

AN EXAMINATION OF THE CAPITAL STRUCTURE
OF THE AMERICAN MINING INDUSTRY WITH
COMMENTS ON THE EFFECT OF DEPLETION FUNDS

ARTHUR LAKES LIBRARY
COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

by

Richard E. Hague

ProQuest Number: 10781668

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



ProQuest 10781668

Published by ProQuest LLC (2018). Copyright of the Dissertation is held by the Author.

All rights reserved.

This work is protected against unauthorized copying under Title 17, United States Code
Microform Edition © ProQuest LLC.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

A Thesis submitted to the Faculty and the Board of Trustees of the Colorado School of Mines in partial fulfillment of the requirements for the degree of Master of Science.

Signed: Richard E. Hague
Richard E. Hague

Golden, Colorado

Date: May 15, 1970

ARTHUR LAKES LIBRARY
COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

Approved: Charles O. Frush
C. O. Frush
Thesis Advisor

Albert M. Keenan
Albert M. Keenan
Head of Department

Golden, Colorado

Date: June 3, 1970

ABSTRACTARTHUR LAKES LIBRARY
COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

It is the purpose of this thesis to examine the capital structure of the nonferrous metals, coal, and iron sectors of the American mining industry and to comment upon the role played by depletion funds in providing capital for expansion and improvement. The capital structure of the industry is that mixture of debt and equity which provides long-term funds to the industry.

The major sources of long-term funds are bonds, common stock, preferred stock, leases, retained earnings, depreciation and amortization, and depletion. Bonds and leases represent debt funds, while common and preferred stock, retained earnings, depreciation and amortization, and depletion represent equity, or ownership, funds.

In general, debt financing should be used only when future earnings are assured so as to reduce risk to both borrower and lender. The cost of capital is somewhat dependent upon, and will determine in part, the mixture of debt and equity used in a capital structure. Ratio analysis is a useful tool with which to examine the capital structure of a company or industry and is used in this thesis.

The capital structure of three sectors of the American mining industry is examined by tracing the following ratios over the period 1929-1968:

- 1) $\frac{\text{funded debt}}{\text{total capitalization}}$
- 2) $\frac{\text{preferred stock}}{\text{total capitalization}}$
- 3) $\frac{\text{common stock and surplus}}{\text{total capitalization}}$

Internally generated funds have become relatively more important since 1900 and have always been significantly more important than have external funds. Depreciation and depletion funds were 19 percent higher than retained earnings between 1900 and the mid-1950's. Use of debt financing has increased significantly since 1900.

A survey of the capital structures of 14 mining and 4 petroleum companies between 1929 and 1968 showed that the importance of debt financing has fluctuated greatly, but that its importance has increased in both sectors over time. The petroleum industry used more debt financing than did mining until the mid-1960's when mining began using debt in amounts comparable to the petroleum industry. The use of preferred stock financing has declined significantly in importance since 1929 in the mining industry. The petroleum industry has never used more than negligible amounts of preferred stock. The proportion of common stock and surplus has declined in both mining and petroleum with the increased use of debt.

The originally planned depletion study was made

impossible by the inadequacy of published data. Only three companies of the 18 surveyed provided adequate data. This information indicated that possibly as much as 30 to 40 percent of the mining industry's total funds may be provided by depletion allowances.

New trends in mine finance are found in debt use and in government participation in mining ventures. The ABC transaction and carved-out production payments will become important financing methods in the future. Government participation, especially in underdeveloped countries, may provide great assistance or may be very harmful and undesirable.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
SOURCES OF LONG-TERM, EXTERNAL FINANCING	5
Bonds	5
Common Stock.	10
Preferred Stock	13
Leasing	16
SOURCES OF LONG-TERM, INTERNAL FINANCING	19
Retained Earnings	19
Depreciation and Amortization	22
DEPLETION FUNDS AS A SOURCE OF INTERNAL FINANCING.	25
Depletion as a Concept.	25
Historical Aspects of Depletion	31
Computation of the Allowance.	39
Other Possible Depletion Concepts	44
CAPITAL FORMATION - THE HISTORICAL PERSPECTIVE	46
Basic Business Finance.	46
Ratio Analysis.	48
Limitations of Study.	49
Trends in Capital Formation	51
Internal Versus External Financing	53
Retained Earnings.	53

	Page
Depletion and Depreciation	55
Debt Versus Equity Financing	56
Bonds.	58
Summary.	60
Capital Structure Trends in Mining and Petroleum, 1929-1958.	61
Funded Debt - Nonferrous Metals Industry . .	61
Funded Debt - Coal and Iron Industries . . .	65
Funded Debt - Petroleum Industry	66
Preferred Stock - Nonferrous Metals Industry	67
Preferred Stock - Coal and Iron Industries .	70
Preferred Stock - Petroleum Industry	71
Common Stock and Surplus - Nonferrous Metals Industry.	72
Common Stock and Surplus - Coal and Iron Industries.	73
Common Stock and Surplus - Petroleum Industry	77
Summary.	77
PRESENT CAPITAL STRUCTURE AND COMMENTS ON DEPLETION. .	78
Capital Structure - 1959 to 1968.	78
Funded Debt - Nonferrous Metals Industry . .	79
Funded Debt - Coal and Iron Industries . . .	81
Funded Debt - Petroleum Industry	83
Preferred Stock - Mining Industry.	84
Preferred Stock - Petroleum Industry	84

	Page
Common Stock and Surplus - Nonferrous Metals Industry	86
Common Stock and Surplus - Coal and Iron Industries	88
Common Stock and Surplus - Petroleum Industry	88
Summary	89
Comments on the Depletion Allowance	92
Problems Encountered	93
Responses to the Survey	98
Definition of Terms	99
Results of the Study	101
Summary	104
RECENT AND FUTURE TRENDS IN MINE FINANCE	106
The ABC Transaction	106
Carved-Out Production Payments	109
Conventional Financial Institution Loans	111
Consortiums	113
Debt Financing of Large Ventures	114
Government Participation	118
CONCLUSION	125
Capital Structure	125
Depletion	128
BIBLIOGRAPHY	131

LIST OF ILLUSTRATIONS

Exhibits	Page
1. Percentage Depletion Rates for Mineral Products.	37
2. Sample Depletion Allowance Calculation.	40
3. Gross Revenues of Sample Companies.	52
4. Recent Capital Structures in the Mining and Petroleum Industries.	90
5. Depletion as a Percentage of Total Funds and of Internal Funds for Three Companies	102

Tables

1. Ratio of Funded Debt to Total Capitalization - Selected Mining and Petroleum Companies - 1929-1968	63
2. Ratio of Preferred Stock to Total Capitalization - Selected Mining and Petroleum Companies - 1929-1968	69
3. Ratio of Common Stock and Surplus to Total Capitalization - Selected Mining and Petroleum Companies - 1929-1968	75

Graphs

1. Ratio of Funded Debt to Total Capitalization - Selected Mining and Petroleum Companies - 1930-1958	62
2. Ratio of Preferred Stock to Total Capitalization - Selected Mining and Petroleum Companies - 1930-1958	68
3. Ratio of Common Stock and Surplus to Total Capitalization - Selected Mining and Petroleum Companies - 1930-1958	74

Graphs	Page
4. Ratio of Funded Debt to Total Capitalization - Selected Mining and Petroleum Companies - 1959-1968	80
5. Ratio of Preferred Stock to Total Capitalization - Selected Mining and Petroleum Companies - 1959-1968	85
6. Ratio of Common Stock and Surplus to Total Capitalization - Selected Mining and Petroleum Companies - 1959-1968	87

ACKNOWLEDGMENTS

The author wishes to thank the National Science Foundation without whose financial aid this thesis could not have been completed.

The author also wishes to thank the members of his thesis committee, Professors Frush, Rudawsky, Bator, and Mather, and the companies which provided valuable data. Thanks are also due to Dr. Henry Kester of the University of Colorado Graduate School of Business.

The thesis is dedicated to Simba, whose unfailing patience during the writing of the thesis provided great moral support.

INTRODUCTION

It is the purpose of this thesis to examine the capital structure of the American mining industry and to comment upon the role played by depletion allowance funds in providing capital for expansion and improvement.

The American capitalistic system is essentially a system of incentive, reward, punishment, and efficiency. Capitalism allows the free flow of productive resources - land, labor and capital - to those sectors of the economy where they may be used most efficiently. The mechanism which makes this flow possible is in the market place. Although modern industry in the United States is by no means so simple and smooth-running as Adam Smith's market place, the new industrial state, as seen by Galbraith, preserves much of the substance of the economic system as seen by Smith.

One example of the efficiency of our system is in the financial structure of our industry - the structure which provides the funds necessary for the system to operate. If capital structure is defined as the mixture of all sources of long-term capital used by the corporation (Bonneville, 1959, p. 161), we find that different segments of American industry have developed structures which best suit the type

of business in which they are engaged. For the purpose of this thesis, the sources of capital which make up this structure are bonds, common stock, preferred stock, retained earnings, capital surplus, depreciation, and depletion. Several other minor sources may also be included. Generally, bank loans are not considered long-term and, therefore, will not be considered as part of the capital structure.

Industries differ in structure and in financial needs and may require different mixtures of debt and equity. For instance, the public utility industry has very large investments in long-term, fixed assets such as generating equipment and furnaces. The industry also has a very stable, long-term earnings outlook due to its localized monopoly position. Such characteristics allow, and require, the industry to use tremendous quantities of debt. Most segments of American industry - whether engaged in mining, retailing, or manufacturing - have characteristics which dictate certain proportions of debt and equity, long-term and short-term financing, and internal or external financing. In fact, most industries can be identified by their characteristic capital structures.

The first purpose of this thesis is to examine three major segments of the American mining industry and to determine the characteristic capital structure of these segments. It has been necessary to limit the scope of this thesis to those companies having a net worth exceeding

\$1,000,000, as defined by Dunn and Bradstreet. Small companies, which contribute little to the gross mining output, have been omitted. The study has been limited to iron, coal, and nonferrous metal mining for the period 1929 through 1968. A brief comparison of these three mining sectors with the petroleum industry has been made for contrast.

The second purpose of this thesis is to examine depletion and its role in mine finance. Recently, depletion practices have been attacked for providing the natural resource industries with unfair tax treatment. Since depletion tax allowances are a large source of internal funds, depletion opponents argue that these funds provide the natural resource industries with low-cost, undeserved financing. Proponents of depletion point out that ore and oil are wasting assets and that funds similar in concept to depreciation should be provided to finance the replacement of these assets. Proponents also argue that the risk involved in mining requires extra incentives to attract capital to these industries. Lost in all of the emotional rhetoric is factual information detailing the actual role played by depletion funds. What proportion of new financing is composed of depletion funds? Is depletion, as presently computed, a fair and logical method for recovery invested capital? A detailed study of the role of depletion in mine finance is impossible due to a lack of meaningful data.

However, a small amount of information provided by three companies included in the study gives some indication of the importance of depletion allowances.

To provide an historical perspective to the capital structure examination, the author has made a survey of past financing methods in the mining industry. Fairly reliable information dating back to 1900 shows a definite trend in the type of financing used and in the type of assets procured with these funds. In order to complete the picture of past and present, a review of several new concepts in mine finance has been made. These recent financial innovations are not at all revolutionary, but represent the application of proven methods to the specific needs of the mining industry.

All of the financial instruments commonly used in long-term financing have been defined and described in the first three chapters of this thesis. These instruments include bonds, stock, retained earnings, depreciation, and depletion.

SOURCES OF LONG-TERM, EXTERNAL FINANCING

The principal methods of obtaining long-term, external funds are bonds, common stock, preferred stock, and leasing arrangements. Although the expression "long-term" has no concrete definition, funds obtained for periods greater than seven to ten years are usually considered to be long-term. The term "external" refers to funds raised in either private or public capital markets outside of the firm. Retained earnings and depletion and depreciation funds are thus precluded. Recent trends in long-term financing with respect to the mining industry will be examined in a later chapter.

Bonds

A bond represents a debt of the issuing company to the bondholder, a creditor of the company. The bond is a written promise to repay this indebtedness at some definite time in the future as well as to pay the bondholder a definite interest rate for the use of his money. Bonds are usually issued in denominations of \$1000 and may be placed privately or sold publicly through investment bankers. A trustee is appointed to represent the bondholders' interests.

Over the years, many different types of bonds have been developed to satisfy the needs of both borrowers and lenders. For both parties, other financial instruments may be used to

raise funds or to provide an investment. The final type of financing used is a product of what the corporation is willing to concede and of what the market will bear.

The distinctive features of debt, as opposed to equity, are related to maturity, claim on income, claim on assets, and voice in management.

In recent years, more than four-fifths of new bond issues have had maturities of 20 years or more, with a concentration in the 20- to 30-year range (Johnson, 1966, p. 488). In contrast to the definite maturities of bonds, stock financing is permanent and never need be repaid.

One of the disadvantages of debt financing is that periodic interest payments and payment of principal must be made regardless of the state of the business. If bondholders are to be assured a return of their principal, a sinking fund may be required into which the corporation must make periodic payments for retirement of the debt. The corporation may make these payments with its own bonds which it has purchased in the open market. If cash payment is made, the bonds may be purchased in the open market or may be called in for redemption. A sinking fund provision may take many forms. Whatever the variation, the purpose of the sinking fund is to insure that the debt is retired orderly and safely. The same purpose is served by the serial bond, a bond issue which has several series, each of a different

maturity. Each series is retired according to a schedule, with the selling price of each series adjusted to the maturity.

From the standpoint of the bond issuer, it may be beneficial if the bond issue could be retired at will rather than by a forced schedule. The bond issuer may insist upon a call provision which will enable the company to call bonds in for redemption before maturity - these are callable bonds.

The bondholder's claim on the company's income precedes that of the company's owners - the stockholders. All interest payments and sinking fund provisions must be met before any income is distributed as dividends. The bondholders may even insist on other restrictive covenants which limit dividend distribution or further acquisition of assets. If the fixed payments to the bondholders are not met, the trustee may declare a default and force immediate payment of the principal or seize the assets which secure the bonds. This fixed claim on income may be avoided with income bonds which require interest payment only if it is earned. Frequently, a company will issue guaranteed bonds where a second company, perhaps the parent of a subsidiary company issuing the bonds, will guarantee both principal and interest to increase the safety of the bonds.

The bond interest rate is the result of a bargaining process in which the company attempts to satisfy investors'

demands to insure the sale of the issue. A lower interest rate may be possible if the issue is "sweetened" with terms favorable to the investor. Likewise, if the interest rate is increased, the investor may be willing to lengthen the bond maturity or to grant a more lenient call privilege. One method of "sweetening" the issue is to offer a convertible bond, one which may be exchanged in the future for a given number of common or preferred shares. Many convertible bonds come with a call provision which enables a company to force conversion should this be desirable. Some companies issue convertible bonds with a call provision so as to force conversion to obtain low-cost, permanent equity financing through a bond issue.

Warrants, which allow the bondholder to purchase common shares from the company at a specified price, are sometimes used to "sweeten" an issue. Should the market price of the stock rise above the warrant price, the bondholder would benefit by purchasing the "warrant shares" and selling them on the market for a capital gain.

Should liquidation occur the bondholders always have a claim on assets prior to that of the owners. To insure themselves of less risk, bondholders may insist that specific assets be pledged as security for the bonds. Such bond issues are called mortgage bonds if the assets pledged are land or buildings. If equipment, such as railcars,

engines, and machinery, is pledged, the bonds are called equipment trust certificates. Several secured bond arrangements are possible; a complete explanation is beyond the scope of this paper. In each case, should liquidation occur, the assets pledged as security will be sold to satisfy the claims of the secured bondholders before any other creditors are paid.

Should the company have adequate earnings, a good financial history, good management, and a favorable outlook, it may be possible to sell unsecured bonds or debentures. Such bonds have become very popular in recent years, especially for large companies. The bonds are secured only by the earning potential of the company and, should liquidation occur, the bondholders would have claim to the company's assets equal to that of all other creditors.

One of the most important financial developments of this century has been the subordinated debenture (oral communication, Dr. Henry Kester, 1969). The holder of a subordinated debenture accepts a claim on assets junior to that of most other creditors. By "freeing" assets for senior claims, subordinate debentures enable a company to borrow more heavily than would be possible if the bonds had a claim on assets equal to that of other creditors. In this sense, subordinated debentures are similar to preferred stock. The advantage of this type of bond is that the

interest payments are tax deductible. If subordinated income bonds could be sold, the company would nearly have preferred stock financing with tax-deductible "dividends."

One advantage of debt financing is that the bondholders have no voice in management other than the conditions set out in the indenture. This arrangement allows a company to raise and to use funds without diluting the control of the owners.

Bond financing is fairly low-cost compared with equity financing, since the interest charges are tax deductible. To meet the fixed costs of bond issues, however, a company must have stable, reliable future earnings. There is a limit to the debt which may be built upon the company's equity. These restrictions have limited bond issues to fairly large companies in reasonably "safe" businesses. It has been only recently that mining companies have ventured into large amounts of bond financing, a trend to be examined later.

Common Stock

The residual ownership of an incorporated business lies in its common stock. The stockholder is the owner of the business and, therefore, is susceptible to the rewards of success and to the losses of failure. Each stockholder is limited in liability for the company's debts to the money he has invested in the stock. The corporation charter, the

document which establishes the company as a legal entity in the eyes of the state, sets forth the conditions, rights, and liabilities of the stockholders. The funds received from this equity financing are a part of the permanent capital of the corporation.

The selling of stock usually assumes the eventual distribution of part of the profits as dividends. A portion of the earnings will be retained in the business to provide internal financing for expansion and replacement. Stockholders have no right to profits until dividends are declared by the elected board of directors and until the preferred stockholders have received their dividends. Should the corporation be forced to liquidate, the owners of common stock receive what remains after all creditors' (including bondholders) and preferred stockholders' claims are settled.

The performance of the corporation is of critical importance for future financing. The market values a corporation's stock by the company's past performance, its management, its earnings per share, and its earnings outlook, among other factors. A high price-to-earnings ratio is necessary if the company is to benefit fully from a new stock offering. Should the company decide to finance through a stock issue, it is important that the earnings per share not be lowered by the new shares outstanding.

The new projects, financed by the stock sale, should increase earnings at least enough to maintain the same earnings per share ratio as before the new issue.

Financing with a sale of stock has several advantages. There are no fixed charges or payment of principal to be made in the future, although most corporations attempt to pay some dividends on a regular basis. The funds received are permanently locked in the business. Stock issues also place few restrictions on management except insofar as stockholders are able to influence company policy through their voting rights. However, the sale of stock can dilute control of a corporation and can dilute earnings per share, to the disadvantage of the old stockholders. Equity financing is by no means cheap. In addition to the mechanical costs involved in issuing stock - such as legal fees, registration fees, printing costs, investment banker commission, which may cost 2 to 5 percent of the total issue - there is a cost to the corporation for the use of the stockholders' money. Although authorities differ in the calculation of this cost, one method is the following (Hunt and others, 1966, p. 425):

$$\text{cost(after tax)} = \frac{(\text{anticipated earnings per share without stock issue})}{(\text{net price obtainable per share on the new issue})}$$

This calculation assumes that earnings per share will not be diluted by the new issue. This cost is very real to the corporation, since stockholders do expect dividends and since

the market usually penalizes those companies which do not adopt a reasonable program of dividend payment. Dividends are not tax deductible and represent a drain on after-tax revenues which can be very serious.

Preferred Stock

Preferred stock is a hybrid security having characteristics of both bonded debt and common stock. The preferred stockholder maintains an equity position in the business with certain preferred privileges. He has all of the rights of the common stockholder with the exception of voting. Preferred stock is usually sold with a par value of \$100 per share and carries a fixed interest rate with regard to dividends. The stockholder is by no means assured of receiving this dividend, however. He occupies a preferred dividend position, since these fixed dividends must be paid before dividends may be distributed to common stockholders. Preferred stockholders hold a senior asset position in the event of liquidation of the business. After all creditor claims, including those of bondholders, have been met, the remaining assets go first to satisfy preferred stockholders' claims. The remaining assets are then distributed to the common stockholders - the residual owners.

The preferred stockholder occupies a safer position than does the common stockholder, but he sacrifices potential high returns for this safety. He is limited to receiving

a fixed return on his investment - the interest rate described previously - and usually cannot share in any dividends in excess of this amount. There are two types of preferred stock with respect to dividends - non-participating and participating. Nonparticipating stock is limited to the fixed interest dividend and may receive no more. Participating preferred will receive the fixed dividends before common and will also share, or participate, in dividends distributed to common stockholders. This arrangement is fairly rare today.

Preferred stock may also be cumulative or noncumulative. Cumulative preferred is stock whose stipulated dividend, if not paid in full in one or more years, is carried over and accumulated from year to year. This dividend in arrears must be paid in full before any common dividends may be paid. Preferred dividends in arrears have a very depressing effect on the market price of the common stock. Therefore, the board of directors usually considers cumulative preferred dividends to be a fixed and necessary expenditure each year. Noncumulative preferred has no such provision, and dividends not paid in any one year are lost forever to the stockholder. Preferred stock usually has no voting privileges; however, there may be provision for voting privileges if dividends have not been paid for a certain number of years.

Preferred stock may also have a call provision similar to that of bonds, where the company can call preferred shares in at a given price so as to retire the issue. Some preferred issues have sinking fund provisions with a definite retirement schedule so that the company may retire the issue. This retirement provision allows the company to use nonpermanent equity financing without the fixed interest charges of debt. Preferred stock may be convertible into common shares to enable preferred shareholders to participate in higher dividends and voting rights. A call-conversion combination may allow the company the benefits of forced conversion.

Preferred dividends are not tax deductible and therefore represent a drain on after-tax revenues. Since it is a hybrid security, preferred stock can be more of a headache than a benefit to management. The stock has preference to dividends as does bond interest, but the dividends are not tax deductible. With cumulative preferred the dividends must be met and, therefore, are more like a fixed interest charge. It usually is better for a company to not have preferred issues, but, rather, to deal only in "straight" debt or equity financing. As with common stock, there is a definite cost of preferred financing in addition to the mechanical costs of issue. Authorities differ as to the calculation of this cost, but one method used is the following (Farwell and others, 1966, p. 417):

$$\text{cost of preferred} = \frac{\text{fixed dividends to stockholders}}{\text{net proceeds per share to issuer}}$$

Leasing

A lease is a contractual agreement whereby the owner of certain property (the lessor) allows another party (the lessee) to use the property for a certain length of time (Johnson, 1966, p. 523). The lessee incurs fixed obligations to the lessor resulting from the borrowing of an asset other than cash. The basic purpose behind all financing is to acquire the use of assets to increase a company's earning power. Usually, it is not absolutely necessary to have title to the asset so long as the company may use that asset. Thus, leasing is almost equivalent to bond financing in that fixed assets are acquired for use.

Assets may be leased for periods ranging from several hours to 50 years or more. Almost any type of asset may be leased - land and buildings, truck fleets, machinery, etc. The major lessors are commercial banks, insurance companies, and special private companies established for leasing. Long-term leases are usually for periods of at least 75 percent of the useful life of the asset, and the leasing terms are designed to enable the lessor to recover his investment plus a profit within the lease period. The parties may enter into a sale-leaseback agreement, where the lessee sells an asset such as a building to the lessor and then leases it back. Hundreds of variations are

possible with leasing arrangements - one of the main advantages of this type of financing.

Many reasons are put forth in favor of lease financing. However, many of the usual arguments are not valid - a close examination of each case is necessary to determine the desirability of leasing. Equipment may be leased to protect the lessee from the risk of obsolescence; however, this risk also accrues to the lessor and thus is implicitly included in the lease charges. A great deal of flexibility is possible in lease agreements. Initial terms may be fitted to each case; but once the lease is signed, the terms are fixed, and the lessor is bound to them as though he owned the asset. Leasing may free badly needed cash from being tied up in fixed assets, but this is true only if the assets would otherwise have been financed from internal sources. Whether leasing is cheaper than borrowing depends entirely upon the individual case. Generally, leasing is more expensive than borrowing, but a detailed discounted cash-flow analysis would be necessary in each instance to determine this factor. Lease payments are tax deductible. This may be an advantage, especially since leased land may be "depreciated" through leasing while, otherwise, it would not be depreciable. The institution of accelerated depreciation in 1954 greatly reduced this advantage of leasing. It may be possible to raise more external funds when assets are leased, rather than when a large debt structure has been built to finance

assets. However, since leasing is nearly the same as borrowing, this "hidden debt" may afford no advantage. Investors will see the lease as a long-term debt obligation and react accordingly.

SOURCES OF LONG-TERM, INTERNAL FINANCING

Although external financing instruments receive much publicity as suppliers of corporate funds, the major source of long-term funds is from within the business itself. In the post-WW II period, internal funds have provided 60 percent of all corporate funds and 75 percent of all long-term corporate funds (Farwell and others, 1966, p. 256). The major sources of these funds are retained earnings, depreciation, and depletion. The first two categories will be examined in this chapter, while depletion will be examined in the following chapter.

Retained Earnings

After all expenses have been deducted from gross income, a net income is usually realized. This profit must then be divided into funds to be distributed as dividends to stockholders and into funds to be re-invested in the corporation - the retained earnings or earned surplus. In the past 20 years, the average payout ratio, or proportion of dividends to net income, has fluctuated between 50 and 65 percent (Farwell and others, 1966, p. 258).

For an economy to gain maximum economic efficiency, funds should be directed toward the most profitable use. Shareholders should be allowed to decide for themselves the most profitable use of the returns on their investment. If

shareholders are able to invest company earnings more profitably than is the company, the stockholders should be able to withdraw all funds which may be re-invested. Should this withdrawal of funds injure the company, or eventually kill it, economic justice will be done, because the company was less profitable than other sectors of the economy and therefore deserved to be "weeded out." Dividends should be withdrawn from company earnings to the point where the last dollar withdrawn can be invested as profitably outside the company as within. Although this marginal approach cannot be completely satisfied in our economy, the system does function somewhat in this manner.

The board of directors is empowered by the stockholders to declare dividends. Generally, dividends must have some relationship to earnings. A company cannot pay dividends for long when it is losing money. On the other hand, future financing needs will require favorable market acceptance of the company's stock. A high market price will require the sale of fewer shares to raise a given amount of money. Often, market price is related to a company's dividend policy. Dividends also depend upon a company's liquidity position, since most dividends are paid in cash. Legal factors or restrictive covenants of senior debt may limit dividends. After considering these and other factors, the board of directors will make the division between dividends and retained earnings.

Those funds retained in the business will be used to finance new investments. Since retained earnings are permanent, equity financing, they should be used to finance long-term, and possibly risky, investments. Retained earnings are free of external controls and require no bargaining or concession in the market as do external funds. For these reasons, retained earnings have been used extensively in American industry for expansion and replacement.

Many corporations incorrectly regard retained earnings as being cost-free. If earnings were distributed as dividends, they might be invested more profitably elsewhere. Therefore, there is an opportunity cost to the company's owners, the stockholders. Since dividends are taxed as income, the stockholder could not invest the entire dividend; the company can therefore justify retaining earnings for investments of somewhat lower return than the investor might realize from alternate investments. This opportunity cost may be calculated as follows (Hunt and others, 1966, p. 429) (Weston and Brigham, 1968, p. 283):

$$\text{cost of retained earnings} = \frac{(1 - \text{investors tax rate})(\text{earnings per share})}{\text{market price of stock}}$$

The tax rate used must approximate the average investor's rate, which is variously taken as 20 percent (Hunt and others, 1966, p. 429) or 40 percent (Weston and Brigham, 1968, p. 283). The cost of retained earnings is not an easy or even an explicit cost to calculate, but some estimate must be used. Generally,

the cost of retained earnings lies above that of bonds and below that of common or preferred stock.

Earned surplus, or retained earnings, must not be confused with other "surpluses" listed on the balance sheet, some of which may be only "paper profits" and not actually a source of funds. Retained earnings may not indicate exactly how much money is available for reinvestment, since profits depend upon the calculation of expenses. Different methods of calculating inventory costs, depreciation, and other cost factors may yield entirely different profit figures.

Depreciation and Amortization

A second very important internal source of funds is depreciation of tangible assets and amortization of intangible assets. Depreciation is a periodic charge against income for the use of the fixed, tangible assets which contribute to the production of income. Capital assets are purchased and paid for at a fixed point in time, but the cost of the asset must be prorated over its productive life. Such assets include buildings, machinery, vehicles, and similar deteriorating assets, but do not include personal property or land. Amortization is similar in concept, but is a term usually applied to the recovery of the cost of intangible assets such as patents, trademarks, incorporation expenses, and other nonphysical asset costs. No cash outflow is incurred at the time of the depreciation or

amortization charge against income. Although no cash outflow occurs, the expense may be deducted from income for tax computations. At this point, depreciation and amortization charges become internal sources of funds. Had this non-cash expense not been written off against income, taxes would have taken 48 percent (assuming the company is in the top 48 percent bracket) of that amount. Through depreciation, 48 percent of the depreciation cost has been shielded from taxation. This amount, combined with the other untaxed 52 percent forms a source of funds for the company.

Depreciation is centered on the idea that fixed assets deteriorate through wear and tear, action of the elements, and through obsolescence and inadequacy. This "using up" of assets should be charged as a production expense. There are two major approaches to depreciation from this point. One school holds that depreciation should compensate a business for only actual costs incurred in buying the original asset. No provision is made for replacing the asset. The other major approach holds that depreciation should provide for the replacement of a worn-out asset. With this approach, today's methods of calculating depreciation are not sufficient. Due to inflation, an asset purchased 10 years ago would cost less than the same asset today. Depreciation charges recovered using today's methods of computation would not be sufficient to replace the asset.

To partially rectify the inflation-replacement problem, four major depreciation methods have been developed. Two of the methods, straight line and units of production, are "unaccelerated" methods, since they provide for a uniform depreciation charge per unit of time or per unit of production over the life of the asset. These methods provide for the recovery of only the original purchase price of the asset. The other two methods, the double declining balance and sum-of-the-years digits, are "accelerated" depreciation methods, which enable a much faster recovery of the asset's purchase price early in the life of the asset than do the unaccelerated methods. Increasing the depreciation charges early in the asset's life generates larger internal funds, which may be invested to earn a return that will provide for inflated replacement costs of the original asset. Nearly all companies now use accelerated depreciation methods for tax purposes, although they may use other methods for their own purposes.

DEPLETION FUNDS AS A SOURCE OF INTERNAL FINANCING

The sources of funds examined thus far have been common to all industries. Depletion funds, however, are unique to the natural resource sector - the petroleum and natural gas, mining, and timber industries. The natural resources exploited by these industries are depletable since, as time passes, the industry's main asset is "used up" and is not renewable in the same sense as is a machine or a building. This type of asset is sometimes called a wasting asset, since a fixed property investment is converted to stock in trade in the course of production. This chapter will examine depletion thoroughly from a conceptual, historical, mechanical, and financial standpoint.

Depletion as a Concept

Depletion is somewhat like depreciation, since the owner of an asset is allowed to recover his investment tax-free. The owner of an ore body or an oil field has incurred costs in obtaining that asset, much the same as the owner of a machine has incurred a purchase cost. Depletion deductions allow the owner of a natural resource asset to write off the cost of the asset against income earned so as to recover his investment in the asset. In recovering these funds tax-free, provision is made for the replacement of the

ore body through further exploration or other means. The present depletion system also provides incentive to the mining industry and to sources of outside capital which otherwise might consider the industry too risky an investment. From this point, however, one's interpretation of "costs incurred" is critical in refining the definition or concept of depletion. This problem of interpretation has caused the heated political and economic debate over percentage depletion since its inception in 1926.

One school of thought, which supports the cost depletion concept, argues that depletion should exactly parallel depreciation. The cost of the natural resource asset is the investment in exploration and development expenses, land purchases, and all other costs incurred in putting a particular property into production. This cost should be written off against income earned by the asset over the life of the ore body or oil field, the limit of the deductions being the original cost of discovery. One supporter of this cost depletion approach is Dean Erwin W. Griswold of the Harvard Law School. Using this "cost depletion" approach, should a company be fortunate enough to stumble upon a billion-dollar ore body after having incurred only \$1000 in discovery expenses, the depletion base would be \$1000. This concept is vigorously attacked by industry spokesmen who contend that cost depletion does not take account of the special problems and risks which occur in

the mineral industries.

The second approach to depletion is that of discovery value depletion which, in 1926, evolved into the present percentage depletion method. This school of thought is supported by the industry and by many political and economic analysts who see the mineral industry as having special problems not common to any other industry. The same concept is attacked by others who see percentage depletion as a tax loophole and as preferential treatment. Under percentage depletion, the owner of an ore body or oil field is permitted to write off against income a certain percentage of the gross revenues of the property. This deduction may be taken over the entire life of the property, there being almost no limit to the total deductions taken. The funds "recovered" through percentage depletion may exceed the original cost of discovery and development. The separation of the cost of asset from the total deduction possible has been the focus of most of the criticism of percentage depletion.

Discovery value and percentage depletion are defended on three basic grounds. First, the industry is entitled to recover, tax-free, the capital invested in wasting assets. All other industries may recover such invested capital through depreciation. The owner of a natural resource asset will invest this recovered capital in further exploration and development so as to replace his depleting asset.

Unlike the owner of a "normal" asset, however, which may be replaced by a simple and certain purchase, the natural-resource owner has no assurance that he may replace his asset at a cost equal to that of his depleting asset. Had he been fortunate enough to discover his original ore body with little expense, he would have no certainty of finding another comparable ore body for an equally small expense. He might have to spend considerably more in the future to find a second deposit. Here, then, is the second justification for being able to recover more than the original cost of the asset - the owner must be reimbursed sufficiently so that he will be able to finance future exploration which may be more expensive than past ventures.

Closely related to this uncertain future cost is the matter of risk and its influence on attracting capital to natural-resource industries. Since future exploration is risky, incentive is necessary to attract funds into this sector of the economy. Investors who expose their funds to such uncertain ventures as finding an ore body must be given additional incentive and compensation should the venture be successful. Percentage depletion, by allowing larger tax deductions to mine and oil investors, maintains the flow of capital into these industries. Since mining and petroleum products are so important to the health of the American economy, such incentives should be considered a matter of national security. Rather than rely on foreign

supplies, domestic exploration and exploitation must be encouraged.

Supporters of percentage depletion also point out that the mining and petroleum industries pay taxes to which other industries are not subject. Severance tax is such a tax. According to a 1963 study (Herlong, 1968, p. 148), the oil industry paid 5 percent of its gross revenues in taxes, a portion identical to that paid in taxes by all industry.

Opponents of percentage depletion hold that such preferential tax treatment provides a loophole and gives mining and oil an unfair advantage. Many such persons favor a complete abolition of depletion allowances; others support a reduction in the present rates. It is beyond the scope of this paper to attempt to answer either argument. It is significant that, usually, neither side supports its arguments with quantitative evidence. The industry endlessly repeats its "risk" argument without providing proof. Likewise, supporters of lower depletion rates apparently pick these rates at random and offer little justification for their choice.

There is little question about how the framers of early percentage depletion legislation viewed the issue. Percentage depletion allowances were designed not only to recover capital, but also to provide incentive and higher rewards to natural resource investors. World War I had impressed Congress with the need for mineral and petroleum

products. Congress was anxious to insure future domestic supplies of these products for national security reasons. Furthermore, a panic had occurred after the war, when it appeared that our natural resources were nearly depleted. Incentive for further discovery of resources was the logical solution to the depletion problem. Government geologists in 1918 warned that the country had oil reserves to last only until 1939. The final report of the Senate Finance Committee in 1918 recommended "special provision...for increased depletion allowance...to stimulate prospecting and exploration" (Lichtblau, 1959, p. 33). Senator Penrose of Pennsylvania, speaking before the Senate on behalf of the Finance Committee, left no doubt that "the Committee deliberately intended to provide a liberal depletion policy for the purpose of stimulating the development of new resources such as mines, oil, or gas wells" (57 Congressional Record 549, 65th Congress, Third Session). Subsequent congressional and presidential examinations supported this policy, perhaps the strongest support being given in 1952 by the Paley Commission report.

The Supreme Court clearly supported the cost-depletion concept, although it never ruled against the percentage depletion procedure. Court decisions in 1917, 1927, and 1940 make this stand very clear. In a 1927 case, Judge Brandeis gave the court's opinion (Lichtblau, 1959, p. 52):

The sale of oil results in the reduction of a capital asset which must be considered in computing taxable income just as the cost of raw material must be deducted from gross income before the net income can be determined.

Actually, both cost and percentage depletion concepts are used today in computing the depletion deduction, although the percentage depletion allowance is used most frequently. The following short historical account of depletion legislation will provide additional perspective to this complex subject.

Historical Aspects of Depletion

Income tax collection in the United States began with the Corporation Exise Tax Act of 1909. This act provided for a tax of 1 percent on incomes over \$5000, provided for a "reasonable" deduction for depreciation of capital equipment, but had no depletion provisions. It was soon realized that mine and oil field owners were being discriminated against. Treasury Decision 1606, in 1910, alluded to a 5 percent depletion deduction, but in very unclear terms. There is no evidence to suggest that the 5 percent deduction was anything but an arbitrary figure. The Revenue Act of 1913 first encoded the concept of depletion and, in doing so, used much of the language of TD 1606. The mining and petroleum industries were allowed to deduct up to 5 percent of the gross value of output each year as a depletion allowance. The limit of the total deduction over the years was

the cost of the property or the market value on March 1, 1913, whichever was greater. The 5 percent deduction again was arbitrary. Within three years, mining and oil interests claimed that the 5 percent limit was too low and was inequitable. Accordingly, the Revenue Act of 1916 provided for a "reasonable" depletion allowance each year, the total deduction over the years not to exceed the original cost or the market value on March 1, 1913. The 5 percent limit was removed. For mines, the yearly deduction was not to exceed the market value of the product in the ground which had been mined and sold during the year of the computation. The 1913 and 1916 Acts used the cost depletion approach which limited deductions to the cost of the asset. The March 1, 1913 market value clause was included to insure constitutionality of the law in view of an 1895 Supreme Court ruling. The acts were confusing, since they required use of contradictory theories of economic value.

The Revenue Act of 1918 was designed to eliminate this confusion and to provide incentive for further exploration. World War I had demonstrated to Congress the importance of domestic resources. The result of this realization was the concept of discovery value depletion deductions. The Act provided for the deduction of a "reasonable" allowance for depletion, the limit of the deduction over the years to be the market value of the property on the date of discovery

or within 30 days thereafter. Properties discovered before 1913 could use the March 1, 1913 market value. The cost-depletion clause was also continued as an alternative. The significance of the 1918 Act, however, was that the depletable base was the market value at the time of discovery. Congress definitely designed the Act to stimulate exploration through liberal tax deductions. By 1921, it was apparent that some taxpayers were using these liberal deductions to off-set taxable income from business unrelated to mining and petroleum. The Revenue Act of 1921 limited depletion deductions to the net taxable income of the property for which the deductions were taken. The Revenue Act of 1924 limited deductions in any one year to 50 percent of taxable income from a property before the depletion deduction.

By 1925, it was apparent that the discovery value method of computing depletion deductions was unworkable. Property valuation had to be made with only the most preliminary exploration information. The difficulty of assessing the economic value of a mineral property within 30 days of discovery need not be dwelled upon. The procedure made taxation inequitable, since valuation depended upon subjective judgment. Naturally, the company geologist and the federal tax assessor never agreed upon the value of a property. The problem was solved with the Revenue Act of 1926

which established the present form of percentage depletion. Oil and gas operators could deduct 27½ percent of gross income each year from taxable income. A year's deduction was limited to 50 percent of net taxable income before depletion. Mineral commodities other than oil and gas remained on the discovery value system. A survey of congressional testimony surrounding this important Act reveals little reason for choosing 27½ percent. The Senate passed a 30 percent deduction after hearing pleas for 25, 30, 32, and 43 percent. The House passed a 25 percent deduction. The resulting 27½ percent was a compromise. The only tangible figure coming from the testimony resulted when the president of the Mid-Continent Oil Producers Association stated that "25 percent of gross income was the lowest possible rate that the oil industry could operate under without destroying its capital base" (Lichtblau, 1959, p. 40). Congressional literature clearly indicates that the intent was to approximate the deductions allowed the industry between 1918 and 1926 (Lentz, 1961, p. 522). Since everyone agreed that the 1918 system was unworkable and many times produced tax dodging, there seems to be little logic in this approach. It appears that the controversial 27½ percent oil depletion allowance was, to a great extent, an arbitrary choice. Congress also indicated that the purpose of the allowance was to recover capital, to provide incentive, to assure mineral supplies for national security, and

to attract capital to the mineral industries.

The new system worked very well, since it was simple to compute and required only concrete income figures. In 1932, percentage depletion was extended to coal, metal mines, and sulfur. The same 1932 law attempted to define the term "mining," since the point at which gross mining revenues are computed is critical. This concept of "mining" will be discussed later. In 1939, further legislation was necessary to refine the definition of the term. In 1943, other non-metallics were added to the percentage depletion category; graphite, talc, mica, beryl, and potash, among other minerals, were covered. A further definition of "mining" was attempted. In 1951, rock products such as sand, gravel, stone, shale, brick and tile clay, marble, asbestos, borax, quartzite, and other products were given percentage depletion allowances. During and after 1954 the term "mining" was further delineated, since the addition of rock products such as crushed gravel, caused many court disputes. The latest depletion legislation, and perhaps the most significant since 1926, occurred in December 1969, when the percentage rates for selected products were reduced. Most notably, the oil and gas allowance was reduced from 27½ to 22 percent. Since there is evidence that the initial percentage figures were arbitrary, it seems likely that opponents of percentage depletion will concentrate on lower-

ing present rates to equally arbitrary rates so as to close supposed tax loopholes. Exhibit 1 shows those depletion rates which were in effect in February 1970.

Throughout its stormy legislative history, percentage depletion has been attacked for providing tax loopholes and for giving the mineral industries special treatment. The logic behind permitting a natural resource owner to recover his investment tax-free is overwhelmingly in favor of having some form of depletion allowance. However, since the intent of Congress was to allow for recovery of capital and to stimulate exploration, the case for permitting the full deduction to royalty owners is difficult to defend. Much of the present protest involves such royalty cases, which can provide genuine loopholes to non-producers. The exact form of the depletion allowance is a debatable subject. The present percentages appear to be arbitrary. It would be advantageous to do a thorough study so as to provide a sound basis on which to build a depletion policy. The petroleum industry has the additional burden of defending tax provisions which allow it to write off, as expenses, all intangible drilling and development costs while still being eligible for percentage depletion. It appears that such costs should be capitalized and used to compute the cost depletion base, since the intent of Congress was to provide a means for recovering such invested capital

Exhibit 1

Percentage Depletion Rates for Mineral Products

<u>Commodity</u>	<u>Percent</u>		<u>Commodity</u>	<u>Percent</u>	
	<u>Domestic</u>	<u>Foreign</u>		<u>Domestic</u>	<u>Foreign</u>
Antimony	22	14	Dolomite 6/	14	14
Arsenic	14	14	Feldspar	14	14
Asbestos	22	10	Fluorspar	22	14
Ball Clay 1/	14	14	Fuller's earth	14	14
Barite	14	14	Garnet	14	14
Bauxite	22	14	Gem stones	14	14
Beryllium	22	14	Germanium	14	14
Bismuth	22	14	Gilsonite	14	14
Borax	14	14	Gold	15	14
Bromine 2/	5	5	Graphite	22	14
Brucite	10	10	Granite 6/	14	14
Cadmium	22	14	Gypsum	14	14
Calcium carbonates	14	14	Ilmenite	22	14
Calcium chloride 2/	5	5	Iodine	14	14
Celestite	22	14	Iron ore	15	14
Cesium and Rubidium	14	14	Kyanite	22	14
Chromium	22	14	Lead	22	14
Clay 3/	22	NA	Limestone 6/	14	14
Clay 4/	5	5	Lithium	22	14
Clay and shale 5/	7½	7½	Magnesium carbonates	14	14
Coal and lignite	10	10	Magnesium chloride 2/	5	5
Cobalt	22	14	Manganese	22	14
Columbium	22	14	Marble 6/	14	14
Copper	15	14	Mercury	22	14
Corundum	22	14	Mica	22	14
Diamond, industrial	14	14	Molybdenum	22	14
Diatomaceous earth	14	14	Natural gas	22	22

Commodity	Percent		Commodity	Percent	
	Domestic	Foreign		Domestic	Foreign
Nickel	22	14	Silver	15	14
Nitrogen compounds	14	14	Slate <u>6/ 7/</u>	5	5
Olivine <u>6/</u>	22	14	Sodium carbonate	14	14
Peat	5	5	Sodium chloride	10	10
Perlite	10	10	Sodium sulfate	14	14
Petroleum	22	22	Stone <u>6/</u>	14	14
Phosphate rock	14	14	Sulfur	22	22
Platinum & platinum- group metals	22	14	Talc (block steatite)	22	14
Potash	14	14	Talc, all other	14	14
Pumice	5	5	Tantalum	22	14
Quartz crystals			Tellurium	14	14
(radio grade)	22	14	Thorium (monazite)	22	14
Quartzite <u>6/</u>	14	14	Other rare earth minerals	14	14
Radium	14	14	Tin	22	14
Rhenium	14	14	Tungsten	22	14
Rutile	22	14	Uranium	22	22
Salt	10	10	Vanadium	22	14
Sand & Gravel	5	5	Vermiculite	14	14
Selenium	14	14	Wollastonite	10	10
Shale	5	5	Zinc	22	14
Shale, oil	15	14			

NA Not applicable.

- 1/ Ball clay, bentonite, china clay, sagger clay and clay used or sold for purposes dependent on its refractory properties.
- 2/ If from brine from wells or a saline perennial lake within the United States.
- 3/ Anorthosite, clay, laterite and nephelite syenite to the extent that alumina and aluminum compounds are extracted therefrom.
- 4/ Used or sold for use in manufacture of drainage and roofing tile, flower pots, and kindred products.
- 5/ Clay and shale used for making brick, tile, and lightweight aggregate.
- 6/ Except 5 percent if used for riprap, ballast, road material, rubble, concrete aggregate, or similar purposes.
- 7/ Except 7½ percent if used for making lightweight aggregate.

through depletion deductions. The present system allows a double deduction for these expenses.

Computation of the Allowance

The actual computation of the depletion allowance is a complex process involving a great deal of technical accounting and financial work. This paper will deal only briefly with the mechanics of the computation. Exhibit 2 details the process. All discussion will involve the mining depletion allowance, since the computations for petroleum and gas are markedly different. The first step in computing the allowance is to delineate the property, defined by the Internal Revenue Code as "each separate interest owned by the taxpayer in each mineral deposit in each separate tract or lease" (Robie and others, 1964, p. 479). The question of property and aggregation of properties is a complex legal affair and is beyond the scope of this paper. Once the property is defined, the gross revenues from the mining operation must be determined. Since tax law permits depletion allowance only on mining revenue, it is important to define the point at which mining ends and manufacturing begins. Mining includes not only extraction from the ground, but also the "ordinary treatment processes normally applied by mine-owners or operators in order to obtain the commercially marketable product" (Robie and others, 1964, p. 482). For most ores, this processing includes milling

Exhibit 2

Sample Depletion Allowance Calculation

Situation: Property A

1969 gross revenues	\$1,000,000
1969 royalty payments	100,000
1969 total costs	600,000
depletion rate	15%
reserves Jan. 1, 1969	2,000,000 tons
1969 production	200,000 tons
adjusted cost base, Jan. 1, 1969	\$ 100,000

A. Percentage depletion and 50% limit calculation:

1) gross revenue	\$1,000,000
2) less royalties	(100,000)
3) adjusted gross revenues less total costs	<u>\$ 900,000</u> <u>\$ (600,000)</u>
4) net income before tax and depletion	\$ 300,000
5) percentage depletion allowance (15% of \$900,000)	\$ 135,000
6) 50% net income limit	\$ 150,000

B. Cost depletion calculation:

1) adjusted cost base from Jan. 1, 1969	\$ 100,000
2) unit cost 1969 (\$100,000 divided by 200,000 tons)	.50/ton
3) tons mined in 1969	200,000 tons
4) depletion sustained on cost, 1969	\$ 100,000

C. Summary

1) percentage depletion allow- ance	\$ 135,000
2) 50% net income limit	\$ 150,000
3) Cost depletion allowance	\$ 100,000

D. Allowable depletion deduction:	\$ 135,000
E. Taxable income calculation:	
1) net income before tax and depletion	\$ 300,000
2) less depletion allowance	<u>\$ (135,000)</u>
3) net taxable income	\$ 165,000

where most of the gangue is removed in order to produce a concentrate. The Internal Revenue Service (IRS) allows transportation of up to 50 miles from mine to mill. The law does not consider smelting or refining as part of "mining." The definition of mining with respect to many rock products is especially difficult, since the law distinguishes between crushing and grinding (mining processes) and pulverizing (manufacturing). Many court cases were fought in the 1950's and early 1960's between rock producers and the IRS; the IRS lost most of the cases (Bell, 1959, p. 85).

Once gross revenues from mining have been determined and all royalties have been deducted, this figure is multiplied by the percentage allowable for the commodity in question. The resulting depletion deduction must be tested against two other depletion calculations. The net taxable income, before depletion deductions, is determined by subtracting all costs incurred during the mining operation, including depreciation, from the adjusted gross income. The allowable depletion deduction is limited to 50 percent of this net income before depletion. A cost depletion figure must also be calculated by taking the capitalized cost of the property (including all purchase prices, capitalized exploration expenditures, etc.), adjusted for past depletion deductions, and dividing this figure by the estimated reserves at the beginning of the tax period. This

"depletion cost per ton" figure is then multiplied by the total production for the given tax period, resulting in the cost depletion for the period. Should the cost depletion allowance be greater than either the percentage deduction or the 50 percent limit, the cost depletion amount is used for the tax allowance. If the cost depletion allowance is the smallest amount, the percentage depletion allowance is used for the deduction, if it is smaller than 50 percent of net income. If the latter figure is smaller, then the 50 percent limit is the allowable deduction.

The depletion allowance is deducted from net income to arrive at the net taxable income. At this point, depletion funds become a source of internal financing. Assuming that the company is large and is in the 48 percent tax bracket, roughly 48 percent of the depletion allowance is shielded from taxation and may be used to finance new ventures.

There are many complex calculations involved in arriving at the net income figure. In mining, exploration expenses up to \$100,000 per year (to a limit of \$400,000) may be deducted as expenses. Expenses over \$100,000 per year (or \$400,000 total) must be capitalized as part of the depletable base. A second alternative is available for exploration expenses, but is beyond the scope of this paper. Exploration costs incurred on unsuccessful ventures may be written off as losses without limit as long as the failure of the venture can be proved. Development costs may be

deducted against current income or may be capitalized and written off against future production on a per unit basis. Therefore, it is important to determine when exploration ends and development begins, since a company may benefit tremendously from being able to write off development expenses rather than to capitalize exploration costs. On the other hand, by writing off development or exploration expenses, the taxpayer reduces his 50 percent of net income depletion limit and may sacrifice some depletion benefits. Each case must be taken individually and few generalizations are possible. Related to the problem of reducing the 50 percent limit is the handling of depreciation. Normally, it is beneficial for the taxpayer to use accelerated depreciation methods so as to quickly recover his investment. However, these accelerated methods may also reduce the 50 percent limit. The actual process of computing the depletion allowance is much more complex than is presented in this paper. However, the computation is primarily an accounting problem and will not be pursued further in this paper.

Other Possible Depletion Concepts

There are other tax concepts which allow for the depletion of a natural resource should one object to the present arbitrary percentages. One of these will be presented briefly.

G. S. Borden, a tax lawyer, suggested that, if one agrees that an ore body is a capital asset, it is not implausible to consider that the mining, and subsequent sale, of the ore body is merely the long-term sale of a capital asset in installments. As such, the profits derived from the sale (revenues less purchase, exploration, and operating costs) might be taxed by the low, long-term capital gains tax (Robie and others, 1964, p. 473). Such treatment would provide funds for further exploration, incentive, etc. Shortly before 1920, the Supreme Court, while not ruling specifically on this concept, implied that such treatment would be illegal. It is important to remember that the present method for computing the depletion allowance may not be the only way to allow for recovery of capital invested in depleting assets. Since tax legislation concerning depletion is a contemporary problem, it may be wise to consider completely new concepts in tax legislation which can be defended on more solid grounds than can present depletion practices.

CAPITAL FORMATION - THE HISTORICAL PERSPECTIVE

All major financial instruments used today in American business have been examined and are now integrated into a study of how the mining industry has organized its finances. In order to fully understand the present capital structure of the mining industry, an historical overview of its development will be helpful. Data have been assembled for the period 1900-1958 to trace this development. The background of mine finance will be compared with the financial development of the petroleum industry. A brief explanation of basic business finance principles will be given.

Basic Business Finance

Most major industries exhibit a characteristic mixture of internal, external, debt, and equity financing. This mixture is determined by many factors and is not adhered to by all companies in the sector. Two of the more important factors which determine the capital structure are risk, both to the company and to the investor, and the cost of capital.*

The assumption of debt requires that fixed interest charges and principle be paid in future periods. A mining firm must be careful in assuming debt, since these fixed charges are incurred whether or not the company is successful. Therefore, only when earnings are relatively assured, when

risk is low, should the firm assume debt.

The largest amount of debt financing in recent years has been through mortgages on fixed plant associated with producing mines. Mortgages may be used to finance smelters, mills, or development work. Once a mining project has reached an advanced stage, careful planning and evaluation will have reduced risks to levels comparable to those in any other industry. Obviously, the same low-risk conditions are not present during exploration when no such success is assured. Since the mining industry operates in relative uncertainty, one might expect a low ratio of debt to total capitalization.

A second important factor in the development of a capital structure is the cost of capital. As was shown in preceding chapters, each form of financing has its cost. Generally, stock issues are the most expensive form of capital. Retained earnings cost somewhat less, while debt financing frequently is the cheapest capital available other than depletion and depreciation funds.

The amount of debt which may be built upon an equity base has a definite limit. Creditors are not anxious to finance a major portion of a firm's operations and to incur the major risks, while the owners reap the profits from a safe distance. The cost of debt will rise as the proportion of debt to equity increases. The company should attempt to use cheap, borrowed funds insofar as prudence

allows to gain favorable leverage and higher returns on equity. These factors will produce definite capital costs for the firm and will, in part, determine the mixture of debt, equity, internal, and external funds.

Given the above factors, one would expect the mining industry to use large amounts of debt to finance large projects in advanced stages of development. Large companies having income from many properties would especially qualify for debt financing, since earnings would not depend on only one project.

Although beyond the scope of this thesis, a basic relationship also exists between long- and short-term funds and the assets financed. Short-term funds should not be used to finance projects which return earnings only over the long term. The financing of assets should be commensurate with the assets' ability to pay for that financing. A capital-intensive industry like mining would be expected to use a great deal of long-term capital.

Ratio Analysis

One of the most useful tools of business finance is ratio analysis. This technique is used by analysts to diagnose problems within a business and to compare a business or industry with other business sectors. Figures taken from a company's financial statements are combined into simple ratios for the analytical procedure. The ratios are only as meaningful as the figures which compose

them. Different accounting procedures between firms or abnormal conditions, causing distorted statements, may produce misleading conclusions. All figures must be comparable. While these problems can be serious, ratio analysis may serve as a very valuable tool if properly applied.

This thesis examines the capital structure of three sectors of the mining industry by using the following ratios:

- 1) $\frac{\text{funded debt}}{\text{total capitalization}}$
- 2) $\frac{\text{preferred stock}}{\text{total capitalization}}$
- 3) $\frac{\text{common stock and surplus}}{\text{total capitalization}}$.

These ratios show the importance of debt versus equity in the capital structure of the industry. They do not show the importance of internal versus external financing, since depreciation, depletion, and retained earnings are not treated separately. This deficiency will be overcome in the following chapter.

Limitations of Study

This chapter examines the historical trends in mine finance between 1900 and 1958. Much of the data come from an exhaustive study done in the 1950's by the National Bureau of Economic Research (NBER) concerning the sources

and uses of funds in the manufacturing and mining sectors (Creamer and others, 1960). Supplementary data were gathered by the author from the financial statements of selected mining companies for the period 1929-1958.

The companies used in this analysis are meant to represent the nonferrous, metal mining industry; the coal industry; and the iron mining industry. The largest and most important producers in each sector were used where possible.

The nonferrous metal producers are well represented by nine companies whose financial statements are comparable throughout the period 1929-1958. Most of the major iron-ore producers are subsidiaries of large steel producers. The financial data of such subsidiaries are not available. Two independent companies, Cleveland Cliffs and Hanna, were used to represent the independent iron-ore producers. The coal industry is represented by three large companies which produce a large portion of the nation's coal. The three producers were chosen for their size and for the continuity of their data.

The coal and iron sectors are represented by only a few companies. The lack of a large sample in these sectors produces some distorted data when large financial operations are undertaken by any one company. However, these sudden distortions are easily observed from the tables and graphs, which are used to present the data, thus enabling

the reader to discount such large fluctuations as abnormal.

The four oil companies used in the study were chosen from a survey of 23 companies and were used because of their size and the continuity of their data. These four companies adequately represent the industry as indicated by a survey by Studley Shupert Statistics, Inc. (1967). Three of the companies - Texaco, Gulf, and Standard (N.J.) - are among the five largest corporations in the United States. The fourth, Continental Oil, is one of the best financially managed companies in the United States. To provide an insight into the relative sizes of the companies used in the study, Exhibit 3 shows the 1968 gross incomes of all 18 companies. The oil companies vary from twice to 15 times the size of the largest mining company.

Trends in Capital Formation

Most of the data for this section came from the NBER study (Creamer and others, 1960) concerning capital in manufacturing and mining. The NBER raw data came from government sources such as the Census of Manufacturers, 1880-1919; Statistics of Income, 1919-1953; Federal Reserve Board studies; and Internal Revenue Service studies.

Two main approaches may be taken in examining capital formation: to examine the structure of internal versus external capital and to examine the situation from a debt versus equity standpoint.

Exhibit 3

Gross Revenues of Sample Companies
(Moody's Industrial Manual, 1969)

<u>Company</u>	<u>1968</u>
American Smelting & Refining Co.	\$ 634,080,514
Anaconda Co.	1,051,015,000
Cerro Corp.	418,974,916
Homestake Mining Co.	25,740,000
Kennecott Copper Corp.	724,487,839
Phelps Dodge Corp.	550,421,794
U.S. Smelting & Refining Co.	129,040,485
American Metals Climax Inc.	570,594,277
Hecla Mining Co.	22,127,177
Peabody Coal Co.	233,923,000 (1966)
Island Creek Coal Co.	135,173,384 (1966)
Ayrshire Collieries Corp.	62,043,534
Cleveland Cliffs Iron Co.	84,708,821
Hanna Mining Co.	170,591,161
Continental Oil Co.	2,420,243,000
Gulf Oil Corporation	4,558,548,000
Standard Oil Co. (N.J.)	15,473,900,000
Texaco, Inc.	5,459,771,000

Internal Versus External Financing: The relative importance of internal and external financing is influenced by many factors. During periods of high profits, such as WW I, 1926 to 1929, and WW II, business uses internal sources of funds. During low profit periods, such as the Depression, external funds assume more importance. Naturally, periods of low interest rates encourage external financing.

Between 1900 and 1953, internal funds were of much greater importance than were external in the mining and manufacturing industries. There was no clearcut relationship between total long-term financing and plant and equipment expenditures, but the relative importance of internal and external financing shifted appreciably. Between 1900 and 1953, gross internal funds became relatively more important. The ratio of internal funds to new security issues rose considerably. The ratio of long-term, external funds to new financing definitely decreased.

Retained Earnings: Retained earnings were roughly twice as large as were total new security issues. Gross internal financing (retained earnings, depreciation, and depletion) was more than five times as large as new securities issued for the period. Since most long-term funds are used to increase long-term assets, it is helpful to compare asset growth with each type of long-term financing.

Retained earnings have fluctuated in importance considerably since 1900. Between 1900 and 1919, the ratio of

retained earnings to asset change increased from 41.3 percent to 52.5 percent. Between 1919 and 1929, the same ratio was very low (26.1 percent), indicating that retained earnings were less important. During the Depression (1929-1937), the ratio was negative due to corporate dissaving, as companies attempted to maintain dividends by reducing retained earnings. From 1937 to 1948, the ratio was at a new high (53.5 percent) as the war, tax policy, and good profits caused retained earnings to be used extensively for expansion. Between 1948 and 1953, the ratio declined somewhat (to 49.2 percent), indicating less dependence on retained earnings.

During the same 1900 to 1953 period, the ratio of new security issues to asset change varied inversely with the retained earnings to asset change ratio. This relationship indicates that external sources of capital became more important as dependence on retained earnings decreased. The only period which did not exhibit this inverse relationship was 1948-1953, when a third finance source became important - income tax reserves, which may be considered as short-term capital lent by the government. Therefore, despite the abnormal period of 1929-1937, mining and manufacturing concerns relied mainly on internal sources of capital for asset expansion.

The data also indicate that, during periods of moderate asset expansion, mining and manufacturing firms relied on internal funds, while, during periods of rapid expansion,

external capital sources were tapped. This relationship is to be expected since huge mining projects, such as Twin Buttes or the expansion of El Teniente in Chile, require large amounts of capital in very short periods. Internal reserves, built up for normal replacement and expansion, are not sufficient for this sudden drain.

Depletion and Depreciation: The relationship between retained earnings, depreciation and depletion is most interesting. For all mining and manufacturing firms, depletion and depreciation funds were less than retained earnings in only three periods between 1900 and 1953. These three periods were 1900 to 1908, WW I, and 1946 to 1949. In all other periods, depletion and depreciation were more important sources of funds than were retained earnings. For the entire 53-year period, depletion and depreciation funds were 1.7 times as large as retained earnings. If the abnormal periods of dissaving, 1921 and 1932 - 1938, are omitted, depletion and depreciation funds still exceeded retained earnings by 19 percent. Between 1900 and 1914, depreciation and depletion accounted for 48 percent of gross internal funds; between 1919 and 1929, 73 percent; between 1936 and 1940, 89 percent; and between 1946 and 1953, 53 percent. Most depreciation and depletion funds were used to replace, rather than to expand, assets.

In the post-WW II period, depletion has accounted for 29 percent of total depletion and depreciation funds in

mining. Depletion has accounted for roughly 15 percent of gross internal financing. Since internal sources comprise 60 to 70 percent of total funds, depletion has contributed 9 to 10½ percent of total mining funds in recent years. This subject will be considered more completely for the period 1958-1968 in the next chapter.

It is interesting to compare depletion and depreciation funds actually "received" and the actual property values which depreciated (the adjusted depreciation and depletion). For all years between 1900 and 1953 except 1932 to 1938, the amounts claimed by the mining and manufacturing sectors for depletion and depreciation were less than the adjusted depletion and depreciation figures. This fact indicates that not enough funds were being recovered through depletion and depreciation to cover replacement of the assets depreciated. This statement must be clarified by pointing out that, prior to 1913, depreciation and depletion figures were not generally computed and, prior to 1932, percentage depletion was not used in mining. One might expect the depreciation and depletion costs recovered and those actually incurred to be more similar in recent years. Also, in 1954, accelerated depreciation was introduced for the first time which could enable an expanding company to perpetually recover high amounts of depreciation.

Debt Versus Equity Financing: Having examined internal versus external sources of funds, we may now examine debt

versus equity financing. It must be remembered that the components of debt and equity are the same as those of external and internal funds. Retained earnings, depreciation, depletion, and stock issues comprise equity funds. All long-term debt is external and is composed of bonds and bank loans. The term "total debt" includes short-term debt as expressed in current liabilities.

In general, mining and manufacturing firms have not relied heavily on long-term debt. However, debt use has expanded considerably since 1900, both in absolute dollar volume and in relation to total capital invested. For manufacturing firms, the total debt to total assets ratio has increased from 23 percent in 1923 to 36 percent in 1952. A similar increasing trend is seen in the mining sector. Large companies have used debt to a much greater extent than have small companies, especially in mining where small, one-property companies are generally bad credit risks and, therefore, cannot raise long-term debt capital. Use of short-term debt has increased from roughly 10 percent of total assets in 1914 to 20 percent of total assets in the post-WW II years. The largest short-term debt increase came from income tax accruals.

Reliable data concerning the use of debt in the mining sector are available between 1919 and 1953. The ratio of total debt to operating assets in the mining industry declined from 1919 to 1929. This ratio was 27.8 percent in

1929, 34.1 percent in 1937, 39.2 percent in 1948, and 42.4 percent in 1952. The pattern for manufacturing was very similar. The ratio of interest-bearing debt to operating assets was 19.6 percent in 1923, 20.4 percent in 1937, 19.7 percent in 1948, and 22.6 percent in 1952. The ratio of total debt to total assets followed the same general trend, being 24.6 percent in 1929, 27.6 percent in 1937, 30.2 percent in 1948, and 34.1 percent in 1952. In all of the above ratios, assets are book value. Operating assets are those physical assets used to produce income.

Generally, the rising debt ratios were associated with expansion of operating assets rather than with replacement. It should be recalled that depreciation and depletion accounted for most replacement expenditures. The use of debt for expansion is consistent with a general trend throughout industry to use debt increasingly to finance operating assets.

Bonds: The use of bonds as a debt instrument was very important before the Depression in the mining industry. For the 5-year period 1900-1904, mining companies obtained approximately \$36 million through bond issues. In the 4-year period 1924-1927, the industry obtained \$42 million. The funds realized between the two periods fluctuated considerably. Between 1927 and 1946, there was a net outflow of bond funds from the mining sector as mining companies attempted to retire bond issues. The hard times of the

Depression made the fixed commitments of bond financing very risky. This reduction in the use of bonds in the mining industry will be shown clearly in the next section of this chapter. Since most of the debt to assets ratios showed a rise over this period, the form of debt must have changed from bonds to bank mortgages, short-term credit, and income tax accruals. The value of assets decreased through depreciation.

During the 1920's, the petroleum industry was the major issuer of bonds. Even during the 1930's, the petroleum industry was one of the few industries to have a positive inflow of bonded debt financing. Petroleum industry financing prior to 1929 provides an interesting sidelight. Some oil companies, Cities Service for example, issued bonds and stock and invested the proceeds in the broker's loan market in New York, thus fueling the eventual stock market disaster (Galbraith, 1954, p. 36).

Stock and bond financing in mining and manufacturing showed several changes between 1900 and 1953. From 1900 to 1919, new bond issues per year decreased in dollar amount from being considerably larger than new stock issues to being considerably smaller. Between 1919 and 1946, the amounts of new stock and bond issues per year generally moved in the same direction, but bond issues were considerably smaller in amount. Following WW II, both stock and bond issues rose a great deal, but bond issues exceeded

stock issues by a considerable amount. Industry used more bonded debt than new equity issues, since the economic future looked promising and since the Treasury policy of maintaining low government bond yields kept the entire bond market very low. However, even though bond issues far exceeded new stock issues, the increased use of internal funds following WW II caused bonded debt to assume a slightly less important position in comparison to equity financing.

Summary: Between 1900 and 1953, internal funds were much more important sources of financing than were external. Internal funds became relatively more important from 1900 to 1953. Retained earnings were extremely important during periods of high profits, while external security issues were important during periods of low profits. Depreciation and depletion funds were larger in amount than were retained earnings for the 53-year period and were used mainly for asset replacement. Depletion accounted for approximately 15 percent of gross internal funds in the post-WW II period.

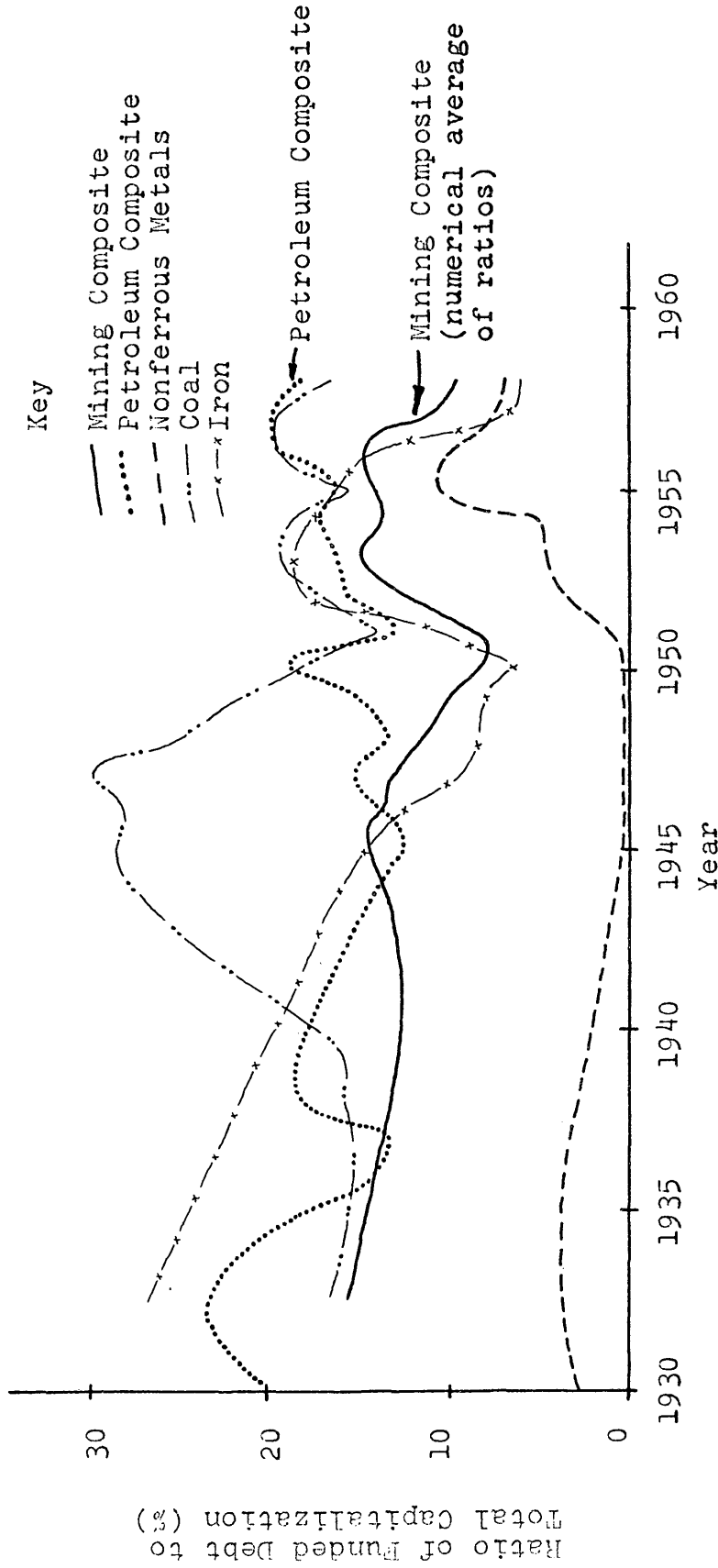
The use of debt financing has increased since 1900, although firms have not relied heavily on this form of financing. Nearly all ratios which compare debt with assets rose during the period 1919-1953. Debt funds were used mainly for expansion rather than for replacement. The use of bonded debt increased markedly after WW II and exceeded new equity issues during this period.

Capital Structure Trends in Mining and Petroleum, 1929-1958

The data shown on Graphs 1 to 3 and in portions of Tables 1 to 3 were assembled from Moody's Industrial Manual for the years 1929 through 1958. It should be remembered that the capital structure of an industry is that mixture of long-term debt and equity which provide the industry with its financing. The petroleum and mining industries are contrasted to point out the different capital structures developed by the two industries.

The limitations for using ratio analysis must be kept in mind. Comparable figures must be used throughout. This study is concerned only with trends: small distortions will not affect the data significantly. The years chosen for the study were designed to be as "normal" as possible while still showing the total economic picture between 1929 and 1958. Several Depression and World War II years were omitted.

Funded Debt - Nonferrous Metals Industry: The funded debt to total capitalization ratio shows a marked difference among the three mining sectors and between the mining composite and petroleum industry. Graph 1 and Table 1 show this difference. The nonferrous metal producers show a sharp decline in the use of funded debt from 1932-1933 until 1952. Six of the nine companies used some funded debt during the Depression, but only two, Anaconda and Phelps Dodge, used a significant amount. The other seven companies used only



Graph 1

Ratio of Funded Debt to Total Capitalization for Three Mining Sectors and Petroleum, 1930-1958.

small amounts of long-term debt (less than 4 percent) or none at all.

The use of some long-term debt early in the Depression was probably due to the very low interest rates common during this period. Stock prices were extremely low, thus making it uneconomical to issue stock. Due to the hard economic times and to the uncertain future, no companies were willing to risk large amounts of debt. The use of debt decreased markedly and, by WW II, only Anaconda had funded debt in its capital structure. This downward trend is consistent with the observation in the previous section that, during the 1930's, mining companies attempted to eliminate bond financing due to the risk of fixed debt payments. In 1952, Amax, Anaconda, and Cerro began using moderate amounts of debt, the debt-to-capitalization ratio for the three being 14.7 percent, 8.8 percent, and 7.6 percent, respectively. Between 1952 and 1958, five of the nine companies used some debt financing. The ratios ranged from a low of 0.9 percent for Kennecott to a high of 28.5 percent for Homestake. Four companies used no debt in their capital structure at all. The industry trend, shown in graph 1, was a low and declining ratio from 1932 to 1952, followed by a rise in the use of debt from 1952 to 1958. The increasing use of debt reflected better economic times when the fixed costs of debt could be borne more safely.

Funded Debt - Coal and Iron Industries: The debt picture is not so clear for the coal industry which may reflect a diversity of financing methods within the industry itself. Peabody Coal shows a tremendous use of debt throughout the period. The funded debt to total capitalization ratio was 33.3 percent in 1933, 51.0 percent in 1945 and 1947, and 33.2 percent in 1958. The major debt instrument was a large mortgage bond issue in the mid-1940's. Island Creek used no debt at all except in 1938 and 1939. Ayrshire used an amount of debt midway between that of Peabody and Island Creek. The ratio was 34.4 percent in 1945 (the first year of comparable data available) and 16.1 percent in 1958. The major debt instruments for Ayrshire were secured bank loans throughout the period. A definite downtrend in debt use occurred, although the ratios were significantly higher in coal than they were in nonferrous metals. The relatively greater use of debt in coal may reflect the use of long-term sales contracts to public utilities. Such contracts would assure coal companies of future earnings with which to meet debt obligations. The industry averages show a fairly stable ratio of around 16.0 percent during the 1930's; a rise to nearly 30.0 percent between 1945 and 1950; and a decline to nearly 16.0 percent in 1958, a trend opposite to that in the nonferrous metals sector.

The iron mining industry trend may not be representative, since only one company had adequate data over the entire period. Cleveland Cliffs had a debt-to-capitalization ratio of 26.7 percent in 1933. The ratio declined steadily to a low of 6.3 percent in 1950 and then rose to 12.2 percent in 1958, a trend very comparable to that in the nonferrous metals industry. The relatively large use of debt may also reflect long-term sales contracts as in the coal industry.

The composite pattern for the mining industry is fairly clear, although the small number of coal and iron producers may not be entirely representative. The debt ratio in 1932-1933 was relatively high (15.6 percent); the ratio then declined to a low ratio of 8.4 percent in 1950 and 1951. Beginning in 1952, the ratio rose to 14.7 percent in 1956 before a decline to 9.8 percent in 1958. For the entire 26-year period, the average ratio was 13.1 percent.

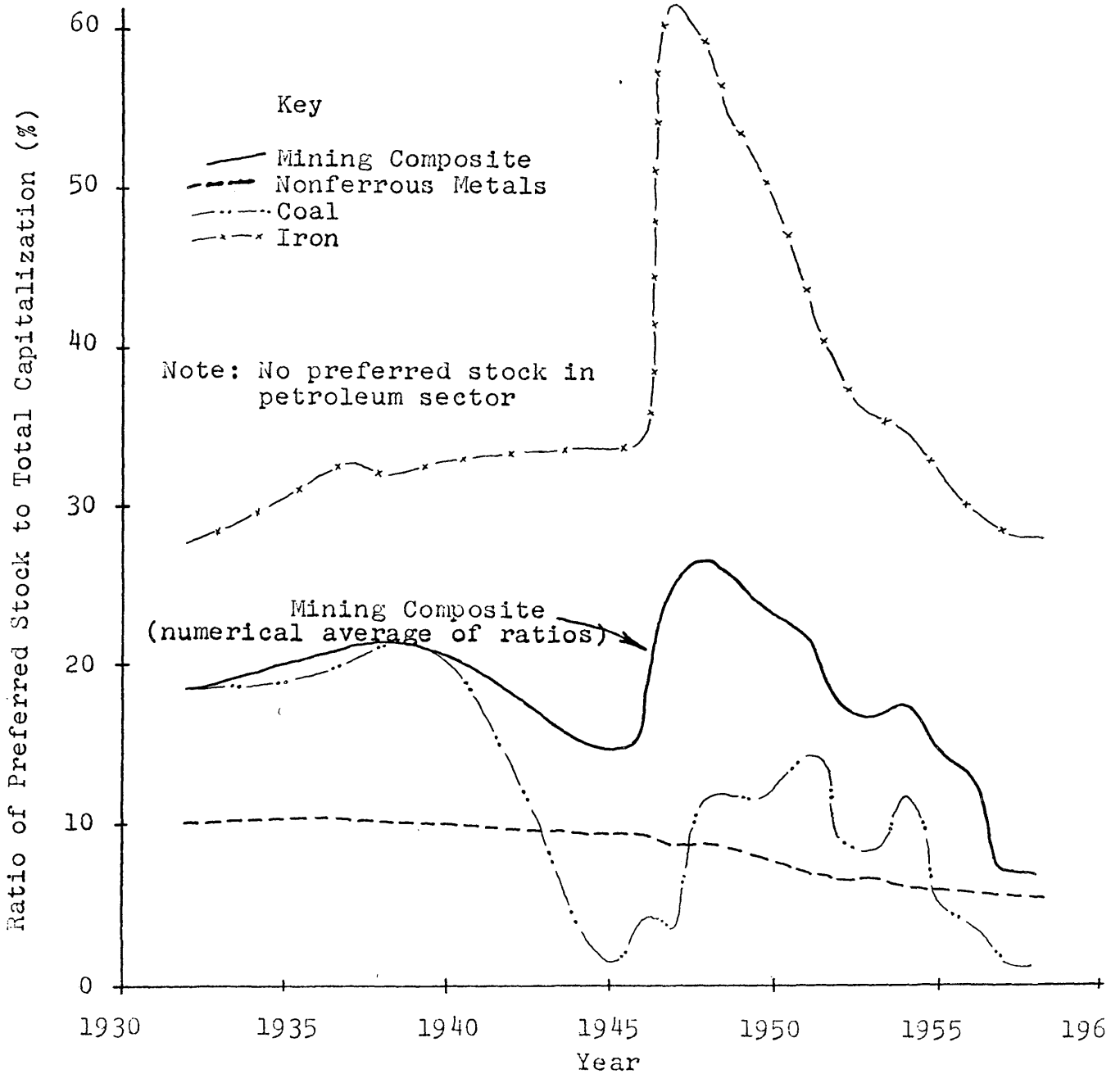
Funded Debt - Petroleum Industry: The petroleum industry stands in rather striking contrast to the mining industry in its use of funded debt. As shown on Graph 1 and in Table 1, the petroleum industry consistently used a high ratio of debt financing in its capital structure. The funded debt to total capitalization ratio for the four petroleum companies ranged from a high of 23.3 percent in 1932 to a low of 12.5 percent in 1945. Although some sizeable ratio differences existed between the four companies in any one year, each company

generally showed a higher ratio than did any mining company.

A pattern similar to that found in mining may be seen in the oil industry's use of debt over time. In the early Depression years, the ratio was 20.0 percent or above. Between 1932 and 1945, an irregular but definite decline in the ratio occurred to a low of 12.5 percent in 1945. Beginning in 1946, an irregular but definitely increasing ratio occurred until, in 1958, the ratio was 18.2 percent. The average ratio for the 30-year period was 16.6 percent.

The contrast between mining and petroleum is apparent. The petroleum industry used large amounts of debt throughout the period, while the mining industry used much smaller amounts of debt until 1952. Even after 1952, the mining industry ratio was relatively small compared with that of petroleum. The contrast between the nonferrous metals industry and the petroleum industry is even more sharp in that almost no debt was used by mining companies in this sector until 1952.

Preferred Stock - Nonferrous Metals Industry: The contrast between petroleum and mining in the use of preferred stock is clear. This contrast may be seen on Graph 2 and in Table 2, which show the ratio of preferred stock to total capitalization for all companies in the survey. Extensive use of preferred stock was made by three nonferrous metals producers: American Smelting, U.S. Smelting, and Amax. The



Graph 2

Ratio of Preferred Stock to Total Capitalization for Three Mining Sectors and Petroleum, 1930-1958.

COMPANY	1929	1932	1937	1938	1939	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968										
Non-ferrous Metals Industry:																																							
American Smelting & Refining Co.	NA	38.51	40.9	40.7	40.3	37.4	35.9	31.0	27.4	26.1	20.3	18.9	18.1	17.3	16.9	16.1	15.3	15.0	14.8		14.8	13.4	13.1	12.7															
Anaconda Co.																																							
Cerro Corp.																																							
Homestake Mining Co.	NA	--†																																					
Kennecott Copper Corp.																																							
Phelps Dodge Corp.																																							
U.S. Smelting & Refining Co.	NA	39.11	39.0	38.7	38.0	39.3	39.1	38.8	38.7	38.5	38.6	37.1	35.1	35.3	33.0	32.5	31.6	31.4	32.3		32.1	33.0	33.1	32.0	31.1	30.4	0.8	0.9	0.7	0.4									
American Metal Climax, Inc.††	NA	12.6†	12.5	12.3	12.1	11.4	11.3	10.3	13.9	13.1	11.5	9.4	8.4	7.0	6.6	6.2	5.2	3.7	3.6		3.3	3.0	--	15.1	11.9	11.2	9.0	6.4	2.5	1.6									
Hecla Mining Co.																																							
average:	0.0	10.0	10.4	10.2	10.1	9.6	9.5	8.9	8.9	8.5	7.8	7.2	6.6	6.9	6.3	6.0	5.8	5.6	5.6		5.6	5.5	5.1	6.6	4.8	4.6	1.1	1.7	0.4	0.2									
Coal Industry:																																							
Peabody Coal Co.	NA	36.9†	42.0	42.8	42.4	13.4	11.8	10.3	35.3	34.7	36.7	42.7	28.8	28.9	35.0	16.0	12.3	4.1	3.6		3.2	3.2	3.2	2.9	2.2	2.1	1.9	1.8	NA*	NA*									
Island Creek Coal Co.	NA	0.14†	0.14	0.14	0.13	0.11	0.11	0.10	0.09	0.08	0.06	0.08	0.08	0.08	0.08	0.05	0.04	0.04	0.03																				
Ayrshire Collieries Corp.	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†	NA†																				
average:	NA	18.7	20.2	21.4	21.3	1.1	4.1	3.6	11.9	11.5	12.3	14.5	8.8	8.2	11.9	5.5	3.9	1.4	1.2		1.1	1.1	1.1	1.0	0.7	0.7	0.6	0.6	NA*	NA*									
Iron Ore Industry:																																							
Cleveland Cliffs Iron Co.	NA	27.7†	32.8	31.9	32.4	33.7	33.7	63.9	59.0	53.4	49.6	43.8	38.3	35.7	34.8	32.8	30.1	28.5	28.1		27.2	26.5	29.0	25.2	24.4	23.0	20.0	18.1	15.6	12.3									
Hanna Mining Co.	NA	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*																				
average:	NA	27.7	32.8	31.9	32.4	33.7	33.7	63.9	59.0	53.4	49.6	43.8	38.3	35.7	34.8	32.8	30.1	14.2	14.1		13.6	13.2	14.5	12.6	12.2	11.5	10.0	9.1	7.8	6.2									
Mining Industry Average:	NA	18.8	21.1	21.1	21.2	14.8	15.7	25.4	26.6	24.4	23.2	21.8	17.9	16.9	17.6	14.7	13.3	7.1	7.0		6.8	6.6	6.9	6.7	5.9	5.6	3.9	3.8	4.1	3.2									
Petroleum Industry:																																							
Continental Oil Co.																																							
Gulf Oil Corp.																																							
Standard Oil Co. (N.J.)																																							
Texaco, Inc.																																							
Petroleum Industry average:																																							

NA--comparable data not available for 1929
 NA*--comparable data not available due to merger
 NA†--data not available
 NA††--comparable data not available due to merger with unincorporated company
 †--1933 data used; comparable 1932 data not available
 ††--data includes merger with Climax Molybdenum Co. in 1957

Table 2
Ratio of Preferred Stock to Total Capitalization
 (%)
 —Selected American Mining & Petroleum Companies —
 1929 — 1968

Data compiled from *Moody's Industrial Manual* and from annual operating statements by the author

other six companies in this sector had no preferred stock in their capital structures. Both American Smelting and U.S. Smelting obtained nearly 40.0 percent of their capitalization from preferred stock in 1933, while Amax obtained 12.6 percent. The ratio of preferred stock to total capitalization decreased markedly, if somewhat erratically, for American Smelting and Amax between 1929 and 1958 but remained fairly constant for U.S. Smelting. The average ratio for the nonferrous metals industry declined steadily during the period from over 10.0 percent in the 1930's to 5.6 percent in 1958. This decline may have occurred in two ways. Since all preferred in the sector was callable, it may have been called and retired. The companies may also have ceased using preferred stock while increasing their use of other financing instruments. A minority of nonferrous metals producers used preferred stock. When such stock was used, however, it was used in large amounts. It occupied an increasingly less important position in the composite capital structure between 1929 and 1958.

Preferred Stock - Coal and Iron Industries: The coal industry exhibited diversity in its use of preferred stock between 1929 and 1958. Peabody Coal used extensive amounts of preferred stock; its ratio of preferred to total capitalization was 36.9 percent in 1933, a high of 42.8 percent in 1938, and only 3.6 percent in 1958. Island Creek used only

negligible amounts of preferred stock. Ayrshire never used any preferred financing. Preferred stock was used very little in the coal industry between 1929 and 1958, but when ~~it~~ it did occupy a position in the capital structure of a company, it was a large position. As shown by the coal industry average ratios, the importance of preferred stock declined significantly.

The iron-ore industry, represented only by Cleveland Cliffs, shows extensive past use of preferred financing. From a low preferred stock to total capitalization ratio of 27.7 percent in 1933, the ratio rose to 59.0 percent in 1948 and then declined to 28.1 percent in 1958. Although little generalization can be made about the industry from one sample, the ratio of preferred to capitalization did decline toward 1958, a pattern similar to that in the other two mining sectors.

The mining industry composite ratios indicate a definite downward trend in the preferred stock to total capitalization ratio between 1929 and 1958 for the entire 14-company sample. This trend indicates the decreasing importance of preferred stock in the capital structure of the industry over the period.

Preferred Stock - Petroleum Industry: The petroleum industry exhibited a sharp contrast to the mining industry as shown on Graph 2 and Table 2. None of the companies used any preferred stock between 1929 and 1958. This absence of

preferred is not entirely characteristic of the industry, as indicated in a Studley Shupert Statistics, Inc. industry survey (1967, p. 4) of 23 companies. The ratio varied from a period high of 4.7 percent in 1929 to a low of 0.5 percent in 1958. These averages are still very low compared with those in mining. The petroleum industry used very little preferred stock between 1929 and 1958; the low ratio of preferred to capitalization declined markedly during this period.

The contrast between the petroleum and mining industries in the preferred stock sector is clear. Petroleum has historically used much less preferred financing than has mining. In both industries, the importance of preferred stock in the capital structure steadily declined between 1929 and 1958. The reason for the marked difference between the two industries is a subject for speculation. Due to the risks inherent in early mining activities, stockholders may have demanded a preferred position with regard to assets should liquidation have occurred. The early and spectacular oil boom may not have produced so many skeptical stockholders; instead, these stockholders may have preferred the rewards of common ownership to the relative safety of preferred stock.

Common Stock and Surplus - Nonferrous Metals Industry:

Common stock, or residual, ownership reflected the changes in funded debt and preferred-stock financing. In this

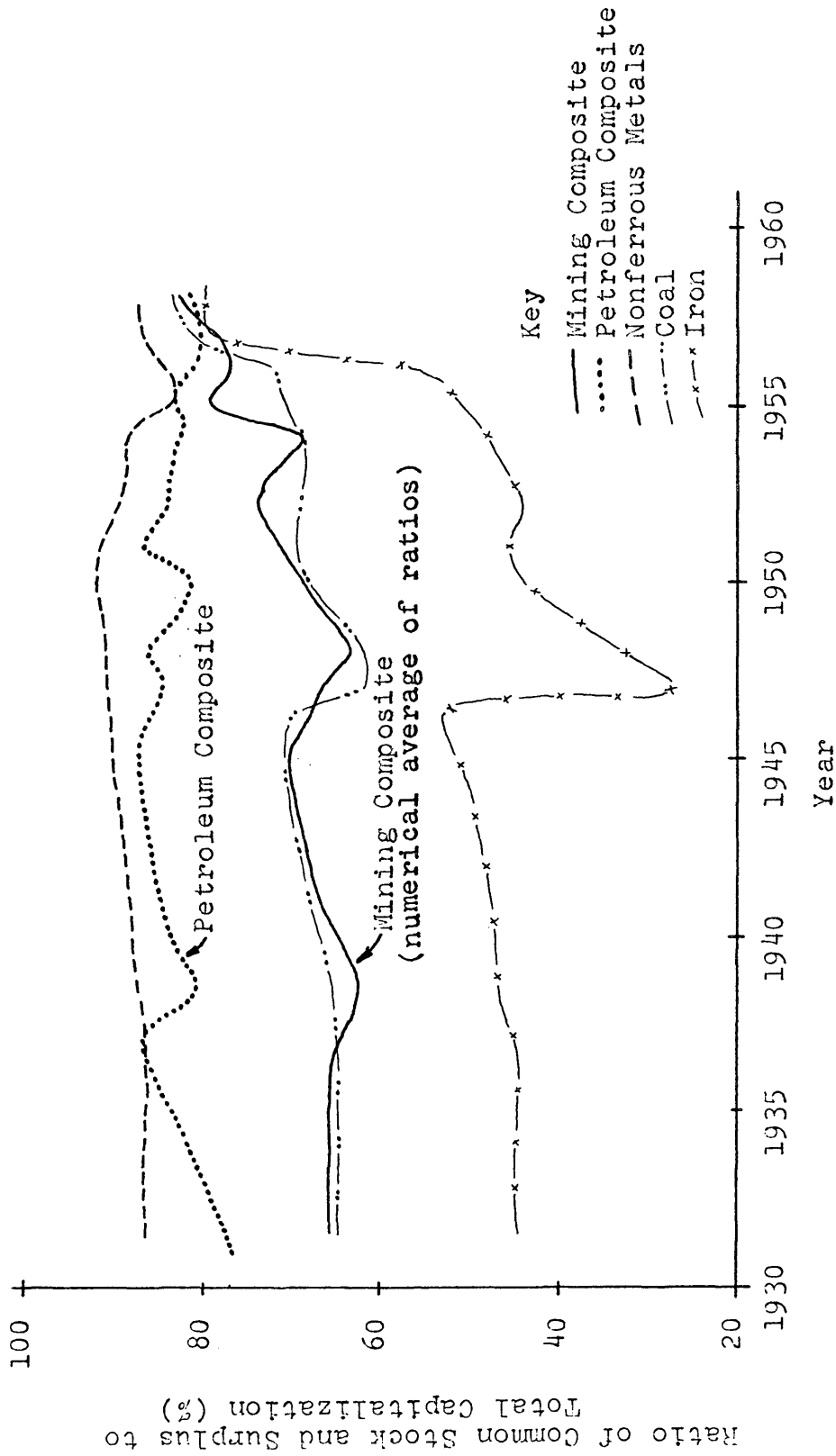
thesis, the terms "common stock" and "surplus" refer to the amounts shown on balance sheets as common stock par value, capital surplus, and retained earnings. Graph 3 and Table 3 show the changes in the use of common stock and surplus for the 1929 to 1958 period.

Common stock and surplus accounted for 86.4 percent of the capitalization of the nonferrous metals industry in 1932-1933. This average ratio reflects the moderate use of funded debt in the early Depression years and the heavy use of preferred financing by three companies. From 1932-1933, the proportion of common stock to total capitalization rose to a high of 91.8 percent in 1951, reflecting the decreased use of debt and the generally decreasing use of preferred. Times were uncertain during the 1930's, thus requiring equity financing, and profitable enough during WW II to allow retained earnings to be used extensively.

Between 1952 and 1958, the ratio declined irregularly to 83.5 percent in 1955 and then rose to 87.4 percent in 1958. This decline in the importance of common equity reflects the growing use of debt financing toward 1958 and the declining importance of preferred stock.

Common Stock and Surplus - Coal and Iron Industries:

The coal industry again exhibited diversity among the companies used. Peabody Coal had a very low common and surplus to total capitalization ratio due to its high proportions of debt and preferred stock. From a low ratio of



Graph 3
 Ratio of Common Stock and Surplus to Total Capitalization for Three Mining Sectors and Petroleum, 1930-1958.

COMPANY	1929	1932	1937	1938	1939	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968		
Non-ferrous Metals Industry:																															
American Smelting & Refining Co.	NA	40.4†	55.5	55.9	57.7	62.6	64.1	69.0	72.6	73.9	79.7	81.1	81.9	82.7	83.1	83.9	84.7	85.0	85.2	85.2	86.6	86.9	87.3	88.7	89.4	90.0	91.5	92.3	94.6		
Anaconda Co.	91.7	92.1	87.3	89.2	90.6	99.3	99.3	99.4	99.4	99.4	99.4	99.5	91.2	86.3	83.2	84.8	86.7	87.8	88.7	91.4	92.5	93.6	90.6	90.8	92.0	93.3	94.8	89.3	80.2		
Cerro Corp.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	92.4	86.0	86.9	76.4	77.0	81.2	83.2	76.5	78.4	78.2	78.2	78.9	86.7	81.5	94.3	93.0	89.0		
Homestake Mining Co.	NA	100.0†	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	71.5	93.0	75.4	79.4	89.5	92.3	100.0	95.0	66.2	62.0	60.9		
Kennecott Copper Corp.	97.7	97.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	94.5	
Phelps Dodge Corp.	100.0	100.0	88.8	88.9	89.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.1	99.1	99.1	98.4	99.3	99.3	100.0	98.3	98.4	81.5		
U.S. Smelting & Refining Co.	NA	60.3†	60.8	61.1	62.0	60.7	60.9	61.2	61.3	61.5	61.4	62.9	64.9	64.7	67.0	67.5	68.4	68.6	67.7	67.9	67.0	66.9	66.0	66.9	69.6	64.2	67.3	59.5	40.3		
American Metal Climax, Inc.††	NA	86.9†	87.5	87.7	87.9	88.6	88.7	89.7	86.1	86.9	88.5	82.2	76.9	79.0	80.7	82.7	85.2	90.4	90.9	91.7	92.9	96.4	81.3	68.1	70.3	67.4	69.1	70.1	69.0		
Hecia Mining Co.	95.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	55.0	54.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
average:	97.1	86.4	86.5	87.0	87.5	90.3	90.4	91.0	91.0	91.4	92.1	91.8	89.9	88.5	89.0	83.5	84.1	87.0	87.4	87.2	88.0	88.9	88.2	87.4	89.5	90.0	86.0	85.5	78.9		
Coal Industry:																															
Peabody Coal Co.	NA	29.8†	27.5	28.1	28.7	35.6	37.3	38.7	17.3	21.6	20.3	24.5	25.1	25.4	11.1	49.0	48.1	61.0	63.2	63.2	70.8	75.0	71.6	62.2	65.1	63.8	67.5	NA*	NA*		
Island Creek Coal Co.	NA	99.86†	99.86	97.36	97.37	99.89	99.89	98.90	99.91	99.91	99.92	99.94	99.92	99.92	99.92	99.92	99.95	99.96	99.96	99.97	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ayrshire Collieries Corp.	NA†	NA†	NA†	NA†	NA†	75.6	67.2	61.4	72.1	77.4	87.0	91.1	97.5	91.5	96.5	88.7	80.7	75.9	83.9	81.2	82.9	78.8	81.5	65.8	65.8	56.3	59.2	63.9	65.4		
average:	NA	64.7	64.6	62.8	63.0	70.5	68.0	66.6	63.0	66.4	69.0	71.6	74.0	72.4	69.0	79.1	76.5	79.0	82.4	81.5	84.5	84.6	84.3	71.9	74.9	72.8	72.0	NA*	NA*		
Iron Ore Industry:																															
Cleveland Cliffs Iron Co.	NA	45.6†	44.9	46.5	47.0	51.7	53.5	26.6	32.6	38.3	44.1	45.8	43.9	45.4	47.3	51.0	55.3	58.3	59.7	9.6	7.1	4.8	65.6	67.1	69.3	72.9	75.6	79.1	83.0		
Hanna Mining Co.	NA	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	NA*	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
average:	NA	45.6	44.9	46.5	47.0	51.7	53.5	26.6	32.6	38.3	44.1	45.8	43.9	45.4	47.3	51.0	55.3	79.2	79.8	80.7	81.4	80.6	82.8	83.6	84.6	74.3	76.7	79.6	82.6		
Mining Industry Average:																															
	NA	65.6	65.4	65.5	65.9	70.8	70.7	61.5	62.2	65.4	68.4	69.8	69.3	68.8	68.5	71.3	72.0	81.7	83.2	83.1	84.6	83.0	85.1	81.0	83.0	79.1	78.2	82.6	80.7		
Petroleum Industry:																															
Continental Oil Co.	81.2	87.6	99.8	81.5	81.6	98.5	99.3	98.9	99.3	99.4	99.8	99.9	89.5	84.4	73.9	75.2	76.1	70.6	72.2	30.2	79.4	74.7	76.0	73.4	72.9	71.7	74.9	75.8	75.9		
Gulf Oil Corp.	83.9	73.3	85.6	84.9	89.2	89.5	89.9	75.9	81.2	81.8	83.3	84.6	86.0	87.4	88.4	89.8	81.8	83.2	83.6	90.8	91.7	93.0	92.5	92.5	93.2	90.6	87.0	86.4	78.4		
Standard Oil Co. (N.J.).	77.2	69.4	76.3	73.2	74.1	77.6	78.3	78.4	80.1	74.7	77.0	77.2	77.7	78.9	83.0	82.8	83.0	83.6	86.4	89.4	89.1	88.9	90.2	90.7	90.8	88.8	86.4	86.3	NA†		
Texaco, Inc.	77.8	76.6	86.7	87.0	81.2	84.4	81.7	85.2	85.5	85.3	86.1	86.9	83.9	84.9	86.1	87.3	82.0	85.1	85.1	88.0	89.1	88.9	91.1	91.5	89.6	90.2	85.8	84.0	83.2		
Petroleum Industry average:	80.0	76.7	86.8	81.7	81.5	87.5	86.6	84.6	86.6	83.3	81.5	87.2	84.3	83.9	82.8	83.8	80.7	80.6	81.8	87.1	87.4	86.5	87.5	87.0	86.6	85.3	83.6	83.2	79.2		

NA+—comparable data not available for 1929
 NA*—comparable data not available due to merger
 NA†—data not available
 NA+—comparable data not available due to merger with unincorporated company
 †—1933 data used; comparable 1932 data not available
 ††—data includes merger with Climax Molybdenum Co. in 1957

Table 3 Ratio of Common Stock & Surplus to Total Capitalization (%)

—Selected American Mining & Petroleum Companies —

1929 — 1968

Data compiled from *Moody's Industrial Manual* and
 from annual operating statements by the author

27 to 29 percent in the 1930's, the Peabody ratio increased to 38.7 percent in 1947, reflecting a decrease in importance of preferred stock. A 1948 issue of preferred stock lowered the ratio to 17.3 percent in that year. After 1948, the ratio generally increased to 63.2 percent in 1958, reflecting the declining importance of preferred stock. Island Creek had a ratio of nearly 100 percent for the entire 26-year period. Ayrshire showed a generally increasing, though irregular, ratio of common and surplus to total capitalization for the period. The ratio rose from 75.6 percent in 1945 to 83.9 percent in 1958.

The coal industry average ratio showed a gradual rise in the proportion of common and surplus financing from 1932-1933 to 1958. This trend reflected the decrease in importance of both preferred stock and funded debt.

The iron mining industry, represented by Cleveland Cliffs, exhibited an irregular rise in the common stock and surplus to total capitalization ratio. The ratio increased from 45.6 percent in 1932-1933 to 59.7 percent in 1958, thus reflecting lower dependence on preferred financing.

The mining industry composite ratio of common stock and surplus to total capitalization gradually increased from 1929 to 1958, thus supporting the NBER study which showed increased use of retained earnings toward the 1950's. The ratio was 65.6 percent in 1932-1933 and 83.2 percent in 1958. The ratio reflected the declining importance of

preferred financing and the increased use of debt.

Common Stock and Surplus - Petroleum Industry: The petroleum industry common and surplus ratio is a direct reflection of the debt ratio, since no preferred stock was noted in the survey. The proportion of equity financing remained fairly constant throughout the period, although there was a gradual increase in the ratio from 1929 to 1945 (80 percent in 1929 and 87.5 percent in 1945). The ratio then declined to 81.8 percent in 1958. It is quite evident that the petroleum industry maintained a fairly high, constant common and surplus ratio from 1929 to 1958 while the mining industry ratio climbed from a relatively low ratio in 1932-1933 (65.6 percent) to one comparable with that of petroleum (83.2 percent) in 1958.

Summary: The mining industry use of debt financing definitely increased from 1929 to 1958. The rise in the use of debt began in 1952. The use of preferred stock declined during the 1929-1958 period. Common stock and surplus financing rose between 1929 and 1958, reflecting a greater dependence on internally generated funds.

The petroleum industry consistently used more debt in its capital structure than did the mining industry. The proportion of debt to total capitalization remained fairly constant from 1929 to 1958. Very little use of preferred stock was made in the industry.

PRESENT CAPITAL STRUCTURE AND COMMENTS ON DEPLETION

The last chapter traced the development of the capital structure of the mining and petroleum industries from 1929 to 1958. This chapter continues the development for the period 1959-1968. The previous chapter also provided insights into the changing nature of long-term funds. One important source of funds - depletion allowances - will be examined briefly. The part played by depletion funds has received little quantitative attention in recent studies of the sources and uses of funds by the mining and petroleum industries. Such lack of attention is undoubtedly due to the lack of meaningful data, a problem encountered in this study also.

Capital Structure - 1959 to 1968

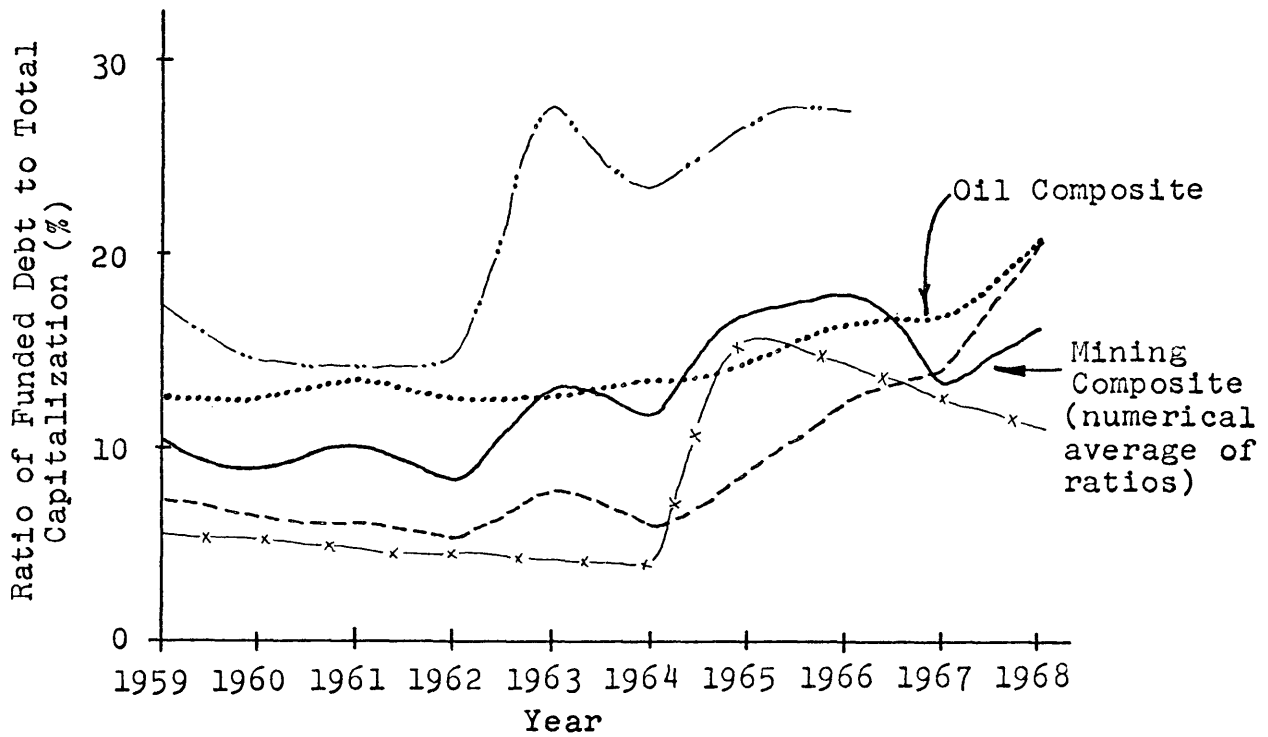
The same technique as that used in the previous chapter has been used to determine the modern capital structure of the mining and petroleum industries. The following ratios have been computed for the nonferrous metals, coal, iron, and petroleum sectors from data in Moody's Industrial Manual, 1959-1969 and in annual operating statements:

- 1) funded debt/total capitalization
- 2) preferred stock/total capitalization
- 3) common stock and surplus/total capitalization.

It is well worth repeating the limitations of this type of ratio analysis. The ratios are only as meaningful as are the figures used in the computations. Therefore, all figures must be comparable. Due to a certain amount of incomparability, the exact ratios obtained from the data must be viewed with caution. This study is concerned with the trend in the ratios, not with the exact figures. Since a small number of companies have been examined, sudden changes in the structures of any one of them may seriously distort the general trend for the group. Reference to both the composite graph data and to the individual data shown in the industry tables is important. The problem of distortions caused by an individual company is particularly troublesome in the iron-mining sector, where only two companies are represented. Despite these problems, a definite trend may be seen in the sources of funds in both the mining and petroleum industries.

Funded Debt - Nonferrous Metals Industry: The use of funded debt has increased markedly in all three mining sectors since 1959. Reference to graph 4 and to table 1 on page 63 will show this increasing trend. Five of the nonferrous metals producers used some debt financing throughout the period. By 1968, only Hecla Mining Co., the smallest company used in the survey, did not rely on some long-term debt. Phelps Dodge and Kennecott used significant amounts of debt financing for the first time in 1968.

Key
 — Mining Composite
 Petroleum Composite
 - - - Nonferrous Metals
 - - - Coal
 -x- Iron



Graph 4

Ratio of Funded Debt to Total Capitalization for Selected Mining and Petroleum Companies - 1959-1968.

Cerro Corp., Homestake, and Amax used large amounts of debt throughout the 1960's.

As pointed out in the previous chapter, the use of significant funded debt in the nonferrous metals sector began in 1952 and increased markedly until 1956, at which time a downtrend began. By 1958, the ratio of funded debt to total capitalization was about 7 percent. This downtrend continued into the early 1960's. In 1959, the ratio was 7.2 percent; it then decreased to a low of 5.2 percent in 1962. In 1963, the ratio began a definite upturn, rising from 7.8 percent in 1963 to 20.9 percent in 1968. The ratio high of 20.9 percent in 1968 capped a 40-year upward trend which began in 1929 at 2.9 percent.

Funded Debt - Coal and Iron Industries: The same increasing trend is seen in the coal sector, where data showed a rise in the funded debt to total capitalization ratio from 17.4 percent in 1959 to a high of 27.4 percent in 1966. Data after 1966 are not available for Peabody or Island Creek due to mergers in 1967.

In the previous chapter, it was shown that the ratio for coal increased from 16.6 percent in 1933 to 29.8 percent in 1947. From 1947, the ratio decreased irregularly to 16.4 percent in 1958. The downward trend continued through 1959 (17.4 percent) to 1962 (14.7 percent). Beginning in 1963, the ratio increased dramatically until,

in 1966, 27.4 percent of the coal industry's financing came from debt funding. Although the sudden rise in 1963 was caused by a large debt issue by Ayrshire, the overall upward trend is supported by greater debt use by all three companies. One may conclude from the ratios of the three sample companies that 1963 saw the beginning of a definite increase in the use of long-term debt to levels higher than those for any other sector in this study. Once again, the effect of long-term sales contracts undoubtedly was very important.

The picture is not so clear for iron mining. This sector had a generally declining ratio of debt to total capitalization from 1933 to 1952. In 1952, a mortgage bond issue by Cleveland Cliffs caused a sharp rise in the ratio, followed by a long decline. The ratio decline continued until 1965 and represented a period during which the 1952 issue was retired while no new debt was issued. In 1965, a similar large issue by Hanna Mining Co. caused a sudden increase in the ratio, followed by a decline as the debt was repaid. Since only two companies have been used in this survey, large, infrequent debt issues will cause this long-term rising and falling pattern. It may be significant, however, that at no time since the early 1930's has the ratio been as high as it was in 1933. This fact points to the conclusion that the iron mining industry has used less debt recently than it has in the past, although the industry

does use occasional moderate amounts of debt financing.

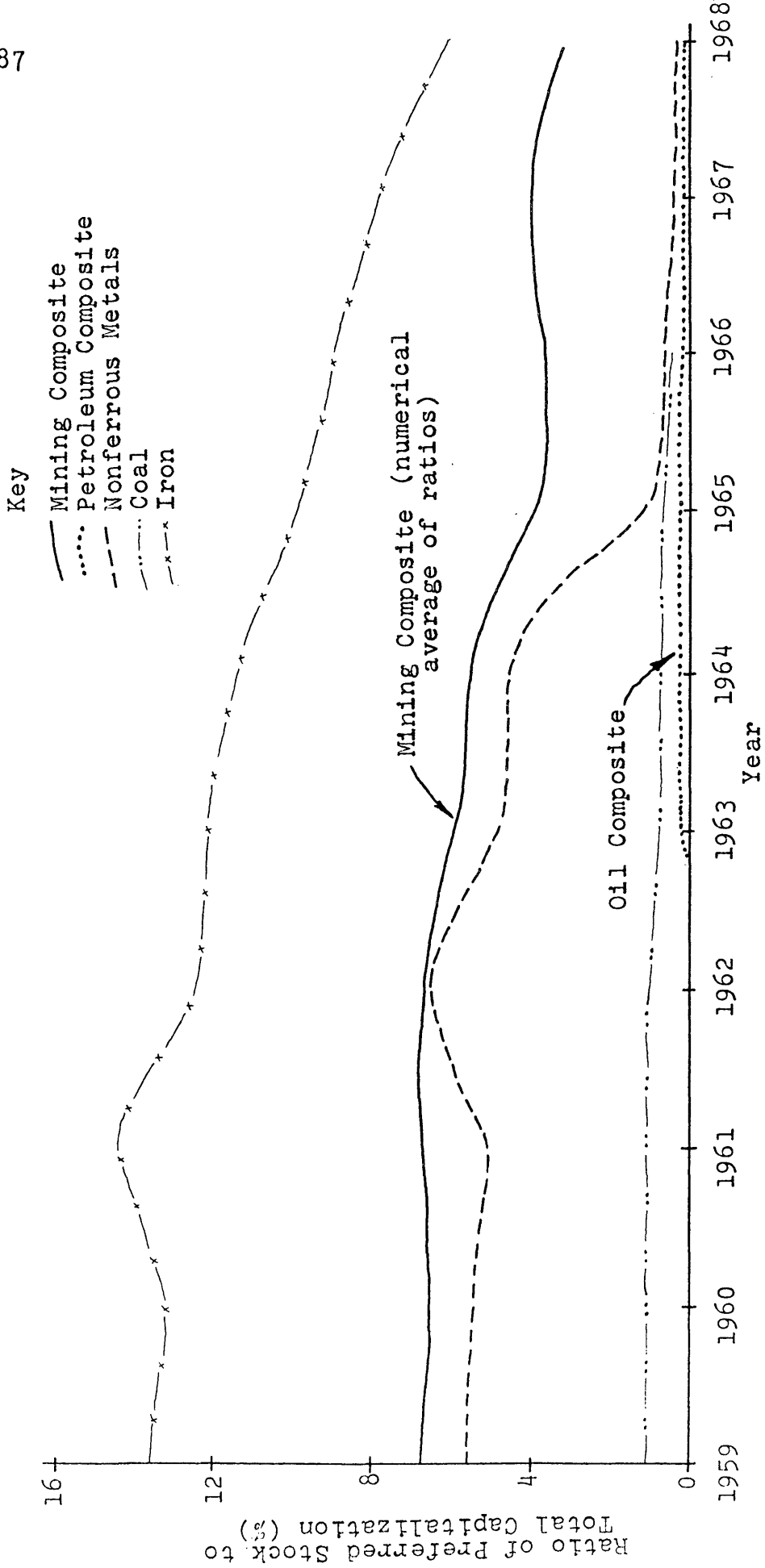
The mining industry average, as shown on graph 4 and in table 1 on page 63, indicates a continuation of the decline in the debt to total capitalization ratio from the late 1950's into the early 1960's. The ratio fell from 14.7 percent in 1936 to 10.1 percent in 1959 and to 8.2 percent in 1961. In 1962, the ratio began a steady rise from 13.1 percent in 1962 to 16.1 percent in 1968, indicating increased use of debt toward 1968. The debt ratio pattern since 1929 has been somewhat irregular, but one can discern a long-term decline in the ratio from 1929 to 1952, followed by an irregular but definite increase in the ratio from 1952 to 1968.

Funded Debt - Petroleum Industry: The petroleum industry data, shown on graph 4 and in table 1 on page 63, indicate a definite increase in the funded debt to total capitalization ratio from 1959 to 1968. Data presented in the previous chapter showed that, while the ratio fluctuated greatly during the 1929-1958 period, the petroleum industry used a fairly high amount of debt during the entire period. Beginning in 1959, the debt to total capitalization ratio rose steadily from 12.9 percent in 1959 to 20.8 in 1968. During most of the 1959-1968 period, the petroleum ratio was higher than that of mining, although the mining ratio was higher between 1963 and 1966. Perhaps the most

significant point to be made in comparing the mining and petroleum industries is that the mining industry, beginning in 1963, began to use debt to a degree comparable to that in the petroleum industry.

Preferred Stock - Mining Industry: The long-term trends in the use of preferred stock continue to be very clear in both petroleum and in mining, as indicated on graph 5 and in table 2 on page 69. In all sectors of mining, the use of preferred stock declined markedly between 1959 and 1968. Although there were highly irregular fluctuations in the preferred stock to total capitalization ratio between 1932 and 1958, the dominant trend in mining was toward a declining importance of preferred stock. The ratio for all mining sectors declined from 18.8 percent in 1932-1933 to 7.0 percent in 1958. The same ratio declined from 6.8 percent in 1959 to 3.2 percent in 1968. All three mining sector ratios declined markedly during this period. The only companies which had large amounts of preferred stock outstanding were U.S. Smelting and Cleveland Cliffs. Even in these two companies, the ratio declined markedly between 1959 and 1968.

Preferred Stock - Petroleum Industry: The petroleum industry continued to use only negligible amounts of preferred stock between 1959 and 1968. During the period 1929-1958, no preferred stock was used by any of the companies sampled. In 1963, Continental Oil had a small issue of



Graph 5
 Ratio of Preferred Stock to Total Capitalization for Selected Mining and Petroleum Companies - 1959-1968.

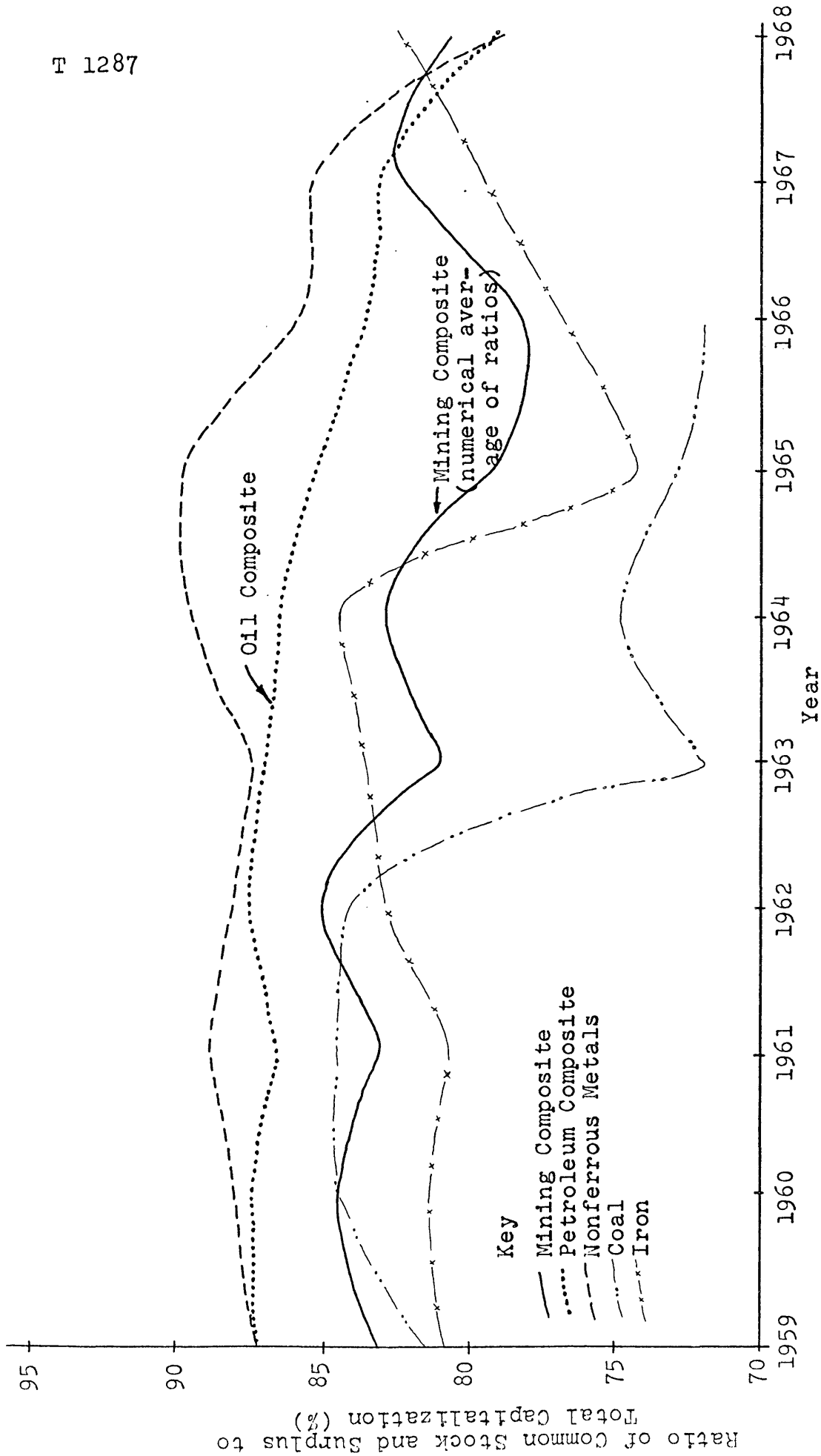
preferred stock outstanding, but the preferred stock to total capitalization ratio never rose above 0.1 percent.

A definite conclusion may be drawn from this mining and petroleum data. The use of preferred stock in the capital structure of the mining industry declined to almost negligible proportions between 1959 and 1968, thus continuing a declining importance which stemmed at least from the early 1930's. The petroleum industry continued its long-term practice of using only negligible amounts of preferred stock.

Common Stock and Surplus - Nonferrous Metals Industry:

The importance of common stock and surplus reflects the increasing importance of debt and the decreasing importance of preferred in both the mining and petroleum industries. Graph 6 and table 3 on page 75 show the common stock and surplus to total capitalization ratios for all sectors studied.

The fact that the nonferrous metals sector had a higher ratio than any other sector, reflected the relatively small use of debt until 1964. The common stock and surplus to total capitalization ratio was 87.2 percent in 1959; following 1959, the ratio declined irregularly to 78.9 percent in 1968. This irregularity is somewhat inconsistent with the fairly smooth trends seen between 1929 and 1958. The definite decline in ratio between 1959 and 1968



Graph 6
 Ratio of Common Stock and Surplus to Total Capitalization for Selected
 Mining and Petroleum Companies - 1959-1968.

indicates both the declining importance of preferred stock and the increasing use of debt during this period.

Common Stock and Surplus - Coal and Iron Industries:

The common stock and surplus ratio for coal also showed a marked decline between 1959 and 1966. This declining trend is opposite to the generally increasing ratio trend seen for coal between 1932 and 1958. The decreased importance of common stock financing beginning in 1963 was caused by a greater use of debt between 1963 and 1966. The common stock and surplus to total capitalization ratio for coal was 81.5 percent in 1959 and 72.0 percent in 1966.

The common stock and surplus ratio for the iron-mining sector was very irregular between 1959 and 1968. This irregularity was caused by the sudden use of large amounts of debt, as explained previously, and by the declining importance of preferred stock. No definite conclusion may be drawn from the iron-mining sector except that both its common stock and surplus ratio and its funded debt ratio are highly cyclical and irregular.

Common Stock and Surplus - Petroleum Industry: The common stock and surplus to total capitalization ratio for the petroleum industry definitely declined from 1959 to 1968. It may be recalled that the same ratio varied fairly consistently between 80 and 87 percent from 1929 to 1958, but with little definite, long-term trend. Beginning in 1959,

when the ratio was 87.1 percent, the petroleum industry ratio declined steadily to 79.2 percent in 1968. This declining trend directly reflects the increased use of debt financing in the capital structure of the industry during the period.

The comparison between the mining and petroleum industries' common stock and surplus ratio is fairly clear. As shown on graph 6, the mining industry ratio declines irregularly from 83.1 percent in 1959 to 80.7 percent in 1968. The petroleum industry ratio is higher for almost the entire period, being 87.1 percent in 1959 and 79.2 percent in 1968. However, the lower mining ratios reflect a greater use of preferred stock in mining than in petroleum, not a greater use of debt. Only in the last five years of the survey did the mining industry use an amount of debt comparable to that used in petroleum.

One of the purposes of this study was to determine the recent capital structure of the mining industry. With the data in tables 1, 2, and 3, this determination can now be made. The average structure for the 1959-1963 period, the 1964-1968 period, and for 1968 are presented in Exhibit 4 for all sectors examined in this study.

Summary: Between 1959 and 1968, both the mining and petroleum industries increased their use of debt financing. The increased use was most noticeable in the mining

Exhibit 4

Recent Capital Structures in the
Mining and Petroleum Industries

	<u>1959-1963</u> (average)	<u>1964-1968</u> (average)	<u>1968</u>
<u>Nonferrous metals industry:</u>			
1) funded debt/total capitalization	6.6%	12.4%	20.9%
2) preferred stock/total capitalization	5.5%	1.6%	0.2%
3) common stock & surplus/total capitalization	87.9%	86.0%	78.9%
<u>Coal industry:</u>			
1) funded debt/total capitalization	17.6%	26.1% (1964-1966)	27.4% (1966)
2) preferred stock/total capitalization	1.0%	0.6% (1964-1966)	0.6% (1966)
3) common stock & surplus/total capitalization	81.4%	73.3% (1964-1966)	72.0% (1966)
<u>Iron industry:</u>			
1) funded debt/total capitalization	5.0%	11.5%	11.2%
2) preferred stock/total capitalization	13.2%	8.9%	6.2%
3) common stock & surplus/total capitalization	81.8%	79.6%	82.6%
<u>Mining industry composite:</u>			
1) funded debt/total capitalization	10.1%	15.2%	16.1%
2) preferred stock/total capitalization	6.6%	4.1%	3.2%
3) common stock & surplus/total capitalization	83.3%	80.7%	80.7%

Exhibit 4 (Continued)

	<u>1959-1963</u> <u>(average)</u>	<u>1964-1968</u> <u>(average)</u>	<u>1968</u>
<u>Petroleum industry:</u>			
1) funded debt/total capitalization	12.9%	16.3%	20.8%
2) preferred stock/total capitalization	0.0%	0.14%	0.1%
3) common stock & surplus/total capitalization	87.1%	83.56%	79.2%

industry, where funded debt increased to proportions comparable to that found in the petroleum industry. The use of preferred stock declined to almost negligible proportions from 1959 to 1968 in the mining industry. The petroleum industry continued to use little, if any, preferred stock in its capital structure. The fact that the proportion of the capital structure represented by common stock and surplus declined in both industries reflects the increased use of debt financing.

Comments on the Depletion Allowance

One of the original goals of this thesis was to examine the effect of depletion allowances as a funding instrument in the mining and petroleum industries. This original goal became impossible to attain due to the lack of meaningful, publicized information concerning actual depletion allowances claimed and due to the refusal of most of the companies studied to provide the necessary data. The author has found very little in the literature concerning the actual effect of depletion allowance funding. A short explanation of the intended study is provided below, followed by an examination of the reasons why the study could not be completed. Data from the three companies which did provide information is also examined.

A great deal of financial data were gathered by the author during the examination of the capital structure of the industry. These data were to be used to determine what portion of new gross internal funds and of new total funds were composed of depletion allowances. The 18 companies used in the capital structure study were to be examined for the period 1959 to 1968. Ratios were to be used to show the relationship between depletion allowances and other sources of new funds.

The ultimate question to be answered was, "How important are depletion allowance funds to the American mining and petroleum industries?" Have such funds increased or decreased in importance over the past 10 years? The answers to these questions would be most interesting, since there has been considerable discussion in the political and economic sectors over the subject of depletion.

Problems Encountered: Close examination of the financial data available from the published annual reports of the 18 companies, from Moody's Industrial Manual, and from other sources demonstrated that little useful information could be obtained from these public sources. In many cases, depletion, depreciation, and amortization claimed for any one tax year were lumped together into one gross figure. Some companies provided no explicit figures for these non-cash expenses, but combined them in their reports under

"other expenses." Four companies did show separate depletion figures.

However, in all cases where any depletion figures were shown at all, whether combined or separate, the notes to the financial statements pointed out that the figures shown for depletion and depreciation had no relation to the amounts actually claimed for tax purposes for these two non-cash expenses. The reason for this discrepancy lies in the accounting practices common in the United States today. It is very common to use one method of accounting for tax purposes, another for publicized information, and still a third for internal purposes. This practice is perfectly legal and acceptable and is of great use to business. The practice does, however, make extraction of many useful and exact details from publicized statements very difficult or impossible.

For tax purposes, most companies use the percentage depletion calculations previously described to claim depletion allowances. The funds "received" from this tax deduction are the critical figures needed to study the effect of depletion as a financing instrument. Most companies, in their published statements, use a cost depletion figure which has little, if any, relation to the allowance claimed on tax returns. These cost depletion figures have as a depletable base the value of company ore bodies as

determined at some point in the past. In many cases, this point is March 1, 1913. In other cases, the depletable base is the value of the ore body as stated in engineering reports during the exploration stage.

Whatever the depletable base may be, the amount shown on the published financial statements has no relation to the depletion amount claimed for tax purposes. The published statements show depletion as exactly analagous to straight-line depreciation. The depletable base is "depreciated" by an amount directly proportional to the production from the ore body. In most cases, the "depreciation" is on a per-unit basis.

The results of this "depreciation" process is that many companies show orebodies which they are now mining as being fully "depreciated." The Homestake orebody in Lead, South Dakota, the major source of the company's income today, was fully "depreciated" in 1936. The company has shown no depletion in its published reports since that year. However, Homestake has received a percentage depletion allowance on its tax return for every year since it began mining.

Other companies are using as depletable bases ore body values which are considerably lower than the actual value. These depletable bases were determined years ago, sometimes as early as 1913, using current metal prices and known technology. Obviously, a large, low-grade porphyry copper

body with an average grade of, say, 0.8 percent was nearly worthless in 1913, but such is not the case today.

The result of the discrepancy between publicized depletion allowances and the actual allowance received for tax purposes is that the publicized figures are totally useless in determining the effect of depletion funds. The only way to obtain the necessary information was to contact the companies themselves. Letters were sent to the appropriate vice-presidents of all 18 companies. The letters were carefully written so as to assure the companies that the data they provided would be used objectively and responsibly. Complete secrecy was assured. The figures would be published only as industry averages.

Despite these assurances, only three of the 18 companies agreed to provide the information requested concerning actual depletion funds "received." The excuses for the refusals were varied, but they all added up to "it's none of your business." Six of the companies did not answer the inquiry.

The reasons for refusal are a subject for conjecture. One may assume that the companies would not hesitate to release any data which would aid them in their struggle for good public relations or in their struggle against the anti-depletion political forces. One must therefore conclude that the refusal to release data on actual depletion

allowances received would be damaging to the companies involved.

Earlier in this study, the point was made that the mining and petroleum industries are continually claiming that percentage depletion, as now computed, is fair and just in view of the risks and large amounts of capital required in the natural resource sector. Tax consideration is absolutely necessary to encourage investors to expose their capital to high risk. Yet very little quantitative data is ever provided with which to support these claims.

The refusal of at least some industry representatives to provide meaningful, quantitative data regarding depletion funds is an indication that perhaps the mining and petroleum industries may not be able to support, in an objective, quantitative, their claims in favor of the present depletion system. If industry spokesmen are being entirely honest and sincere in their statements in support of percentage depletion, it would seem that they should have no hesitation in providing data for an objective, responsible study which might support their arguments. There are, however, other explanations of this reluctance.

One is that while depletion allowances are intended to compensate the industry as a whole for its investments in mineral and petroleum exploration, this compensation goes

only to those companies having profitable operations. Those which do not have profitable reservoirs or ore deposits in production receive nothing, regardless of what they may find, while those that do receive compensation which may be greatly in excess of their actual costs. This information, if released for a study which is concerned only with companies that are successful, could easily be misinterpreted, to the detriment of the whole industry.

Another reason may lie in the inherent conservatism of those in managerial positions and their reluctance to release any information not clearly required by law or company policy.

Still another may be that the information is not readily available and the expense of collecting it, or the necessary time, precludes its being sent.

However, whatever the actual reason, one is left with the strong suspicion that the factual data would not support the claims of the mining and petroleum companies regarding percentage depletion.

Responses to the Survey: Three of the 18 companies surveyed provided data on the exact amounts claimed between 1959 and 1968 for depletion and depreciation. All three companies requested that their names not be used and that the exact figures not be published. Therefore, these companies will be referred to as A, B, and C. All three

companies were nonferrous metals producers; responses from the petroleum, iron, and coal sectors were either negative or were not received. One of the companies which did provide information, company B, did not separate the depletion and depreciation data. Only two companies of the original 18, therefore, provided the necessary details on depletion claimed.

The lack of data prevents the drawing of meaningful conclusions about the four sectors studied. The information as intended in the original study are presented for the two companies which did provide usable data. These calculations are meant to provide only an indication of the effect of depletion funds in mine financing and should not be construed to represent the industry in general.

Definition of terms: Three ratios were computed to show the importance of depletion funds for given periods of time:

- 1) $\frac{\text{net internal funds generated}}{\text{net total funds generated}}$
- 2) $\frac{\text{total depletion allowances received}}{\text{net internal funds generated}}$
- 3) $\frac{\text{total depletion allowances received}}{\text{net total funds generated}}$.

Net internal funds include all funds generated during a given period through internal sources less all outflows of internal funds. Net total funds received include all internal and external funds generated less any outflows of funds. Total depletion allowances include all funds

claimed for tax purposes. It must be remembered that all funds shown are net of outflows. Outflow of funds might occur through transactions such as the retirement of a debt issue, the retirement of a preferred stock issue, or a loss sustained in a given period which reduced retained earnings.

Four time periods were used in this study: 1959 through 1961; 1962 through 1964; 1965 through 1968; and 1968. These periods were chosen so as to provide short enough periods within the scope of the study (1959-1968) in which to demonstrate trends over time. The periods also had to be long enough so that distortions in any one year could be averaged and smoothed out with the other years. The one-year study of 1968 was done to examine whether any gross differences existed between one year and a somewhat longer period.

The total funds generated during the periods studied were calculated by taking the difference between balance sheet data at the beginning and at the end of the period. For instance, a positive difference between retained earnings for the beginning and end of a period would indicate a retention of funds generated through profits. A negative difference between bonds outstanding at the beginning and end of the periods would indicate an outflow of funds to retire the bond issue. The depletion and depreciation

figures for each year, as provided by the three cooperating companies, were totalled over each period.

Results of the Study: The results of the study of the three companies are shown in Exhibit 5 for the three ratios computed over the four time periods studied. Only the company A and company C ratios show depletion as a separate entity. Company B's data have actual depreciation and depletion combined.

It may be seen that depletion funds were extremely important sources of funds throughout the 1959-1968 period for both company A and company C. Company A received a maximum of 81.4 percent of its total net funds from depletion (1959-1961) while the minimum that it received from depletion was 10.4 percent. Company C received a maximum of 93.5 percent of its total net funds from depletion (1962-1964) and a minimum of 16.2 percent (1965-1968). Similar high ratios may be seen for depletion as a percentage of net internal funds. For the entire 1959-1968 period the average ratio of depletion funds to total funds for company A was 38.1 percent and for company C was 56.1 percent. For the same period, the average ratio of depletion funds to total internal funds for company A was 38.4 percent and for company C was 61.1 percent.

For the entire 1959-1968 period, depletion funds for company A were 45.1 percent of the total of depletion and

Exhibit 5

Depletion as a Percentage of Total Funds
and of Internal Funds for Three Companies

	COMPANY A	COMPANY B(c)	COMPANY C
	<u>1959 through 1961</u>		
<u>net internal funds</u> <u>net total funds</u>	149%(a)	86.0%(c)	103.0%(a)
<u>depletion funds</u> <u>net internal funds</u>	54.6%	68.0%(c)	56.8%
<u>depletion funds</u> <u>net total funds</u>	81.4%	58.5%(c)	58.5%
	<u>1962 through 1964</u>		
<u>net internal funds</u> <u>net total funds</u>	99.5%	105.0%(a)(c)	154.0%(a)
<u>depletion funds</u> <u>net internal funds</u>	22.5%	53.1%(c)	60.8%
<u>depletion funds</u> <u>net total funds</u>	22.4%	55.8%(c)	93.5%
	<u>1965 through 1968</u>		
<u>net internal funds</u> <u>net total funds</u>	27.6%	84.9%(c)	24.6%
<u>depletion funds</u> <u>net internal funds</u>	37.9%	52.1%(c)	65.5%
<u>depletion funds</u> <u>net total funds</u>	10.4%	44.1%(c)	16.2%
	<u>1968 Only</u>		
<u>net internal funds</u> <u>net total funds</u>	negative(b)	92.3%(c)	70.2%
<u>depletion funds</u> <u>net internal funds</u>	negative(b)	62.0%(c)	76.6%
<u>depletion funds</u> <u>net total funds</u>	2.9%	57.2%(c)	53.9%

Exhibit 5 (cont.)

	COMPANY A	COMPANY B	COMPANY C
	<u>1959 through 1968 average</u>		
<u>net internal funds</u> <u>net total funds</u>	92.2%	91.8%(c)	85.1%
<u>depletion funds</u> <u>net internal funds</u>	38.4%	57.8%(c)	61.1%
<u>depletion funds</u> <u>net total funds</u>	38.1%	52.8%(c)	56.1%

- (a) Ratios higher than 100% obtained because of net outflows of debt funds resulting in net outflows of total external funds.
- (b) Negative ratios obtained because of net outflows of internal funds. Retained earnings outflows were greater than depletion and depreciation inflows.
- (c) Company B data combined depreciation and depletion funds. Therefore all ratios in which depletion funds are indicated actually are ratios of combined depreciation and depletion.

depreciation. The same percentage for company C was 76.5 percent.

These data, while not necessarily representative of the industry, do indicate that depletion allowances are tremendously important funding instruments for the mining industry. The data gathered by the author in this chapter conflict with that gathered by the NBER study (Creamer and others, 1960) in the 1950's. The NBER study indicated that the mining industry obtained 9 to 10½ percent of its funds from depletion. The data in this chapter suggest that the industry actually may receive 50 percent or more of its funding through depletion allowances.

This discrepancy between the two studies may be explained by the fact that the NBER study used only published data of the SEC and of other government sources. These published sources would show only the cost depletion figures which, as explained previously, are of little value. A brief examination of several companies and their published depletion data, supported this idea.

Summary: Percentage depletion allowances clearly give preferential treatment to the natural resource sector. Such treatment was intended by Congress to allow natural resource companies to recover, tax free, capital invested in natural resource assets. The real issue is whether these industries receive too much preferential treatment. Are other non-natural resource industries being taxed unfairly while the mining and

petroleum industries receive huge capital windfalls through depletion? Have these two industries managed to falsely convince the people and the government of unusual risks and of needs for incentives resulting in unfair preferential treatment?

Unfortunately these questions go unanswered while both pro and con depletion forces stage verbal battles regarding the depletion issue. Since it is clear that neither side provides concrete data with which to support its arguments, and since it is clear that the industry has refused to provide such data in at least one case, it is doubtful whether the argument will ever be won by either side.

RECENT AND FUTURE TRENDS IN MINE FINANCE

This study has examined past and present practices in mine finance. To complete the financial picture, it is necessary to study very recent developments in mine finance and to point toward future trends in this field. The most significant financial developments are in debt financing and in government involvement in mining projects. Several recent developments have been examined first in this chapter. Actual examples are then studied to demonstrate the newest techniques in mine finance. Many of the recent financial innovations concern extremely large, foreign ventures in which American and foreign companies combine to develop high-tonnage, long-term, low-grade deposits in all parts of the world.

The ABC Transaction

One of the more common financing methods in the petroleum industry is the ABC transaction, which is used to transfer a property from one party to another while allowing both parties maximum tax advantages and minimum investment of capital. The name of this financing method is derived from the common practice of designating the original owner, and seller, of the property as party A, the buyer as party B, and an unrelated third party as party C.

For example, party A owns a property worth \$2,000,000. Party B wishes to purchase the property for this amount, but does not want to pay the \$2,000,000 in cash. Parties A and B agree to an immediate payment of \$500,000 by B to A, the remaining \$1,500,000 to be paid through a production payment in the future. A production payment is a payment out of future gross proceeds from the property. These production payments may extend over several years or over 10 or 15 years; therefore, this transaction may be considered as intermediate to long-term financing. Party B would pay A an interest rate of, say, 5 3/4 percent for this "loan" of \$1,500,000. Party A then sells the production payment to a third party, C. Party C may be an insurance company, a group of individuals, or another company wishing to invest funds. Party C finances the \$1,500,000 with a commercial bank loan at an interest rate of, say, 5 1/2 percent. The result of this transaction is that C will receive the full \$1,500,000 production payment plus 5 3/4 percent interest in the future. Party C's profit will be the spread between the 5 3/4 percent interest he receives and the 5 1/2 percent interest he pays on his bank loan. Party C secures the bank loan with a mortgage on the production payment.

Party A has received his full \$2,000,000 at the time of sale of the property. Party B has acquired the title to the property and must pay only the production payment out of gross income for a limited number of years in the future.

If the agreement is properly arranged, the production payment will be large enough to leave B with only enough revenue to cover operating and depreciation costs. Party B will incur no taxes for the period of the production payment and will be able to repay the "loan" from before-tax revenues. Had party B paid cash for the property, he would have to recover his investment from after-tax revenues, since he would have used retained earnings (an after-tax source of funds) to pay for the property. Party B may acquire the mineral property by outright purchase, but, in doing this, B will tie up substantial amounts of capital which would be recoverable only through cost depletion. Since, in most cases, percentage depletion is greater than cost depletion, it is usually advantageous to keep capitalized costs as low as possible. The ABC transaction has been developed to enable the purchaser of mineral property to capitalize as little of the purchase price as possible. It must be stressed that this transaction depends entirely upon tax legislation; changes in the present tax structure may eliminate the advantages of this financing method.

Little use has been made of this method in the mining industry, although there appear to be no unusual restrictions or reasons for this lack of use. Since the mid-1950's, many court cases have developed precedents and definitions of terms and concepts. The use of the transaction in the mining industry apparently awaits only the recognition of

its merits by the industry and the aggressiveness of the banking sector. It appears that the ABC transaction may play a major role in mine finance in the future barring unforeseen changes in present tax legislation. Although no exact data are available, there is evidence that, after 1965, the ABC transaction gained some followers in mining. The petroleum industry has used this method extensively. A recent study demonstrated that, at the end of 1959, 12 major banks had outstanding petroleum and natural gas production payment loans of \$392 million. In 1963, the same 12 banks reported \$1.147 billion in such loans (Cummings, 1965, p. 64).

Carved-Out Production Payments

A financing method similar to the ABC transaction is the carved-out production payment which might be considered an "AC" transaction. The carved-out production payment is used to maximize depletion allowances and to finance development work. Once again, the petroleum industry has used this method extensively, while the mining industry has not yet tapped this source of capital to any degree. This lack of interest by the mining industry may reflect less need to maximize depletion allowances with these techniques or a lack of aggressiveness on the part of the banking sector.

The first major type of carved-out production payment is designed to maximize depletion allowances. It may be

shown that the net gain from percentage depletion is maximized if the percentage depletion allowance is identical with the limitation of 50 percent of net income before depletion and taxes (Cummings, 1965, p. 65). If a company has high, non-recurrrable expenses in any one year, it may be subject to the 50-percent limitation and may therefore lose some of the benefit of the percentage depletion allowance. If it can increase its income without increasing expenses, the 50-percent limitation will be overcome.

Tax courts have ruled that the sale of a carved-out production payment is an advance sale of production and is taxable income. Party A, the owner of a producing property, may sell a production payment to party C, an unrelated third party. Party C will finance the transaction with a bank loan secured by the production payment. The income generated for A through this transaction is taxable income which will raise his 50-percent limit on claimable depletion. Therefore, A will maximize the benefit from percentage depletion by obtaining such debt financing. The period over which the production payments are to be made may cause this financing to be intermediate or long term. It must be stated that the use of such a technique depends entirely upon the individual case. The current use of "future" income will deprive future periods of income and may cause problems concerning the 50-percent limit at that time.

A second type of carved-out production payment may be used for development work. The owner of a mining property, A, may sell a production payment to a third party, C. Proceeds from the sale are not taxable if they are used to carry on development work. This type of transaction has been used recently in foreign ventures and will be illustrated later. Domestic use of this type of carved-out production payment has increased in the last few years (Wilson, 1968, p. 128).

The purpose of both major types of production payment is to obtain capital and to repay the principle out of before-tax income. Naturally, production from the property in question must be assured for either the ABC or the "AC" transaction to be a safe venture for either A or C.

Conventional Financial Institution Loans

It was pointed out in previous chapters that the use of debt financing in the mining industry has been on the increase since at least the early 1960's and probably since about 1952. The reasons for this trend are not difficult to understand. The economic picture has improved considerably since the Depression and WW II periods. This improving outlook has encouraged many mining companies to expose themselves to the risk of debt financing so as to obtain lower cost capital. The efficiency of the American money and capital markets has also improved, enabling investors

and borrowers with special needs to obtain the necessary type of financing. Undoubtedly, the sophistication of those charged with the financial responsibility throughout the business sector has increased. A combination of the above factors has improved the image of the mining industry and has made the investment sector more willing to provide debt financing for the mining industry. In periods of at least mild inflation, such as have been experienced in the last 20 years, the use of debt financing is particularly attractive to borrowers. The fixed interest and principle become lighter burdens for the borrower, since inflation makes repayment of debt "cheaper" as time goes by.

The major forms of debt financing currently used in the mining industry have been conventional bond issues and bank loans rather than the specialized debt instruments described previously in this chapter. Since 1963, mineral producers have made increasing use of commercial bank term-loans to finance surface and underground facilities, excavating machinery, rolling stock, ore processing facilities, and other tangible equipment (Wilson, 1968, p. 127). Most of these loans have been intermediate-term, three to eight years, and do not strictly come under the definition of long-term capital used in this thesis. Nearly all loans are secured by mortgages on the equipment purchased. Although a great deal more bank financing has been used in the

petroleum industry than in mining, the future definitely will see more use of bank credit by the mining industry.

Loan policies used in petroleum financing will have to be altered to accommodate the special conditions found in mining. According to Wilson (1968, p. 127), determination of reserves in place is easier in mining than in petroleum, while determination of recoverable economic reserves and cash flows are more difficult in mining, since mining profit margins are much lower than are petroleum margins (5 to 25 percent versus 50 percent). Mineral prices fluctuate more than petroleum prices. Mines are more risky investments due to the danger of such disasters as cave-ins. However, mines generally do not decline in production with time as quickly as do oil wells.

This chapter now concludes with examples of these trends in long-term, debt financing and with an examination of government assistance in the mining sector.

Consortiums

One of the most significant structural, as well as financial, developments in the mining industry in the last 20 years has been the tendency toward consortiums of large mining companies. Exploration and development have become so expensive that one company cannot afford either the costs or the risks associated with modern-day mining. This tendency is particularly true on the international scene

where risks associated with uncertain political conditions and costs of development have been extremely high. The several large iron developments in Australia are excellent examples of this trend to consortiums - Hamersley (Conzinc Rio Tinto and Kaiser Steel) and Mount Newman (Amax and Colonial Sugar Refining Co.). The Southern Peru Copper Corp. composed of ASARCO, Cerro, Phelps Dodge, and Newmont is a Latin American example. Palabora, in South Africa, was originally owned by Newmont, Amax, Union Carbide, Selection Trust, Rio Tinto, and several other smaller interests.

The development of consortiums not only assures each participant of lower risk than encountered in a solo venture, but also assures the project of adequate financing. Most of these large consortiums have relied upon huge amounts of debt financing and have acquired this financing through the sound financial status and credit-worthiness of the partners. Most ventures of this type have required not only exploration and mine development work but also construction of harbors, railway facilities, towns, and other extremely expensive undertakings. Undoubtedly, one of the major reasons for the recent large use of debt in international ventures has been the development of consortiums.

Debt Financing of Large Ventures

The projects which have brought consortiums to the forefront of modern mining have been very large users of capital.

Palabora required over \$100 million, Mount Goldsworthy over \$106 million, Hamersley over \$170 million, and Mount Newman over \$125 million (MacWilliam, 1966, p. 39). A large portion of these requirements has been met through debt financing. It is absolutely necessary that the project be well planned and that all financing needs be arranged before the project is begun. Generally, lenders will require that the borrower invest a large amount of money in the project before loan money is made available.

The development of the Mesabi Range taconites is an excellent example of debt used to finance equipment and development. The Reserve Mining Co., owned equally by Armco and Republic Steel, spent \$8 million proving its deposits and undertook to invest an additional \$40 million. A consortium of insurance companies then provided \$148 million by purchasing a mortgage bond issue for additional development expenses (MacWilliams, 1966, p. 40). Canadian banks frequently provide similar financing, as well as equity financing, as in the case of Consolidated Denison Mines.

The sale of production payments to metal-consuming companies promises to be a very important source of debt financing in the years ahead. The purchasers of these production payments have a genuine interest in the success of the venture and would probably be more accommodating in the event of unexpected financial trouble. Such arrangements

promote a type of financial "vertical integration" and can be extremely complex and varied. In the most simple form, a metal consumer will provide the producer with loan capital and will accept repayment in mine products. Such a case was the agreement between Brunswick Mining and Smelting Corp. of Canada and Société Générale des Minerais Belgium (SGM), where SGM purchased \$11,500,000 of 6-percent mortgage bonds (MacWilliams, 1966, p. 40).

The negotiation of long-term sales contracts, sometimes extending up to 20 years, may provide producers with excellent collateral with which to seek debt financing. The Australian iron-ore developments are excellent examples of such arrangements. The owners of the Mount Goldsworthy project negotiated a 7-year sales contract, worth approximately \$160,000,000, with several Japanese steel mills. Development costing nearly \$52,000,000 was financed largely through debt funds secured by the sales contract. Similar arrangements were made by the owners of Hamersley, Palabora, and Mount Newman (MacWilliams, 1966, p. 41). Debt financing enables producers to use large amounts of relatively cheap capital to obtain very favorable leverage on equity funds and to maintain complete management control of the project with a fairly small equity base.

The financing of Palabora in South Africa, an extremely complex arrangement, provides an additional example. Debt

funds were obtained through loans from German metal consumers; the loans were guaranteed by the German government. Loans were obtained from a South African bank, and bonds were sold to the sponsoring companies in the project. Preferred stock was sold to South African insurance companies and to a government development corporation. The financing of the Savage River project in Tasmania was equally complex and involved several major American and Australian producers, Japanese steel and trading companies, Australian insurance companies, Australian oil companies, and American banks and insurance companies. A large amount of debt financing was used (Conway, 1969, p. 43).

The trend is very clear. Huge amounts of debt are being used increasingly to finance large foreign mining ventures which are sponsored by consortiums of many companies of different nationalities. Not the least important development is the practice of including local capital in the project even if local interests must borrow these funds from the American, British, and other interests. One of the major reasons for such large use of debt is the capital export restrictions imposed by the British, American, and Japanese governments. Because large amounts of equity cannot be exported from these countries, the participants seek loan capital elsewhere. By use of debt financing, control over the project can be maintained with a small equity base,

while large amounts of capital are still available to finance the project adequately.

Government Participation

It would be a mistake to ignore the increasing importance of government participation in mine finance. It is beyond the scope of this study to examine the effects of fiscal policy, monetary policy, tax legislation, and mineral and corporate legislation on the world mining industry. These policies are extremely important. Governments throughout the world are becoming increasingly important in the actual financing of mining ventures.

Perhaps the best example of such government participation in the United States is the Office of Mineral Exploration (OME) which provides loan capital to worthy exploration projects. The OME is the latest in a series of government agencies which provide financial aid to private interests and encourage exploration for domestic mineral resources. Acceptable private interests may obtain loans from OME for exploration work only. If the venture is successful, the loan is repaid through a 5-percent royalty on production. If the venture is unsuccessful, the loan need not be repaid. This program has succeeded in locating \$11 of economic reserves for every \$1 spent by the government (personal communication, William Hasler, 1969). Perhaps the most successful example of this program is the

Questa project of Molycorp in New Mexico.

Other government agencies have been important in financing both exploration and development during war periods. The White Pine project of the Copper Range Co. is perhaps the most notable example (MacWilliam, 1966, p. 43). Between 1952 and 1955, a 5-percent, 20-year loan of \$66,000,000 was provided by the government and was secured by the fixed assets of the mine. A large portion (\$47,000,000) of the project qualified for accelerated depreciation, 70 percent of which could be written off within 5 years. The government also agreed, if requested, to purchase 89 percent of the first 275,000 tons of copper produced at \$0.255 per pound or at market price, whichever was higher.

The work of the Bureau of Mines and the Geological Survey is of considerable importance. The mapping and research work done by these agencies is available almost cost-free to anyone in the United States. Although this work is not direct financing of the industry, it cannot be ignored as an indirect source of long-term funds. The government is providing information which would be very costly if the industry itself had to finance the work.

Foreign governments provide even more financial aid than does the American government. This aid can range from complete loan financing of exploration programs, including rental of drills and other equipment as found in Rhodesia, to full-scale nationalization. The Canadian Geological

Survey provides a great deal of geological work to the mining industry in a fashion similar to the U.S. Geological Survey. The government of Ecuador maintains a large exploration program, including diamond drilling of interesting targets, under the control of the Army. Results are supplied to private interests.

The issue of nationalization is not always a welcome one for the mining industry; but, nevertheless, such government policy does provide financing for the industry. The most conspicuous examples today are the Chilean, Peruvian, and Zambian ventures into the mining industry. Such nationalization arises from complex backgrounds and probably hurts the country involved in the long run.

More palatable government participation is represented by sales contracts similar to those of the White Pine project. For instance, the governments of the United States, England, and Canada guaranteed success to uranium mines in Canada and South Africa through sales contracts. The contracts were then used by the mines involved as collateral for loans to finance expensive mine development. Loans obtained in such a manner constituted 9.3 percent of the total investment in Orange Free State (South Africa) mines in 1955 (MacWilliam, 1966, p. 43).

Governments also provide loan or equity financing to mining projects through development corporations. These corporations generally work as partners with private

interests and are found in virtually all African countries. Similar development corporations are maintained by Great Britain and Germany to aid in the industrialization of underdeveloped economies.

A good example of a domestic development corporation, and one which the author observed closely, is the Industrial Development Corporation (IDC) of South Africa. The IDC participates in all areas of industry, but is particularly interested in developing domestic natural resources due to South Africa's vulnerable political position with regard to imports. In early 1970, IDC and Falconbridge, a Canadian nickel producer, announced a joint copper venture in South West Africa involving large amounts of loan and equity capital from IDC. The huge Rosh Pinah zinc project in South West Africa is also an IDC undertaking, where a sub-economic deposit is being exploited to supply domestic, private metal consumers with zinc.

An excellent example of an advanced country's development corporation is Great Britain's Commonwealth Development Corporation (CDC), which operates in Britain's former colonies. The CDC is definitely profit motivated and will not undertake an uneconomic venture (personal communication, John Langton, 1968). At the same time, the CDC is interested in projects which will benefit underdeveloped countries. One example of its participation in a mining venture is Kilembe Mines, Ltd., in Uganda. The CDC provided

a 20-percent equity interest, while Falconbridge provided the other 80 percent to develop the large Ugandan copper project. The CDC also provided over \$2,800,000 in debt financing through unsecured loans and debentures. Other mining projects in Kenya, Tanzania, and Uganda have benefitted from consortia consisting of CDC, the national governments, and the West German equivalent of CDC. Such projects frequently are developed by the quasi-government organizations such as CDC and are then sold to, participated in, or managed by private mining interests.

The United States government operates, or participates in, several agencies which provide capital to the mining industry for foreign ventures. The Export-Import Bank frequently provides loan capital for American-sponsored ventures such as the Southern Peru Copper Corp. or guarantees loans to the participants in these ventures. The Agency for International Development (AID) is probably the closest American agency to CDC. The World Bank, heavily supported by the United States government, also provides large amounts of loan funds to American mining ventures. The Compagnie Minière de l'Ogooué (COMILOG), which operates manganese mines in Gabon and is 49 percent owned by U.S. Steel, received \$35,000,000 in loans in 1964 from the World Bank (MacWilliam, 1966, p. 42).

The examples cited above demonstrate the importance of government financing in the mining sector. The development

of such government participation has been fairly recent, and there is little doubt that this participation will increase in the future. It is important to note that many of the companies involved in these government-supported ventures are American. Such government support, especially in the domestic ventures cited, must be considered an important source of long-term financing. The American mining industry is more and more frequently moving abroad, in selected areas, in its search for minerals. Government-supported ventures conserve domestic United States capital and provide more safety for these American companies. It is extremely significant that most of the capital provided through government participation is debt capital which provides low-cost funds with no loss of control of the project.

A final example of modern trends in mine finance will demonstrate nearly all of the recent financial developments described in this chapter. Freeport Sulphur Co. and the Indonesian government have made final arrangements to develop the Ertsberg copper project in West Irian (U.S. News, 1970, p. 60). The \$120 million project will be financed by Freeport and the Indonesian government and by a \$100 million set of loans from various sources. Japanese and West German copper buyers will provide \$42 million in loans to be repaid with production from the mine. Senior debt financing amounting to \$40 million in loans will be provided by American insurance companies such as Connecticut General, Equitable,

Northwestern Mutual, Aetna, and Mutual of New York. These loans will be fully guaranteed by AID. A further \$18 million has been provided by seven United States banks, among which are Chase Manhattan, Chemical, Morgan Guaranty Trust, and United Virginia/State Planters. These loans have also been guaranteed by AID. Freeport is also insured by AID against war loss, seizure, or currency unconvertibility.

CONCLUSION

This thesis has examined the financial instruments used today to fund American business; the capital structure of the mining and petroleum industries from 1929 through 1968; the trends in the financing of business ventures since 1900; and the depletion question. Several conclusions may be inferred from this study.

Capital Structure

It is evident that mining companies are using greater amounts of debt financing today than they were in the past. This use of cheaper funds will undoubtedly decrease the weighted cost of capital for the mining industry and should, therefore, cause profits to rise. Since, by almost any measure of profits, the mining industry has performed poorly in the past, a rise in profits will enhance the position of the industry in the business sector. A rise in profits should make mining a more attractive investment for non-speculative capital, a situation which could cause mining stocks to increase in price. The improved profits picture will make more cheap capital available to the industry, a situation which will enable the industry to spend more time and money in developing new mining methods and new machinery, and in pursuing other problems through research.

The greater availability of capital through increased profits and the increased effort in research and development will enable the industry to improve exploration and mining techniques and to remove some of the risk under which the industry now works. New and lower grade mineral deposits in many parts of the world may then become economic propositions. The increased ability of the industry to mine lower grade deposits will benefit everyone concerned.

The use of debt financing requires a safe earnings outlook and a low risk to the lender. It was pointed out that large mining companies are the main users of debt due to their greater safety in having many sources of income. The increased use of debt by all business sectors may encourage the formation of large mining companies so as to be able to compete with other industrial sectors for scarce funds. The increase in debt use is, in part, a result of new developments in today's money and capital markets. These new developments are providing new sources of financing to American industry. American mining must be able to compete for these funds in order to keep pace with other industries. Raw materials must be provided to today's expanding economy. If today's mining companies are to provide these materials, they must be able to compete for funds. Part of the solution in this competition is size. Today's mining

companies may grow "naturally" or through merger, but they must grow.

Closely allied with the need and the tendency to grow is the direction of this growth. Part of the solution in the competition for capital is size; another part is an assured future income. It was pointed out in a previous chapter that one reason the coal industry has, historically, used great amounts of debt financing is long-term sales contracts. Such contracts insure future earnings with which to repay debt. Earnings may also be made more reliable through vertical integration. Such integration decreases the risk of selling products produced by a given company. Just as large steel companies have reduced their risk of supply of iron ore by integrating back to the mine, today's base metal producers and other mining sectors will integrate forward to assure themselves of markets for their products. This trend is already obvious. For example, both Anaconda and Kennecott own large fabricating subsidiaries. U.S. Smelting recently purchased such a subsidiary.

Where this forward integration will end is difficult to surmise. The petroleum industry has gone the entire course from raw producer to retailer. The mining industry will encounter large interests as it integrates forward in the form of the consumers of its products. It may then become a question of who will swallow whom in the merger game.

The increased use of debt will prompt the money and capital markets to devise new financing methods with which to cope with mining's unique problems. Such methods as the ABC transaction will be developed to provide adequate financing, efficient use of scarce capital, and maximum tax advantages. This situation will increase the efficiency of the capitalistic system to the benefit of all.

Depletion

Little can be said in the area of depletion due to the lack of adequate data. It appears that, historically, the present system of percentage depletion was arbitrary and had little factual base. One of the advantages of the present system is its simplicity compared with the pre-1926 methods of computing depletion. For this reason alone, the present method should probably be maintained. Also, over the years, many court cases and other legal and tax work have refined, defined, and established procedures understood by all persons involved in the depletion area. Such work is valuable and should be carefully considered before major alterations are made which would require equally long periods of definition and refinement.

However, one cannot help but be concerned over the arbitrary nature of the percentages used in the present tax legislation. The major conclusion of this study with regard to depletion is that more information is necessary

so as to determine exactly what effect today's practices cause. Are the recent percentage reductions justified? Is the industry being hurt by such reductions? Or is the industry already receiving more than its share of tax relief? The information is simply not available with which to answer these and other questions. Because the information is not available, arbitrary percentage reductions in the political arena, such as the 1969 tax reform, may seriously injure the industry. On the other hand, if today's percentages are too high, the economic efficiency of our system may be harmed by the diversion of scarce funds into a sector of less than average profitability.

A thorough study should be undertaken by the Internal Revenue Service or by some other comparable body so as to provide objective, reliable information around which to develop American tax legislation. Companies should be forced to divulge the necessary information. The study should be completely apolitical and should be under the direction of a highly competent and neutral body.

The small amount of data available for two companies on actual depletion allowance received indicates that depletion is an extremely important financing instrument for the industry. This small amount of data make the question, "How important is depletion for the mining and petroleum industries?" a most intriguing one - one which should be

examined thoroughly and carefully by a competent and neutral body.

BIBLIOGRAPHY

- American Gas Association Monthly, 1963, The case for percentage depletion: Am. Gas Assoc. Monthly, v. 45, no. 3, p. 7-8.
- Barrons, 1969, American Smelting taps promising profits lode: Barrons, v. 49, no. 41, p. 23-24.
- Beizer, J. D., 1969, Merger trend sideswipes nonferrous industry: Iron Age, v. 203, no. 17, p. 93-96.
- Bell, J. N., 1959, Where do we stand on depreciation and percentage depletion? - Part 1: Rock Products, v. 62, no. 10, p. 85-88.
- _____ 1959, Where do we stand on depreciation and percentage depletion? - Part II: Rock Products, v. 62, no. 11, p. 93-95.
- _____ 1960, What you should know about percentage depletion: Rock Products, v. 63, no. 2, p. 90-93.
- _____ 1962, What's ahead in percentage depletion?: Rock Products, v. 65, no. 3, p. 74-79.
- Bonneville, J. H., 1959, Organizing and financing business: Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 381 p.
- Broy, A. T., 1968, Mining maze: who owns whom?: Magazine of Wall Street, v. 122, no. 5, p. 13-15.
- Butz, R. H., 1966, Depreciation reserves can pay for new equipment: Pit and Quarry, v. 59, no. 2, p. 89-90.
- Chemical Week, 1967, Money for mineral hunts: Chem. Week, v. 101, no. 17, p. 31.
- Conway, W. E., 1969, Savage River Mines - a tri-national joint venture: Mining Cong. Jour., v. 55, no. 1, p. 44-50.
- Creamer, D. B., Dobrovolsky, S. P., and Borenstein, I., 1960, Capital in manufacturing and mining; its formation and financing: Princeton, New Jersey, Princeton University Press, 344 p.

Cummings, T., 1965, Commercial bank financing for the minerals industry: Mining Eng., v. 17, no. 5, p. 63-65.

Economist, 1967, Mining; long range: Economist, v. 224, no. 6474, p. 1136.

Financial World, 1967, Investments at a discount: Financial World, v. 128, no. 2, p. 11.

_____ 1968, Cyprus Mines - expanding complex: Financial World, v. 129, no. 12, p. 12.

_____ 1968, Asarco's expanding stake: Financial World, v. 129, no. 18, p. 5.

_____ 1968, Prosperous processors: Financial World, v. 130, no. 22, p. 13-14.

Flawn, Peter, 1966, Mineral resources: geology, engineering, economics, politics, law: Chicago, Rand McNally, 406 p.

Forbes, 1968, Newmont formula: Forbes, v. 101, no. 9, p. 46.

Fortune, 1963, Depletion; what's at stake for thirty companies: Fortune, v. 67, no. 4, p. 206.

Galbraith, John Kenneth, 1954, The great crash - 1929: Boston, Houghton Mifflin Co., 211 p.

Garnet, D. M., and Faillace, M. F., 1961, Exploration expense; present situation tax-wise: Coal Age, v. 66, no. 7, p. 95-101.

_____ 1961, Development expense: Coal Age, v. 66, no. 9, p. 82-90.

Herlong, S. A., 1968, Percentage depletion; loophole or equity: Mining Cong. Jour., v. 54, no. 2, p. 147-152.

Hogle, J. E., 1968, Growth and direction of mining investment: Mining Cong. Jour., v. 54, no. 1, p. 38-41.

Hunt, P. H., Williams, C., and Donaldson, G., 1966, Basic business finance: Homewood, Illinois, Richard D. Irwin, Inc., 940 p.

Johnson, R. W., 1966, Financial management: Boston, Allyn and Bacon, Inc., 695 p.

Just, Evan, 1965, Mining profits are inadequate: Mining Cong. Jour., v. 51, no. 3, p. 48-51.

- Kaufman, K. A., 1969, Depletion cut proposals startle oil and metals: *Iron Age*, v. 204, no. 5, p. 70.
- Keefe, R. M., 1967, Foreign mining investments as they relate to current balance of payments: *Mining Cong. Jour.*, v. 53, no. 1, p. 26-32.
- Koenig, R. P., 1964, National attitudes; vital key to effective mineral development: *Mining Eng.*, v. 16, no. 7, p. 95-97.
- Kuehl, F. G., 1960, Economics of equipment replacement in the mining industry: *Mining Cong. Jour.*, v. 46, no. 6, p. 77-78.
- Lentz, O. H., 1961, Depletion rationale and recent political pressures of erosion: *Petroleum Tech. Jour.*, v. 13, no. 6, p. 522-526.
- Lichtblau, J. H., and Spriggs, D. P., 1959, The oil depletion issue: New York, Petroleum Industry Research Foundation, Inc., 148 p.
- MacRae, R. M., 1967, Resourceful investor: *Barrons*, v. 47, no. 31, p. 5.
- MacWilliam, R. H., 1966, Changing patterns of mining finance: *Inst. Mining Metallurgy (London) Trans.*, v. 75, no. 6, p. 36-44.
- McCarthy, F., 1966, Wall Street looks at coal: *Mining Cong. Jour.*, v. 52, no. 7, p. 41-43.
- Moody's Investors Service, 1929-1960, Moody's manual of investments: New York, Moody's Investors Service.
- _____ 1961-1969, Moody's industrial manual: New York, Moody's Investors Service.
- Oil and Gas Journal, 1959, Depletion treated kindly by critics; House Ways and Means Committee hearing: *Oil and Gas Jour.*, v. 57, no. 50, p. 73-74.
- _____ 1962, Depletion foes gain in industry fight: *Oil and Gas Jour.*, v. 60, no. 32, p. 99.
- _____ 1964, Depletion becomes issue in San Francisco trial: *Oil and Gas Jour.*, v. 62, no. 9, p. 77-79.
- _____ 1966, Stem-to-stern depletion study out: *Oil and Gas Jour.*, v. 64, no. 17, p. 98-99.

- Oil and Gas Journal, 1969, Depletion linkup to U.S. search hinted: Oil and Gas Jour., v. 67, no. 20, p. 52.
- _____ 1969, Producers balk at new IRS depletion rules: Oil and Gas Jour., v. 67, no. 18, p. 100.
- Parker, L. T., 1963, What is depletion?: Pit and Quarry, v. 56, no. 1, p. 225-226.
- Raymond, L. C., 1964, Investment capital and mineral development: Mining Eng., v. 16, no. 8, p. 39-43.
- Rickard, T. A., 1932, A history of American mining: New York, McGraw-Hill, 210 p.
- Robie, Edward, editor, 1964, Economics of the mineral industries: New York, Am. Inst. Mining Metallurgical Engineers, 787 p.
- Rutledge, F. A., 1965, Eximbank financing in Latin America: Mining Cong. Jour., v. 51, no. 4, p. 63-67.
- Sheehan, R. T., 1964, Great day in the morning for Texas Gulf Sulfur: Fortune, v. 70, no. 7, p. 136-140.
- Skinner, R. G., 1962, Leasing vs. purchasing of mining equipment: Mining Cong. Jour., v. 48, no. 12, p. 24-29.
- Stern, E. W., 1966, Revised depletion laws could mean \$500,000 to light weight aggregate producers: Rock Products, v. 69, no. 11, p. 76-77.
- Strain, M. M., 1947, Some specialized phases of accounting practice: San Francisco, Paeioli Press, 164 p.
- Studley, Shupert Statistics, Inc., 1967, Metals and mining (copper) industry composite: Boston, Studley Shupert Statistics, Inc., 44 p.
- _____ 1967, Oil industry composite: Boston, Studley Shupert Statistics, Inc., 22 p.
- Weston, J. F., and Brigham, E. F., 1968, Managerial finance: New York, Holt, Reinhart & Winston, 829 p.
- Willcox, Frank, 1949, Mine accounting and financial administration: New York, Pitman Publishers, 489 p.
- Williams, D. N., 1969, Ax hangs over mineral depletion allowances: Iron Age, v. 203, no. 23, p. 41.

Wilson, W. W., and Jackson, E. G., 1968, Bank financing for mineral producers: Mining Cong. Jour., v. 54, no. 2, p. 127-133.

Wright, M. H., 1964, Financing domestic mining ventures: Mining Cong. Jour., v. 50, no. 2, p. 58-60.