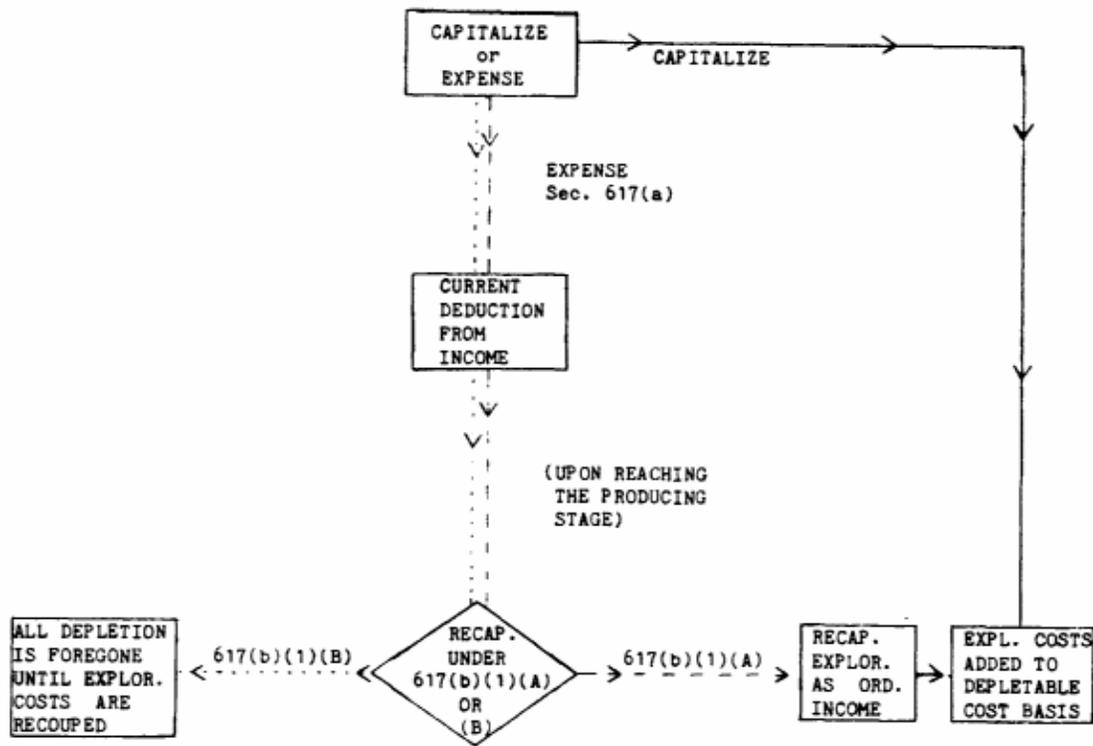
### RECAPTURE OF DEDUCTED EXPLORATION COSTS

When a mine reaches production stage, exploration expenditures which were previously deducted (expensed) under Sec. 617(a) must be recaptured under one of two methods. The first method is to forego depletion deductions until the adjusted exploration expenditures equals depletion foregone. The second method is to include in gross income during the taxable year an amount equal to adjusted exploration expenditures. This is done the year the mine reaches the productive stage. Figure 1 provides a graphic illustration of the election paths for these exploration expenditures.

### ELECTION PATHS

As depicted in Figure 1 there are three election paths: 1) Capitalize all exploration costs (solid line), noted hereafter as  $PV_{CAP}$ ; 2) elect to expense exploration costs under provisions of Sec. 617(a) and recapture under provisions of Sec. 617(b)(1)(A) (dashed line), noted hereafter as  $PV_{E\&R}$ ; and 3) elect to expense costs under Sec. 617(a) and recapture per Sec. 617(b)(1)(B) (dotted line), noted hereafter as  $PV_{E\&F}$ .

FIGURE 1  
FLOWCHART OF POSSIBLE  
ELECTION PATHS FOR  
EXPLORATION EXPENDITURES



MODEL VARIABLES

The following variables are utilized in the models:

- TX = tax rate (assumed constant);
- ACRS<sub>i</sub> = deduction of exploration costs (capitalized per Sec. 291 (b)) in period i;
- D<sub>i</sub> = depletion taken in period i;
- E = exploration expenditures;
- AE = adjusted exploration expenditures (E>AE);
- r = discount rate;
- j = period in which production stage is attained;
- k = period in which adjusted exploration expenditures are recouped via forgoing depletion per Sec. 617(b)(1)(B);
- n = total periods (j ≤ k ≤ n);
- C = mineral acquisition costs; and
- ITC = investment tax credit percentage.

ASSUMPTIONS

Simplifying assumptions are necessary in an analysis of this nature. The assumptions for the decision models are listed below.

- 1) Exploration costs are paid at the beginning of the periods.

- 2) Decisions regarding exploration cost treatment are responsible for all cash flow differentials.
- 3) All tax induced cash flows (refunds and payments) occur at year ends.
- 4) Percentage depletion exceeds cost depletion. (This situation would most likely occur with a profitably operating mine as percentage depletion would not be reduced by the 50 percent of net income requirement under Sec. 613(a).)

DECISION MODELING

The first decision management must make concerning exploration cost tax elections is whether to capitalize or expense these costs. Reducing the decision to a manageable form yields the following models.

$$\begin{aligned}
 PV_{\text{tax}} &= \left[ \frac{TX \times 80\%E}{(1-r)} \right] + \left[ \frac{ITC \times 20\%E}{(1-r)} \right] \\
 &- \sum_{i=1}^j \left[ \frac{TX \times ACRS \times 20\%E}{(1-r)} \right] - \left[ \frac{TX \times 80\%AE}{(1-r)} \right] \quad (1) \\
 &- \sum_{i=1}^n \left[ \frac{TX \times D}{(1-r)} \right]
 \end{aligned}$$

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$$PV_{CAP} = \sum_{t=1}^n \left[ \frac{TX \times D}{(1+r)^t} \right] \quad (2)$$

Utilizing these models, the student should easily see that  $PV_{E\&R}$  provides a larger tax savings than  $PV_{CAP}$ .

If desired, one could relax the fixed tax rate constraint. If this is done, the optimal choice would not change until marginal tax rates in year  $j$  have increased by an amount necessary to offset the discounting effect and the benefits

Once it is shown that  $PV_{E\&R} > PV_{CAP}$  the student can compare  $PV_{E\&R}$  to  $PV_{E\&F}$ . The model for  $PV_{E\&F}$  is:

$$PV_{E\&F} = \left[ \frac{TX \times .80(E)}{(1+r)^t} \right] + \left[ \frac{ITC \times .20(E)}{(1+r)^t} \right] + \sum_{t=1}^5 \left[ \frac{TX \times ACRS \times .20(E)}{(1+r)^t} \right] - \sum_{t=1}^n \left[ \frac{TX \times D}{(1+r)^t} \right] \quad (3)$$

Assuming constant tax rates, the value of  $PV_{E\&F}$  is larger than  $PV_{E\&R}$ .

from ITC and ACRS.

Once preference for  $PV_{E\&F}$  has been established, it may be appropriate to begin changing the values of the variables. In so doing, the student gains an appreciation for the consequences of changes in discount rates, tax rates, and investment tax credit provision of the tax code, to name a few.

### EXTENSIONS

The previous decision models were predicated on the use of percentage depletion. A more rigorous and realistic learning experience may be had by considering the possibility of cost depletion exceeding percentage depletion. Decision models for this variation have been developed and are only slightly more complex than those presented earlier [1].

Uncertainty could be incorporated in the decision framework with only slight modifications. For example, one could assign subjective probabilities to differing sets of values for the variables and compute their expected values for each election option ( $PV_{CAP}$ ,  $PV_{E\&R}$ , and  $PV_{E\&F}$ ).

### SUMMARY

The purpose of this paper was to provide a vehicle by which students in a corporate taxation or extractive industries accounting course can experience the use of models to make rational economic choices, similar to those required of management, concerning certain tax election paths. The models are environmentally sound and can incorporate the variations one would expect a sophisticated management to utilize including uncertainty. The models are readily adaptable to computer assisted analysis using one of several software packages commonly available.

### REFERENCES

- [1] Kilpatrick, Bob G. and Larry E. Watkins, "An Analysis of the Alternative Elections for Exploration Costs in the Mining Industry", Journal of Petroleum Accounting, Summer 1985, pp. 93-109.