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Articles

THE FAIR MARKET VALUE OF FEDERAL COAL

DAVID A. GULLEY*

I. INTRODUCTION

The rapid rise in energy prices created a widespread perception that energy development is enormously lucrative. Whether correct or not, this perception has led public bodies to modify public finance aspects of energy development. The interest in raising public monies via resource development is not so much new as cyclical. At present, interest in this possibility is keen. This Article discusses the issue of public revenues raised through the sale of leases to mine federally-owned coal. This subject, dealing as it does with the government's role as a landlord, raises issues not commonly aired in public finance discussions. This Article describes the current public controversy, provides a conceptual framework for understanding the value of mineral estates and discusses the recent history of federal policy.

Until recently, there was little need for a discussion of this subject, inasmuch as the payments for public coal leases were a routine detail, somewhat cut and dried. Only occasionally was concern expressed about underpayment for coal reserves. However, other policy issues predominated, such as production levels, diligent development, and environmental quality. Through a combination of factors described in this article, attention has been focused on the fair market value (FMV) of public coal. Parties involved in coal reserve acquisition—whether of public or private mineral estate—will want to form an opinion about the pricing policies of the nation's dominant coal owner, the federal government.

II. THE CURRENT CONTROVERSY

The controversy over fair market value grew out of various long-standing unresolved issues, but a convenient starting point for discussion is the April, 1982 Powder River Basin coal lease sale. That sale, to be discussed in more detail momentarily, was noteworthy for several reasons. It was the largest federal coal lease sale in history, located in perhaps the nation's most profitable coal mine district. Further, despite its size, the sale failed to at-

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tract much industry participation. Finally, the Interior Department implemented major procedural changes on the eve of the sale. At first, the sale raised suspicions about impropriety, breach of conduct, and other concerns. Some thought it might involve a Teapot Dome-type scandal, which of course was also a public energy reserves case. However, these allegations have not been proven. Attention has shifted to administrative bungling and ultimately to the generic policy issue of what exactly fair market value might be.

In September, 1982 the mining subcommittee of the House Committee on Interior and Insular Affairs held the first of what became a series of hearings on FMV. As problems came to light, other committees got involved, notably the House Appropriations Committee. Reports were written by that committee's staff, by the General Accounting Office, and the Congressional Research Service, and the Interior Department responded as well.¹ A commission was appointed to air the issues, and report back.² Lawsuits were filed.³ An appropriations-based temporary moratorium on coal leasing was passed in the Senate,⁴ a similar moratorium having already been passed in the House.⁵

The iconoclastic and combative style of the Interior Secretary heightened the sense of drama and confrontation over the issue, with the result being that the debate was regularly featured on the front and editorial pages of newspapers.⁶ The controversy reached its peak intensity in late September, 1983. In the space of a few days a U.S. district court suspended the most recent sale (of Fort Union leases),⁷ after public interest groups joined by the House Interior Committee had entered an environmentalist court challenge

¹ HOUSE APPROPRIATIONS COMMITTEE, SURVEYS AND INVESTIGATIONS STAFF, A REPORT TO THE COMMITTEE ON APPROPRIATIONS, U.S. HOUSE OF REPRESENTATIVES ON THE COAL LEASING PROGRAM OF U.S. DEPARTMENT OF THE INTERIOR, (April, 1983). U.S. GENERAL ACCOUNTING OFFICE, ANALYSIS OF THE POWDER RIVER BASIN FEDERAL COAL LEASE SALE: ECONOMIC VALUATION IMPROVEMENTS AND LEGISLATIVE CHANGES NEEDED, (May 11, 1983). Thompson & Zimmerman, A HISTORY AND ECONOMIC ANALYSIS OF FEDERAL COAL LEASING POLICY (Sept. 2, 1983) CONGRESSIONAL RESEARCH SERVICE.

² Supplemental Appropriations Act, 1983, Pub. L. No. 98-63, 97 Stat. 301, 328-29 (1983).

³ See, e.g., *Natural Resources Defense Council v. Burford*, No. 82-2763 (D.D.C. filed Sept. 28, 1982) (challenging the new coal leasing regulations); *National Wildlife Federation v. Watt*, 571 F. Supp. 1145 (D.D.C. 1983) (preliminary injunction preventing 1983 Fort Union lease-sale).

⁴ Department of the Interior and Related Agencies Appropriations, 1984, Pub. L. No. 98-146, 97 Stat. 919, 937 (1983) (passed by the Senate on October 20, 1983, 129 CONG. REC. 14,276-82 (1983)).

⁵ 129 CONG. REC. 8878-80 (1983).

⁶ A small sample of the reportage of the Secretary's quip includes the following: *Watt prays but it's amen on Monday*, N.Y. Post, October 8, 1983, at 2; *Watt's Words*, Wall St. J., Sept. 27, 1983, at 4; *Mr. Watt's Disabling Offense*, N.Y. Times, Sept. 23, 1983, at A26; *Watt Asks that Reagan Forgive 'Offensive' Remarks about Panel*, N.Y. Times, Sept. 23, 1983, at A1; For reportage on the fair market value controversy itself, a small sample includes: *Watt Leased Coal at a Loss*, Washington Post, May 11, 1983, at 1; *Coal Bucket*, Wall St. J., June 8, 1983; *Interior Chief Wins Victory in Senate Panel Spending Bill*, Wall St. J., Sept. 20, 1983, at 56; and *Senate Denies Bid by Reagan on Cut in Interior Funds*, Wall St. J., Sept. 22, 1983, at 4.

⁷ *National Wildlife Federation v. Watt*, 571 F. Supp. 1145 (D.D.C. 1983) (Granting preliminary injunction).

of the Fort Union sale,⁸ and the Interior Secretary made remarks about the membership of the fair market value commission, which ultimately led to the Secretary's resignation.

The controversy had focused attention on the fair market value issue. A coal leasing moratorium was in effect through nearly all of the 1970's, and the first sale of new coal leases in a decade was held under new regulations⁹ in January, 1981, just days before the inauguration of a new president. At the time the new program was being designed, FMV was not seen as much of a problem. Only three percent of the text of letters of comment on the coal program's environmental statement was devoted to payments and royalties.¹⁰ Interior Department staff had addressed the issue, as had the Energy Department (as required in the DOE authorization act).¹¹ Moreover, language in the Federal Coal Lease Amendments Act of 1976 stipulated the use of competitive bidding and (on half the tracts at least) the use of deferred payment of bonuses.¹² Still, the extent of the recent furor would have surprised people during the planning and implementation phase of the program. Even representatives of state governments, which are direct financial beneficiaries of lease payments, seldom raised the issue.¹³

Why, then, did controversy arise? To a degree, the FMV issue may have provided a convenient focus for some parties' frustration with the Administration's leasing policies more generally. But, despite the fact that Interior planners did not foresee the extent of the resulting controversy, the FMV dispute is not without antecedents. Theodore Roosevelt suspended coal sales in 1906 on the grounds that the price was too low. The 1920 Mineral Leasing Act addressed the issue, as did a much more recent amendment to the Act.¹⁴ Moreover, as mentioned, the Department of Energy's earlier authorization act directed that agency to examine energy lease payments. However the most significant factor was the Powder River Basin sale on April 28, 1982.

Thirteen coal lease tracts were offered for competitive sale at that time, and \$55 million in bonus bids were received. These bids were placed on tracts

⁸ *Id.*

⁹ 43 C.F.R. §§ 3400-75 (1982) (as amended).

¹⁰ GULLEY & MEI, AN APPRAISAL OF MODELS AS A SUPPORT OF DECISION MAKING IN THE FEDERAL COAL MANAGEMENT PROGRAM, 1984, (final report to the U.S. Bureau of Mines).

¹¹ An extensive bibliography of these and other reports is cited in the final report, *id.* For the most part this article will cite only the open scholarly literature and a few key unpublished reports. In this regard, see: W. TYNER & R. KALTER, WESTERN COAL: PROMISE OR PROBLEM (1977); R. NELSON, THE MAKING OF FEDERAL COAL POLICY (1983); U.S. DEPARTMENT OF THE INTERIOR, FINAL REPORT AND RECOMMENDATIONS FOR THE SECRETARY ON FAIR MARKET VALUE AND MINIMUM ACCEPTABLE BIDS FOR FEDERAL COAL LEASES (1979).

¹² 30 U.S.C. § 201(a)(1) (1976).

¹³ GULLEY & MEI, *supra* note 10. This observation is based on extensive field interviewing and attendance at Regional Coal Team and Federal-State Coal Advisory Board meetings during a period of over two years.

¹⁴ Federal Coal Leasing Amendments Act of 1976, 30 U.S.C. §§ 181-209 (1976 & Supp. IV 1980).

totalling 1.5 billion tons of coal. To put these figures in perspective, the \$55 million figure was not only the highest dollar volume associated with any federal coal lease-sale, it also significantly exceeded total 1980 coal payments (primarily royalties). The sale's tonnage figure, 1.5 billion, fell between the original intent of Secretary Watt, who in February had decided to offer 19 tracts containing 2.24 billion tons, and the Carter Administration's original intent (roughly half the tonnage actually bid upon on April 28). Eleven tracts received bids, and ten of the bids were eventually accepted. See Table 1 for details.

TABLE 1 BIDS RECEIVED IN POWDER RIVER SALE, APRIL 28, 1982

Tract (State)	Tonnage	Total Bid	Remarks
Spring Creek (MT)	35.0 million tons	—	No bids.
North Decker (MT)	66.0 million tons	—	No bids.
Coal Creek (MT)	60.0 million tons	\$ 351,220	Two bidders, \$340/acre from \$25/acre.
Colstrip A & B (MT)	58.5 million tons	\$ 41,641	One bidder, \$25/acre.
Colstrip C (MT)	18.9 million tons	\$ 22,771	One bidder, \$25.50/acre.
Colstrip D (MT)	43.2 million tons	\$ 57,375	One bidder, \$25.50/acre.
West Decker (MT)	5.0 million tons	\$ 20,000	Two bidders, from \$25 to \$500/acre.
Cook Mountain (MT)	178.0 million tons	\$ 4,450,000	One bidder, 2.5¢/ton.
Little Rawhide Creek (MT)	90.0 million tons	\$ 7,420,000	One bidder, \$14,000/ acre.
Spring Draw (WY)	323.0 million tons	\$25,901,175	One bidder, \$7,025/ acre.
Rocky Butte (WY)*	445.0 million tons	\$11,168,800	One bidder, \$2,300/ acre.
South Duck Nest (WY)	143.0 million tons	\$ 3,606,250	One bidder, \$3,125/ acre.
Keeline (WY)	170.0 million tons	\$ 1,619,000	Two bidders, \$500/ acre from \$25/acre.

*Tract rejected as not meeting Fair Market Value.

Various parties quickly passed judgment on the results of the lease sale. Opinion was divided. For example, the Wyoming BLM news release quoted Interior Secretary James Watt as saying, "By any measure, the sale was a re-

sounding success."¹⁵ On the other hand, the industry newsletter *Coal Week* headlined the affair as "Powder River Sale Inspires Little Competition."¹⁶ This discrepancy is explained by the high levels (relative to other sales) of total revenues and tonnage coupled with the low number of bidders. For example, only 3 of the 13 tracts received more than a single bid; two tracts received no bids at all; and most bids were at or only slightly above the entry level minimum. This level of bidding competition characterizes most federal coal sales. Although the sale included the highest single bid ever made for federal coal (26 million dollars for the Spring Draw tract), some industry people and conservationists argued that the more representative bids were only a third of the amounts of the bids received in 1981 for comparable Colorado coal. Most observers agreed that market conditions were unfavorable at the time of the sale.

Procedurally, the sale was a muddle, and this more than anything inspired litigation and congressional scrutiny. It was charged that early FMV estimates had been leaked to coal companies and others and that Washington cut the FMV team's price recommendations in half. Moreover, the format of the sale itself was changed only a day before it was held. At this point (Jan. 15, 1984), allegations of wrong-doing have not been convincingly supported. However, some of the changes in FMV procedures which were effected at the Powder River Basin sale have since been withdrawn. In effect, the Administration has agreed with its critics on some points.

The results in Table 1 are a logical outcome of the structure of the coal reserves market and the policies and administrative practices of the federal government. In what follows, the market for mineral estate is described, as is the FMV doctrine as an expression of public policy, and the interaction of the two. In other research currently in progress, government and industry strategies are being evaluated quantitatively.

III. THE MARKET FOR MINERAL ESTATE

The market for coal reserves should be distinguished from the market for coal as a mined commodity. At the time this article was written, steam coal sold at the mine-mouth at prices ranging from five dollars to forty dollars per short ton, depending upon location, quality, and market conditions. By way of contrast, in several private transactions involving eastern coal, reserves *and* capital (mines and preparation plants) sold for, or were offered for sale, at prices under fifty cents per ton of recoverable reserves.¹⁷ Such a price would

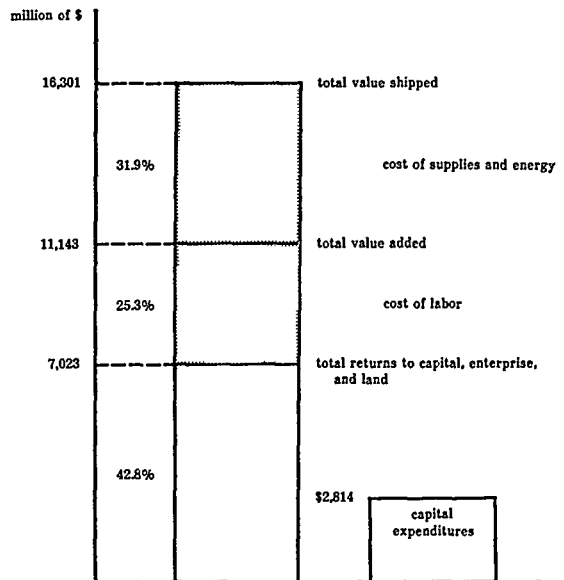
¹⁵ Bureau of Land Management, Dept. of Interior, News Release, (May 6, 1982) (Cheyenne, Wyo. office).

¹⁶ COAL WEEK vol. 8, no. 18, May 3, 1982, at 1.

¹⁷ See for example, *Zapata Corp. Sells Its Coal Operations for \$100 Million*, Wall St. J., Sept. 2, 1983, at 4 and *Armco's Sale of Coal Lands is Terminated*, Wall St. J., May 26, 1983, at 4.

be paid out as some combination of cash, security, and future production royalty. Naturally, extreme caution should be exerted in generalizing from any number, but these figures serve to underline the distinction between mined coal and coal reserves. See Figure 1.

FIGURE 1 THE BITUMINOUS COAL AND LIGNITE INDUSTRY IN 1977



This diagram shows approximate industry-wide returns to the factors of production. Although the properties assigned to each are meaningful as industry averages, returns for any given tract may vary considerably. The shaded area indicates the approximate payments to variable factors, with the remainder being the quasi-rent (returns to non-mobile factors). From the data given, it is not possible to allocate the remainder to the individual components of capital, enterprise, and land. However, in that year new capital expenditures amounted to \$2,184 million, a figure which might approximate actual capital consumption.

The two markets are, of course, linked. Mining firms typically acquire reserves for near-term production, often with a final consumer (electric utility) already in mind. At the same time, the spot market for mined coal has been growing in importance, weakening the connection between reserve holder and consumer. Moreover, speculators and other intermediaries acquire coal reserves for other than immediate production. The company has a reasonable assurance (though not certitude) that given enough time and providing it has acquired attractive reserves, it can find a buyer (utility) that will pay an ade-

quate price to cover the reserve acquisition and mining costs.¹⁸ At the same time, the presence of vast amounts of uncommitted coal and of speculators serve as a restraint on reserve prices.

A. *The Supply and Demand of In Situ Reserves.*

The market price for *in situ* reserves reflects these features. Ultimately, reserve prices result from the distribution of income from the sale of mined coal among the inputs used in production. In the abstract the dynamics of this distribution are easy enough to catalogue, but the reality of the process is complex. As a first approximation, reserve prices are ordinarily fairly low. Since reserves are not easily shifted from one use to another the way labor, materials, and even capital can be shifted, the payment to the owner of reserves will come from the residual left after paying for the more mobile factors and after paying the necessary return on investment for the use of capital. This residual would be divided by the owner of the mineral estate and the mine operator, and in this division the entrepreneurial skills and market power of the two parties are crucial. Since this market exchange is not predetermined there can be no inexorable or exactly "right" price for the reserves.

An example might clarify this assertion. In considering the last offer made by a prospective mine operator, the reserves holder will consider holding out for a higher price. In evaluating a higher price demanded, the coal operator may take into account, besides the projected profitability of the reserves, the availability of other parcels. At the same time, the operator will consider the fact that higher reserve acquisition costs may be partially or wholly transferred to the contracting utility. However, by raising the price, the operator may also prolong the search for a contract, thereby negating the advantages of higher coal prices. The reserve owner, the operator, and the utility probably will have various other entities they could conceivably be doing business with, as well. And of course, everything depends upon such projections as utility build rates, energy prices, and construction costs, to say nothing of the inherent uncertainty in the tonnage and quality of the reserves.

B. *Rent and Opportunity Costs*

Nevertheless, some boundaries on the solution can be set. These boundaries coincide to the rent and opportunity costs associated with a given parcel of reserves. The term economic rent is most commonly used by economists to denote payments in excess of whatever is necessary to employ an input. Labor, materials, and capital investment must all be paid the going market price. Reserves are not mobile, so a payment that accrues to the reserve

¹⁸ The statement is true as written, with the critical phrase being "given enough time;" present diligence requirements can be a serious constraint on time.

owner is a rent. Some caution is warranted when reviewing any analysis of rents, since the term is used differently from time to time. Also, various theories have been put forward about the origin and nature of rents, and these propositions are not necessarily consistent with a given real life situation especially since the term rent is sometimes used loosely to signify any payment to land or a natural resource. In federal coal leasing, rent refers to acreage fees levied in addition to bonuses and royalties. In what follows, the rent is taken to mean the residual of profits after payments at the market rate for operating costs (primarily labor) and capital investment (both equity and debt capital). This residual is the total contribution margin of mineral estate and the management function, and is equivalent to the after-tax net present value of the project. This approach is in widespread if not universal usage.¹⁹ This is the upper bound on the price of the mineral estate.

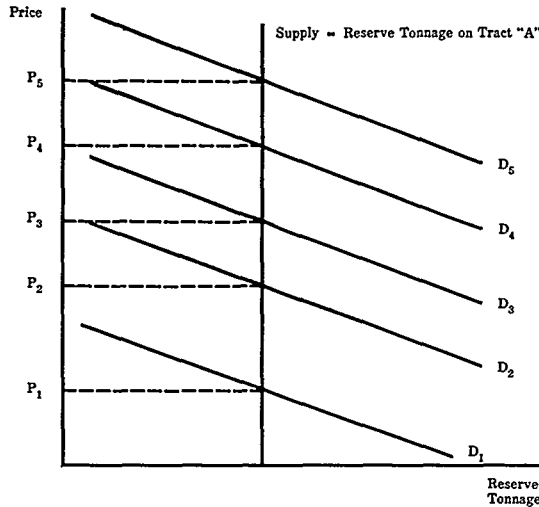
The lower bound on the mineral estate price is provided by the opportunity cost of the reserves in their alternate uses. Generally speaking, and for the moment ignoring current federal policies, a coal reserves tract would have the following potential uses: (1) the continued usage for agriculture or other surface uses; (2) deferred mining, where short-term development is not contemplated and the reserves are left to appreciate in value to be mined at a later date; (3) the tract's usage by a new entrant to the coal field; (4) the tract's consolidation with adjacent acreage to form a larger logical mining unit. In all of these cases, agricultural use after disturbance and reclamation might add value not considered here. Still, this added value is unlikely to vary in a major way across these alternatives, and at any rate is not the value of the tract's mineral estate. (However, the loss of agricultural output during mining is a true opportunity cost and is included explicitly as item 1 above). Item 2 would be a time series of value but for convenience we might consider only the value at that future date which creates maximum present value.²⁰ Item 3 might give rise to a number of different opportunity costs, depending on the mining and marketing strategies of different potential entrants, together with any variations in effective tax rates and financial positions. Again, in item 4, a range of values is possible depending upon the degree to which this tract is assigned any overall increase in value arising from consolidating various holdings. Figure 2 provides an illustrative factor

¹⁹ An interesting taxonomy on rent and management is found in TILTON, *THE FUTURE OF NON-FUEL MINERALS* (1977). Quantitative analyses of coal leasing which have used this or a closely related convention includes TYNER & KALTER, *supra* note 11, and ICF, INC., *ECONOMIC ASSESSMENT OF EFFECTS OF ROYALTIES, SEVERANCE TAXES, AND DILIGENT DEVELOPMENT REQUIREMENTS ON COAL PRODUCTION AND PRICES* (1982).

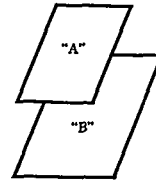
²⁰ There may be an equilibrium of constant present value over time, which has been suggested by some theoretical work, although the conditions to achieve this are quite stringent. An enormous literature on this exists, with a convenient starting point provided by Devarjan & Fisher, *Hotelling on Exhaustible Resources*, 19 J. ECON. LIT. 65 (1981).

supply-demand diagram based on one such situation, where the tract lies adjacent to another reserves holding. As suggested by Figure 2, the pattern of surface and mineral ownership can exert a strong influence on the distribution of coal reserve payments.

FIGURE 2 DIFFERING INTERPRETATION OF FAIR MARKET VALUE



When a given tract, "A," is offered for lease, the winning bid could resemble any of these prices, and perhaps others as well. P_1 corresponds to the lowest usage of the tract, essentially the opportunity cost of the land in its alternate uses (e.g., agriculture). If there are many more tracts than bidders, this price may hold. A single-mine company might bid any price between P_1 and P_2 . P_2 represents the present value of tract "A" to a single-mine company, and is the upper bound on what the company is willing to pay. If the company is a multi-mine company, better able to take advantage of tax savings, its profits from "A" would be higher as represented by D_3 and P_3 . If a mining company presently operates on tract "B," it will have a higher present value for tract "A," reflecting the economies of joint operation. This is represented by D_4 . In fact, in such a case it might be possible to secure some of the increased profits, not only from "A" but also from "B," shown here as D_5 . In most actual cases, then, bids could range from P_1 to P_5 depending on government policy and competition. If a small competitor bids against the tract "B" operator, a plausible result is P_2 .



The highest use (the highest rent) is the upper bound on mineral estate value, and the effective lower bound is the highest use which corresponds to an alternate mine operator. This analysis is an elaboration of the standard economics textbook treatment of rents, and is subject to the qualifications discussed below. Note especially that the diagram gives no clue as to what exact price will result. The price will depend upon the negotiation skill and strategies of the competitors. An important qualification is that the alternate firm might not come forward, since its participation in bidding and negotiation is not costless and, as a low bidder, it expects to lose. It is also possible that the alternate firm might bid a price in excess of the tract's value to the firm, if it is confident that it could resell the reserves to the adjacent operator. Additionally, other speculators might enter a price between the highest-use and alternate-use values, in order to resell later. Either situation would occur only if at the time of the transaction the adjacent operator was not aware of the other offer or could not adjust its offer to a higher level, as would be the case with sealed bids.

Finally, just as coal operators compete for reserves, so too do reserve owners compete for the privilege of near-term development. Given the extensive American coal reserves, and the low growth rate of coal consumption, the latter may be the dominant form of competition. In such a case, to the extent that there is a floor on reserve prices it is probably provided by the price leadership of dominant landowners, such as the Federal government. In short, the common view of the reserve market is that of several operators competing for a tract. But it may be more accurate to think of tracts competing for an operator. In effect, reserve holders might compete for the privilege of near-term development, just as farmers compete for new subdivisions.

C. *Bidding and Negotiation as Market Mechanisms*

These complications underscore the fact that a supply-demand diagram is not a process model of the actual formation of the coal reserves price. Two possible market mechanisms are bidding and negotiation.²¹ FMV usually refers to the process rather than the result. That is, fair market value is not a particular number, but rather the outcome of procedures that fairly determine value. For both political and administrative reasons, the government has preferred the auction format over direct negotiations. The administrative benefit of bidding is that it reduces the government's knowledge burden. The political benefit arises because auctions, unlike negotiations, are not held behind closed doors and are relatively objective. Thus it is harder to accuse the government of either favoritism or of unrealistically higher re-

²¹ Survey papers for the former are: R. Englebrecht-Wiggens, *Auctions and Bidding Models: a Survey*, 26 MGMT. SCI. 119 (1980) and Stark & Rothkopf, *Competitive Bidding: a Comprehensive Bibliography*, 27 OPERATIONS RESEARCH 364 (1979). The literature on negotiation is nowhere near as well developed. An introduction is: A. ROTH, AXIOMATIC MODELS OF BARGAINING (1979).

quirements. Of course, when auctions yield only one bidder, both of these advantages are nullified.

From the foregoing it is clear that the price of the reserves can not be a precise derivation. Indeed, by suggesting that the price will be bounded below by the tract's value in its next best use, an implicit assumption arises that need not always be true. This assumption is that a potential competitor retains an interest in the tract, rather than simply ignoring the parcel in question and pursuing other available parcels.

D. *Price Effects in Reserve and Forward Markets*

Of course, some price will emerge. The next question is what effect the reserves' price will have on forward markets—the price of mined coal, electricity, and other products using coal as an input. Since rents are a residual of income, economists generally believe that commodity prices affect rents but not vice versa. The argument is that the commodity's price is governed by the marginal firm, and that firms with better deposits simply reap any surplus value created by their lower cost or higher quality. Unlike monopoly profits, which are administered, rents are not predetermined and passed forward. The original expression of this belief seems quaint but bears repeating:

If the high price of corn were the effect and not the cause of rent, price would be proportionately influenced as rents were high or low, and rent would be a component part of price. But the corn which is produced by the greatest quantity of labor is the regulator of the price of corn; and rent does not and cannot enter in the least degree as a component part of its price.²²

Notwithstanding whatever truth exists in this theory, the reserves holder actually extracts, in exchange for the mineral estate, a levy or claim against income. And while rents may reflect an exogenously-determined price, the fiscal instrument used by the landlord *can* enter into commodity price formation. In other words, a fiscal levy which is targeted at the rent is nevertheless not the rent itself. If all coal owners insisted on a 12.5% production royalty, for example, this would affect production costs at the margin and the price would rise. This royalty would not truly capture rent, which varies from site to site and would be zero at the extensive margin. The royalty would be instead a form of tax (whether levied by government or private parties), and would be subject to the same shifting and incidence as an *ad valorem* severance tax. The use of royalties effectively increases firms' operating costs and these may be partially or wholly forward-shifted, raising price (and rents) by some fraction. This result is true if the reserve owners act in unison, as might happen if a dominant landholder exists (the federal government) and acts as a price leader (i.e., if the federal royalty rate be-

²² RICARDO, PRINCIPLES OF POLITICAL ECONOMY AND TAXATION, *quoted in* FERGUSON & GOLD, MICROECONOMIC THEORY at 511 (1975).

comes a *de facto* industry standard). It may sound paradoxical to say economic rents do not enter into price formation while at the same time saying reserve holder's cash charges may very well affect price. However, it merely means that rents and payments for reserves are different; rents are a conceptually-defined portion of income, and reserve payments are actual levies that can enter into contract negotiation.

Since a production royalty is not equivalent to rent, can the reserves market involve both? The answer has to be yes. In addition to a royalty, the landlord may take payment in other forms, such as a front-end cash bonus or as an equity interest. The three forms of payment can interact with each other and with price. The reserves and commodity markets are closely linked and sometimes vertically integrated in a single firm. Since coal prices and (to a greater extent) reserve prices are a small component of electricity and steel prices, the potential exists for a partial or complete pass-through of reasonable charges of either bonus or royalty. In the experience of many coal professionals, at least some contracts (not all contracts however) involve a negotiated price based on projections of profitability. Early studies of fair market value did not address this issue, but more recent studies have. Nevertheless further examination of the issue, particularly of the price effects of a front-end bonus, is warranted.²³ It is worth noting that the relationship between bonus and royalty depends upon shifting. Given a competitively determined bonus which is not passed forward, higher royalties mean a lower bonus payment. The reserve holder is shifting payment from one form to another. (In theory, an exact relationship can be derived, but it is likely to be an approximate relationship in reality.) On the other hand, if the bonus is forward-shifted, a larger bonus would increase the coal price and therefore increase production royalties.

To summarize, this section of the paper described the theoretical underpinnings of a coal reserve market. The discussion embraced the value added to land by present or future coal mining; the relationship between rent, opportunity cost, and the market price of the mineral estate; the determinants of mineral reserve supply and demand; bidding and negotiation processes; and price effects on forward markets. So abstract an exercise is not a substitute for a detailed appreciation of industry practices. However, the conceptual framework can aid in organizing such detail into a more coherent pattern.

In closing the section, it is interesting to note that the issue of economic

²³ TYNER & KALTER, *see supra* note 11, assume without discussion that the firm's bonus bid will equal the tract's after tax net present value and that there will be no price effect. ICF, Inc. likewise assumes what they call the "fair market value" or bonus bid will be the tract's present worth, and also that this payment is not shifted. Coal company officials maintain that they do not sign utility contracts that do not cover all costs plus a required return on investment. This may often be the case in negotiating for the development of a new mine, but given the present overcapacity of the industry, some firms undoubtedly sell for little more than the out-of-pocket mining costs.

rents has a venerable intellectual tradition. The writings of the early classical economists Malthus and Ricardo (the original "dismal scientists") embraced land rents as one element in a model of social and economic stagnation. Later writers such as Henry George injected a policy element by suggesting that rents are a social surplus that could fund government progress. Interestingly, the father of modern microeconomic productivity theory, J. B. Clark, attributed his interest in the topic to a desire to identify and measure the contributions of land and other factors, à la Henry George.²⁴ Later resource economists such as Harold Hotelling believed that all or a portion of rent might be a legitimate payment for an asset that depletes with use.²⁵ A thorough historical airing of this issue is inappropriate here, but the present discussion highlights the fact that the issue is not open-and-shut. Historically in Britain the issue of the "true" royalty for coal was never resolved theoretically but practical rules-of-thumb proved feasible,²⁶ and this experience parallels the situation in America today.

IV. FAIR MARKET VALUE AS PUBLIC POLICY

When the government buys or sells property, it endeavors to obtain the fair market value (FMV). Interestingly, the doctrine of FMV has evolved from law rather than from economic science. As is so often true, the legal issue is largely procedural: whether the fair market value is the result of an appropriate process. Thus, FMV has no well-defined, unambiguous meaning. Using the framework developed in the previous section, FMV can be interpreted as a fairly precise analytical concept, i.e., a value bounded above by rent and below by opportunity cost. Even this is vague, however, and it is also a reinterpretation.

A. *General Approaches to FMV*

Congress directed that FMV be paid for land parcels, but the legislative record does not clarify the terminology.²⁷ The task of interpreting FMV has fallen largely to the courts. The judiciary has not commented on coal properties, but a general picture of fair market value has emerged. The accepted definition of fair market value is: "the amount in cash, or on terms reasonably equivalent to cash for which in all probability the property would be sold by a knowledgeable owner willing but not obligated to sell to a knowledgeable purchaser who desired but is not obligated to buy."²⁸

This definition does not give an agency much guidance. In fact, some as-

²⁴ FERGUSON & GOULD, *supra* note 22; H. George, *PROGRESS AND POVERTY* (1879).

²⁵ Devarajan and Fisher, *supra* note 20.

²⁶ Fine, *Landed Property and the Distinction between Royalty and Rents*, 58 *LAND ECON.* 3.

²⁷ 30 U.S.C. § 201(a)(1) (1976).

²⁸ INTERAGENCY LAND ACQUISITION CONFERENCE, U.S. DEPT' INT., *UNIFORM APPRAISAL STANDARDS FOR FEDERAL LAND ACQUISITIONS* (1973) [hereinafter cited as *LAND CONFERENCE*].

sert that for practical purposes, this means FMV is whatever the Secretary of the Interior decides it to be. Market prices meet this definition, but not just any market price is desirable. For example, OPEC oil prices meet this definition, as do other market prices reflecting monopolies, oligopolies and other socially undesirable circumstances. The desirable price is an "efficient" price, such as one produced under conditions of perfect competition. The FMV definition, then, is vague and consequently difficult to operationalize. For guidance, agency professionals must turn to agency and procedural handbooks, to standard professional and industry practice, and to the interpretations made by the courts. Economic analysis and modeling plays a role in the formulation of agency policies, in the design of procedures to assure FMV collection, and in the routine task of evaluating individual properties.

Three general techniques may be employed in measuring FMV. These are (in order of declining acceptability to the courts): comparable sales, the income approach, and the cost approach. In the comparable sales approach, a sample of similar properties establishes the prevailing market price. When the comparable sales approach is not feasible, the analyst may turn to the income approach, in which one estimates the present worth of revenues associated with the property, and from that determines a fair market price. The property must be a potentially productive asset for this method to work. The third, and least satisfactory approach, is the cost method. Here the analyst determines the cost of improvements and other costs associated with the parcel, and from cost, estimates FMV.

The FMV concept hinges on the notion of the government and other party as price takers instead of price makers. As long as the government and other party are negligible participants in the market, the market clearing price will be unaffected by the sale. However, some transactions are sufficiently large so as to shift supply or demand; and price is no longer stable. Then, intentionally or otherwise, the price is manipulated by the very action of participating in the market, and the price could be any price within the power of either party to effect. This suggests that, questions of measurement and competitiveness aside, market clearing price is a constructive way of interpreting fair market value only when the government's presence is nominal. The seriousness of this limitation on general FMV policy can be appreciated by the realization that government goods and services are roughly one-fifth of total domestic output. Thus, in many circumstances government is unlikely to be a price taker. In the case of Western coal, the federal government owns or directly influences the development potential of perhaps eighty percent of the reserves.²⁹

²⁹ Various numbers have been reported, with this number seeing as much use as any. There has not been a rigorous empirical determination, and it may be that these numbers, having been repeated often enough, acquire the status of accepted wisdom. The usual argument is that in addition to its own coal reserves, new federal leases fill in a checkerboard pattern of ownership to

B. *Practical Measurement Problems*

Certain practical considerations are important in evaluating FMV policy. It is desirable that fair market value guidelines be symmetric with respect to purchase and sale, consistently applied, and administratively efficient. As for symmetry, when the government takes a certain position with respect to its offers to buy property, the same general principle ought to be applied to the sale of property. For example, if the government purchases property for the going market rate, rather than for a higher sum equivalent to the property's long-term profitability, then when it sells property, the determination of an acceptable price should be based on comparable sales, and not, for example, on the present value of a likely investment at some given discount rate.³⁰ Consistency among applications is straightforward. The government should evaluate similar properties similarly. Finally, administrative efficiency involves the creation of mechanisms that lead easily to FMV determination. In addition to the static efficiency attributes of markets, the market aids in generating information.³¹ For example, where feasible, FMV determinations are enormously aided by competitive bidding; the more bids received, the more accurate is the picture of FMV that emerges.

C. *Procedures for Determining FMV of Federal Coal*

In turning to the terms of sale for federal coal, it is necessary to discuss pertinent regulations. At present the Interior Department is operating under rules published on July 30, 1982.³² However, these rules are being contested in court.³³ The extent to which a successful challenge of the disputed rules would invalidate present lease activity cannot be determined at this time. Interested readers may wish to compare specific revisions made at the time of the disputed changes with the sections previously applicable.³⁴ The discussion below will concentrate on program elements pertinent to fair market value; these sections are contained primarily in volume 43, sections 3420 and 3470, and in volume 30, section 211 of the Code of Federal Regulations.³⁵

As currently authorized, new federal coal tracts are sold for a fixed royalty rate, a modest acreage rental, and a bonus bid,³⁶ with the coal sold in

enable more efficient production. Thus a smaller federal lease can assist or, if not issued, possibly prevent the development of adjacent holdings.

³⁰ Federal FMV policy in the acquisition of land does not guarantee the private property owner a given return on investment. LAND CONFERENCE, *supra* note 28.

³¹ C.L. SCHULTZE, *THE PUBLIC USE OF PRIVATE INTEREST* (1977).

³² 47 Fed. Reg. 33,154 (1982) (to be codified at 30 C.F.R. § 211.1-102). These are the regulations under which the Department is presently operating. An alternate set of FMV regulations was published in 47 Fed. Reg. 40,242 (1982).

³³ *NRDC v. Burford*, *supra* note 3.

³⁴ Compare 30 C.F.R. §§ 211.1-78 with 47 Fed. Reg. 33,179-95 (1982).

³⁵ 30 C.F.R. §§ 3420, 3470 (1982); 30 C.F.R. § 211 (1982).

³⁶ 30 C.F.R. § 3422.3-1(b).

an open auction to the qualified firm offering the highest bonus bid.³⁷ Under some conditions, this procedure would maximize federal revenues. However, it is conceivable that the winning bidder could extract a lower amount of coal under the maximum economic recovery guidelines than would be the case for another bidder.³⁸ If this were to happen, the higher bid would be offset by lower production payments. One situation where this might arise is when an adjacent operator would fail to acquire the lease, and the high bidder would bypass coal that would be mined if the properties were consolidated. Nevertheless, leases are awarded to the highest bidder, provided the bid meets the post-sale fair market value criteria and the firm is deemed to be qualified after review.³⁹

Government revenues will also depend upon the success of the auction format in fostering competition. The government has experimented with both sealed and oral bids, and has considered a variant of the auction known as intertract bidding. The applicability of bidding theory is an open question. For example, much of the theory developed assumes that a competitor is bidding against a "reservation price"⁴⁰ that reflects all other bidders. This assumption is analogous to the price-taker role of a perfectly-competitive firm in microeconomic theory. Neither model is applicable when individuals recognize the identity of and their interdependence with other competitors. But coal auctions are oligopsonistic, and in actual situations the bidders may be aware of the corporate and personal characteristics of other bidders (if there are any). Also, the auction literature is largely based on models of identical players, but in coal leasing important cost and information asymmetries exist. Thus, it is not possible at this point to say what auction format is most likely to maximize government revenues, or alternatively, to minimize the firm's risk of overbidding.⁴¹

At present, the sales procedure stipulates sealed bids of at least one hundred dollars per acre, where this minimum amount may or may not be acceptable as FMV.⁴² In any calendar year, at least half the tracts offered are offered under a "deferred bonus" arrangement; and while the Interior Depart-

³⁷ 30 C.F.R. § 3422.3-2.

³⁸ This could occur when the high bid represents a higher fraction of a lower projected profitability than is the case with the adjacent operator. MER guidelines would not require the lease holder to extract coal at a loss, even if the unmined coal could have been mined if the tract had been consolidated with adjacent holdings. The winner of a Danforth Hills tract sold in the first Green River-Hams Fork sale was a rival to the adjacent operator. Since then, the winner resold the tract to the adjacent operator. See 30 C.F.R. § 211.2 (definition); 30 C.F.R. § 211.40 (general performance standards).

³⁹ 43 C.F.R. § 3422.3 (1982) (post-sale FMV evaluation by sales panel); 43 C.F.R. §§ 3422.4, 3472 (1982) (award of lease).

⁴⁰ A reservation price is the minimum winning bid.

⁴¹ See *supra* note 21 and accompanying text.

⁴² 43 C.F.R. § 3422.1 (1982).

ment conducts sales using a cash bonus-fixed royalty bidding system, it has the option of adopting other bidding systems through further rulemaking.⁴³ Historically, bonus bids have ranged from a fraction of a cent to several cents per ton, for the great majority of tracts.

On new tracts the royalty rate is typically 12.5% of gross value for surface mineable tracts and 8% for underground tracts. However, underground tracts may be offered at rates as low as 5%.⁴⁴ Old tracts may have a different royalty provision involving a cents-per-ton basis. If after acquiring a lease, the company can prove the royalty rates prevent the company from operating profitably, it may initiate royalty reduction proceedings.⁴⁵

"Gross value," as defined in the regulations, is controversial.⁴⁶ The Interior Department states that it determines gross value as the weighted average selling price for the reporting period at the point of the sale.⁴⁷ Some state and local government taxes, royalties, and fees (whether reimbursed or nonreimbursed) are included in gross value. Overriding royalty interests (including surface owner payments in cases of split estate) are limited to 50% of the federal royalty,⁴⁸ except in cases where such interests are required for the financing of the mine.⁴⁹ In some circumstances, gross value may be determined by the Interior Department's District Mining Supervisor.⁵⁰ This situation arises in cases of captive operations or other transactions not made at "arms-length."⁵¹

D. *Tract Determination*

Coal tracts are delineated by means of the standard American land classification system of township, range, section, and section fractions. This leads to polygonal surface areas (which may be publicly or privately owned) overlying one or more beds of coal. The amount of coal can vary enormously (Table 1). Western coal ownership is often described as a checkerboard, with the federal government as the dominant landowner. Federal tracts can be contiguous to other federal tracts, or to private coal holdings. A federal tract could conceivably be isolated from tracts already in private hands (whether the original ownership was public or private). However, the vast majority of new federal tracts lie adjacent (either contiguously or very close) to privately held coal.

⁴³ 43 C.F.R. § 3422.3-1 (1982).

⁴⁴ 43 C.F.R. § 3473.3-2 (1982).

⁴⁵ 30 C.F.R. § 211.63(c)(1); *see also* U.S. GENERAL ACCOUNTING OFFICE *supra* note 1.

⁴⁶ *See* 47 Fed. Reg. 33,181 and 33,191-92 (1982) (to be codified at 30 C.F.R. §§ 211.2(a)(20) and 211.63).

⁴⁷ 47 Fed. Reg. 33,158 (1982).

⁴⁸ 43 C.F.R. § 3473.3-2(c) (1982).

⁴⁹ *Id.*

⁵⁰ 47 Fed. Reg. 33,192 (1982) (to be codified at 30 C.F.R. § 211.63(g)).

⁵¹ *Id.*

The geographical pattern that results can give one company a marked advantage over other companies. The federal tract could be too small to mine economically, unless it becomes an extension of an existing mine. This could be due to scale economies or to the avoidance of certain front-end costs (e.g., rail loading facilities, or lowered costs of dragline installation). Alternatively, an adjacent operator can have an informational advantage. By means of an exploration license, in theory all companies interested in a tract have equal access to drilling information on that tract (if they are willing to pay for it),⁵² but the adjacent operator has more or better information about an adjoining tract. The relative and absolute importance of these two advantages varies from site to site, but even in cases where better knowledge or lower costs are minor or nonexistent, they may be perceived as advantages by other possible bidders. These perceptions may account for the frequency with which tracts receive only one bid.

In remarks made before the Fair Market Value Commission and elsewhere, Interior officials have stressed the difficulty in delineating new tracts that are economic to mine yet located at some distance from privately held reserve blocks. Moreover, all parties agree it would be foolish to deliberately eschew the leasing of the attractive reserves just because of their proximity to existing or planned mines. A difficult task before the Interior Department is to lease attractive reserves that are competitive either as extensions of mines or as the sole reserves for a new entrant to the coal field. As displayed in Figure 2, this creates a spread in value, with corresponding ambiguities in the interpretations of FMV. Nevertheless, much of the time such tracts should be offered for lease. This ownership problem is one of the dominant characteristics of federal coal leasing, and the tract delineation process is one of the key details of the coal management program.

The split-estate issue is another feature related to tract delineation. In portions of the West, the surface estate is privately owned, and in cases where the coal will be mined by methods other than underground techniques, portions of the Surface Mining Control and Reclamation Act apply which require the surface owner's consent to mine.⁵³ The surface estate owner may offer this consent in exchange for a financial interest. This consent is usually acquired by a company with active interest in the tract. However, the consent must be transferrable in the event a different party acquires the lease. A constraint on a surface owner's overriding royalty has already been mentioned in passing.⁵⁴ At present, the Interior Department makes a minimum allowance for surface owner costs when evaluating FMV.⁵⁵ Perhaps this is

⁵² 43 C.F.R. § 3410.0-2 (1982).

⁵³ 43 C.F.R. § 3927 (1982).

⁵⁴ See *supra* note 48 and accompanying text.

⁵⁵ See 43 C.F.R. § 3422.1-1(a) (1982).

done in the belief that otherwise the surface owner would capture a portion of value that ought to be assigned to the government.

Since the royalty and rental rates are fairly standardized, the allocation of tracts to producers and the acquisition of fair market value hinge on the government's acceptance of the bonus bid. Thus, fair market valuation devolves to the determination of what bid is acceptable.

E. *FMV—the Interior Department's Approach*

We therefore turn to the practices used by the Interior Department to evaluate actual tracts. Over the last several years, the units undertaking FMV analysis were reassigned twice. Originally a part of the Conservation Division of the U.S. Geological Survey, the units were transferred to a new agency, the Mineral Management Service (MMS). Later, in December, 1982, coal leasing functions were transferred to the Bureau of Land Management. This last action consolidated the separate offices involved in the coal program.

Sales procedures also underwent changes during this period. The following chronology is helpful. On May 28, 1980, the Secretarial Issue Document on FMV was signed.⁵⁶ This document defined FMV and described the discounted cash flow (DCF) and comparable sales approaches to be used on large tracts. It also directed that a minimum acceptable bid (MAB) be the larger of these two values, and called upon the Department to study methods to encourage competition in upcoming lease sales, notably the Powder River Basin sale, scheduled for 1982. A half year later, on December 1, 1980, the Under Secretary approved methods for establishing MABs for "high rent" small tracts. A year later, on December 14, 1981, methodology to comparable sales adjustments was drafted. Two days later, a notice was published in the Federal Register of a proposed regulatory change that would determine FMV *after* a sale⁵⁷ (rather than before, as had been the case); this change would allow the evaluators to include bidding patterns and sales data in their work. (Only two coal companies were to respond to this notice.) A few days later, in January, 1982, the MMS established new guidelines for tract delineation.⁵⁸ During that winter and early spring, as preparations were underway for the biggest coal sale in history, the Powder River sale, Interior Department officials discussed the switch to new post-sale FMV evaluation procedures. During March and April of 1982, the Interior Department simultaneously evaluated FMV estimates for the Powder River sale and finally implemented the new post-sale procedures, just one day before the Powder River sale. As

⁵⁶ DEPARTMENT OF INTERIOR, SECRETARIAL ISSUE DOCUMENT ON FAIR MARKET VALUE (1980).

⁵⁷ 46 Fed. Reg. 61,396 (1981).

⁵⁸ Tract delineation guidelines are found at 43 C.F.R. § 3420.3-2 (1982).

discussed earlier, the timing of these events has provoked questions because of the confusion over FMV at the Powder River sale, and also because the procedures were not published until September 13, 1982,⁵⁹ months after their adoption. Public comments on these regulations continued until November 15th.

The FMV calculation process can involve either DCF calculations, comparable sales analysis, or both. Some variation occurs from district to district; however, the following summary is broadly representative.⁶⁰

The process begins with the district geologist's request for reserve data. The FMV team receives from the geologist a "tract development summary report" and a "tract resource development report." At one time there were specific drill hole requirements for reserve estimation, but this requirement has been eliminated. The geological reports contain estimates for a variety of data, including reserve tonnage, a range for overburden, seam thickness, quality data, and faulting. Most of these values are expressed as a point estimate; no explicit uncertainty is incorporated at this stage. The FMV team also acquires other company data (access to which is granted in the process of acquiring an exploration license), and any drill hole data on neighboring federal or state land.

The DCF process, once regularly employed, continues to be used occasionally. This method begins with the reserve and environmental data inputs described above. The FMV team performs a coal price survey of perhaps twenty or thirty coal buyers, freight people, coal operators, and utility people. Published federal coal contract prices are also checked. Since coal varies according to quality, this procedure helps the team set an initial sales price. The FMV team assumes all coal is sold under contract with prices rising. Inflation adjustments are the same for price, operating cost, and downstream investment, with the rate set by headquarters; recently this rate reflected the high levels of inflation occurring at the time.

Mine costs are estimated by designing a hypothetical mine built to certain standards. The FMV team always assumes a new mine, although the team recognizes that this is seldom the case. Capacity of this hypothetical mine is such as to assure depletion of reserves in twenty to forty years. Standard industry manuals give equipment, labor, and other costs.

These data are input to a DCF computer package, such as the Coal Resource Economic Value (CREV) model. The calculations are quite detailed. The intricate financial and tax calculations, involve assumptions of a multi-mine company which writes off tax losses in the year the loss is incurred and

⁵⁹ 47 Fed. Reg. 40,242 (1982).

⁶⁰ This summary is based on extensive field research and interviews conducted by the author. GULLEY & MEI, *supra* note 10.

uses straight-line depreciation and a range of discount rates which reflect industry practices. Working capital requirements are assumed to be a standard percentage of depreciable equipment.

Total staff time for a DCF analysis varies. Some FMV professionals believe a completely adequate assessment can be made using three professionals for three or four days. However, FMV calculations can and do sometimes stretch out to a month or more, due to iterations between the field and headquarters and other reasons.

As indicated previously, the courts have not indicated any preferences in coal lease FMV per se,⁶¹ but in general show a preference to comparable sales approaches. This article relates this preference to orthodox economic theory (the courts have drawn no such parallel). In principle, any and all coal sales in the region could be used in a comparable sales approach. However, there is often great difficulty in determining sales price for private coal. This determination involves a search of official records for the title, and the title generally states that the sale was for "one dollar and other considerations." Sales information is available for federal and state sales, so this data is regularly used. Federal sales can be broken down into new lease sales and assignment sales, the latter involving the transfer of a tract from one private party to another. Assignment sales usually involve coal leases acquired prior to the Federal Coal Leasing Amendments Act,⁶² and thus the lease is subject to different stipulations than apply to new leases. Moreover, leases vary in terms of diligence deadlines and other matters. Thus, geologic and mining conditions aside, the true comparability to any two tracts is subject to question. In practice, FMV evaluators generally use only recent federal and state leases.⁶³ It might be noted that if such leases carry prices either too high or too low, the comparable sales approach will tend to perpetuate the situation.

In establishing comparability, FMV evaluators try to bracket the tract's conditions, such as: seam thickness, proximity to rail, overburden (for surface mines), means of entry (for deep mines), coal quality, reserve tonnage, and the extent of faulting. Since most calculations are done per ton of coal reserve, scale is not a principal variable. (That is, having divided costs or value by tonnage, further adjustments compensate for scale, which is a less important factor.) Each of these factors requires a computation. It is therefore misleading to view comparable sales as a less tortuous FMV methodology. In fact, some FMV teams use extensive simulation and statistical procedures to establish comparability, even going so far as to use a DCF model to develop what is termed "pseudodata"⁶⁴ to adjust tract values. The critical distinction, then,

⁶¹ See *supra* note 28 and accompanying text.

⁶² Federal Coal Leasing Amendments of 1976, 30 U.S.C. §§ 181-209 (1976 & Supp. IV. 1980).

⁶³ GULLEY & MEI, *supra* note 10.

⁶⁴ Pseudodata refers to the practice of simulating a process and then using the simulation

between DCF and comparable sales is *not* in the data base, the methodological rigor, or any freedom from the need to make assumptions. The critical distinction is that DCF calculations estimate profitability, whereas comparable sales approaches estimate the asset sales price. As Figure 1 suggests, the two are related but not necessarily equivalent. Either method can be done ably or otherwise, neither methodology per se guarantees appropriate judgment, sound data, or correct answers.

These two methods, DCF and comparable sales, have been summarized with a view toward their use in setting FMV on new tracts. In passing, it is worth mentioning related applications. FMV calculations are also needed for royalty reduction proceedings and for land exchanges. A company may apply for royalty reductions at any time, if the company currently operates an adjacent tract. If there is no adjacent operation, it may apply after one year of operation. The company must prepare a report answering about twenty questions, and it must supply operating and cost data, financial statements, and so on. Guidelines exist for writing and processing the applications. The issue in lease exchanges is to determine the equivalent value. The land exchange need not involve two coal properties, although generally it does. In coal-for-coal exchanges, one approach is the resource-for-resource approach, in which a trade of equal tonnage is made. However, in some cases, a trade of equal FMV is proposed. Generally speaking, the company suggests the exchange, including specific parcels and perhaps an additional cash payment. Typically, companies wish to exchange several small, scattered parcels for a logical mining unit. Such exchanges may represent the wave of the future, inasmuch as they offer companies an alternative to the less flexible standard lease sequence. FMV teams have used both DCF and comparable sales techniques. Current law states the exchange must be within 25% of equal value.⁶⁵

V. AN APPRAISAL OF CURRENT PROCEDURES

Given the present controversy over fair market value, a discussion of the techniques and policies presently in force is warranted. Beginning with a discussion of DCF models, comparable sales, and other technical points, the focus will then shift to broader concerns such as the interaction among coal regulations.

A. *DCF Models*

The DCF approach to fair market value provides a particularly good starting point, since the use of this approach has been criticized within and

output as the data inputs for further computational refinement. For example, a DCF model estimates parameters which vary as an input is varied. The variation in output is related to the variation in inputs by means of simple or multiple regression.

⁶⁵ 43 C.F.R. § 3436.2-3(e) (1982).

without the Interior Department. The CREV model used by Mineral Management Service for FMV calculations is not available for public examination. This is due to the need to prevent full disclosure. This model, however, incorporates standard engineering economics calculations, and these generic types of calculations can be critiqued. The basic elements of the DCF approach (e.g., discounting and depreciation) are not controversial, although some variations exist. The greatest challenges to DCF analysis are in the basic data and assumptions that constitute the projection of profitability. Since data and assumptions vary from case to case, blanket statements are not very useful. However, FMV practices can be compared to those adopted by industry and recommended by professional associations. This comparison helps frame the controversy which presently surrounds the DCF approach.

What is commonly termed the income or DCF method to fair market value is actually a general approach to the problem of cost estimation and investment analysis for new engineering projects. Even in the less mechanical aspects of the analysis, industry standards and preferred techniques often exist. This is true not only for the computation of final profitability (the truly "DCF" part of the study), but also for the derivation of costs and other data inputs.

The general DCF technique has been around for a long time, and is today the dominant, but by no means only approach taken to investment analysis in industry. The purpose of DCF calculations is to project the earnings into an equivalent sum which may be compared to the investment funds required. Risk analysis is an extension of DCF analysis which incorporates uncertainty by specifying probability distributions for key variables. CREV is a standard DCF model, although a "Monte Carlo" risk analysis program, GEN2, was used by the Energy Department for its evaluation of alternate leasing formats.

Capital intensive industries, such as coal mining, use a variety of measures for investment analysis, including DCF. A survey found that in 1975, 54% of the firms surveyed used DCF techniques as the most important measure. Considerably fewer treated risk in any formal fashion.⁶⁵

B. *DCF and Federal Coal*

DCF analysis, as the term is used in the Federal Coal Management Program, is tantamount to a mine feasibility study. Before discussing some of the analytical elements, it is useful to sketch the overall process. The process involves the following: specifying the plant, process, and equipment to be used; estimating costs, revenues, and other financial and market conditions; and

⁶⁵ Rosenblatt & Jucker, *Capital Expenditure Decision Making: Some Tools and Trends*, 9 INTERFACES 63 (1979); Rappaport, *A Critique of Capital Budgeting Questionnaires*, 9 INTERFACES 100 (1979); Jucker, *A Response*, 9 INTERFACES 103 (1979).

performing the financial (DCF) calculations. Cost estimation and feasibility analysis can be undertaken for a variety of purposes. For example, such studies are made in contemplation of the appropriation of funds, for bidding, for selection of alternate investment possibilities, for condemnation, for internal budgeting, and so on. Moreover, as a proposed project moves through various stages, from initial planning to final development, more and more is known about the site and the studies are refined and updated. Since both the study purposes and the level of detail can vary, naturally the accuracy and rigor of the study varies as well.⁶⁷

Even when individual cost estimates are highly accurate, the projection of profitability is subject to larger errors. The subtraction of projected costs from projected revenues creates a much smaller net value, and errors that are small relative to individual numbers become much larger relative to the net result. If costs and revenues differ by only 10%, and each is subject to a 10% error, then the difference (profit) is subject to a 200% error. This error potential explains why some people believe that DCF estimates are highly unreliable. For this reason, some analysts often contend that DCF methods are most appropriate for comparing alternate investments. For such comparisons, the accuracy of the assumptions is less critical, since the same assumptions are used for each alternative. In federal coal leasing, this application would correspond to lease exchanges.

Does this mean that DCF calculations are useless for projecting value for a given coal tract? Such an assertion is overstated. These techniques are widespread in industry, and serve as decision making documents for mine operators, engineering and construction firms, financial institutions, and other parties. Anyone familiar with the on-again, off-again history of some large engineering projects is suspicious of feasibility studies. Moreover, profound differences exist between the definitive studies, associated with a project's final stage and costing as much as tens of millions of dollars, and the more constrained work of a FMV team. But even so, Western coal mining entails standard technologies and processes, used in well-known mining districts. Reserves, prices, sociopolitical conditions, and site costs are much easier to appraise than for many other mining projects (e.g., a hydrothermal vein deposit in the jungles of Indonesia). It would therefore be stretching things to say that a coal tract's value is impossible to project approximately.

C. *Proposals for Change*

1. DCF Evaluation

If critics believe FMV teams do not adequately project a tract's value, one solution is simply to devote more resources to the effort. As mentioned

⁶⁷ The American Association of Cost Engineers suggest the following error ranges as their professional standard: order of magnitude study, - 30% to + 50%; preliminary study, - 15% to

earlier, teams typically devote between one person-week and one person-month to a tract's valuation. Based on professional standards, even with the assistance of computer models, this is a limited exercise. Also, unlike a coal company, the Interior Department does not have access to a growing, constantly-replenished data base drawn from actual operations. The Department can and does attempt to acquire necessary data, but some might argue that DOI can never develop the feel for feasibility analysis equivalent to that of a mine operator. But it may be unnecessary for DOI to value coal tracts with extreme precision. The proper DCF question is simply: how expensive is it to value coal tracts at different levels of precision, and do the benefits justify the expense? Of course, any projection of value, no matter how sophisticated, would then need to be related to the rent and opportunity cost framework developed in Section 3 (Figure 2). That is, DCF projections could put numbers in the Figure 2 framework, but further analysis is necessary to determine the relationship between those numbers and the FMV. It is not widely appreciated that using any DCF projection directly involves implicit assumptions, beyond those in the data, as to the market processes shaping FMV.

When and if the Department of the Interior uses DCF methods, it should of course use the methods correctly. Leaving aside the crucial question of whether a mine's net present value is equivalent to FMV, a valuation exercise should conform to high professional standards. No two parties ever perform a mine valuation in precisely the same way. Not only do assumptions vary, but so do the calculations themselves.⁶⁸ This is perhaps a natural expression of the uncertainties inherent in any type of financial projection.

Turning specifically to the DCF analyses undertaken by the FMV teams, the most striking aspect is the conservatism of the assumptions.⁶⁹ As previously mentioned, most companies do not evaluate the risk explicitly (mathematically). Conservative estimates are an alternate means of treating risk. The FMV team has a further reason to adopt deliberately conservative measures; that reason is the team's desire to compute a floor price for a bid, rather than a most-likely estimate of profitability. The teams believe that when their calculations indicate a positive level of profits, they can be quite sure this is a very charitable sum for the government to demand. On the other hand, in an industry as competitive as coal there is often little fat, and

+ 30%; and detailed study, - 5% to + 15%. Experienced engineering economists regard such standards as more often than not honored in the breach, but generally speaking improved accuracy can be purchased with more time, personnel and funds.

⁶⁸ To illustrate this, compare detailed computational procedures as published in various sources: TYNER & KALTER, *supra* note 5, L. Raymond, *Valuation of Mineral Property*, ECONOMICS OF THE MINERAL INDUSTRIES (1976); Whitney and Whitney, Inc., *INVESTMENT AND RISK ANALYSIS IN THE MINERALS INDUSTRY* (1979).

⁶⁹ This includes straight-line depreciation, deferred tax writeoffs, and market contract terms. See GULLEY & MEL, *supra* note 10.

if one assumes everything at its worst (which the FMV team does), it is not surprising that most of the time calculated profitability is negative. This is one reason the bidding floor has so often been \$25, or more recently, \$100 per acre—the calculated values were obviously unreasonable, (often negative) and the team reverted to standard, if arbitrary, floor prices.

Generating the data used in these calculations is often the most challenging part of the mine valuation study. Here again fairly standardized procedures exist, and the FMV teams use commonly accepted approaches. Typically, a mine is specified in terms of a manning schedule and equipment lists; and a series of handbooks and direct quotes are used to estimate the costs. Of course, the actual mine and the company's actual tax and financial posture are indeterminate at the time of the FMV calculation. The lease has yet to be offered. Thus, the FMV calculation is suggestive of what the profitability might be, if a similar mine were built by a company with similar conditions. Ordinarily, the FMV team "designs" a mine that is typical of mines actually working at the present in the vicinity of the tract. This need not be the case, but is as reasonable an assumption as any.

Conservative DCF calculations are sometimes justified as being fairer to the bidders. For example, one could compute the net present value that would accrue to a new entrant, while expecting that the mine could and probably will be operated more profitably by the operator on an adjacent tract. In this way, certain policies promulgated by GS/MMS headquarters appear to be aimed at reducing DCF estimates to a "fairer" FMV. But this seems to be confusing the issues. Are conservative estimates meant to adjust for uncertainty or for market risk; or are they meant to distinguish between profitability and market price? Greater clarity would be desirable, and this clarity could best be obtained by acknowledging each of these elements separately and formally.

2. Comparable Sales

Turning to the comparable sales method, in practice this method has involved updating relevant earlier sales and adjusting them to the unique circumstances now under consideration. Tract profiles are prepared on the various candidates, and judgement is rendered as to which are most nearly comparable. This judgement, and the various adjustments to sales price, are often performed subjectively. It is difficult to evaluate the adequacy of a subjective process. Presumably, it depends on the individual. Procedures exist which aid subjective evaluators by eliminating some types of biases and by forcing greater consistency, e.g., delphi techniques, but these methods are not in use. Some FMV teams have based their comparable sales adjustments on pseudodata simulations. For each pertinent factor, they have simulated with DCF models how a change from one set of conditions to another affects present value, thus creating a systematic means of adjustment. The

drawback to this procedure is the time and expense involved with such complex calculations. But, on the other hand, the procedure has the advantage of being visible and systematic.

Current practices have tended to be viewed in the light of market mechanisms for FMV (meaning a viable bidding system) versus regulatory approaches (meaning calculations). A variant of the dichotomy is also suggested, the data-and-assumption-intensive DCF procedure versus the market-oriented comparable sales procedure. These are easy distinctions to make, and are fairly plausible. However, both dichotomies miscast the analysis. The real issue is how government lease policies mesh with or distort the market for coal reserves. Furthermore, neither DCF nor comparable sales outcomes are synonymous with use of any given auction format or computation. If comparable sales is a better approach than DCF, it is not because of the computations per se, but because of the distinction between profitability and asset price formation.

The practical question of measurement aside, even theoretically there are several choices as to which number to select: the number that most closely resembles the outcome of a certain type of reserves market, the outcome corresponding to a minimally functioning reserves market, the number corresponding to total profits, to pure resource rents, and so on. The question of which of these is "fair market value" as intended by Congress is not strictly to methodological, although further economic analysis would clarify the implications of alternate policies.

D. *Interrelationships Affecting Leasing*

This brings the discussion to a broader issue, the relationship among FMV, leasing level, and diligent development. To view the issue negatively, critics contend that the government has leased too much coal for too little money, and with too little of the coal actually mined.⁷⁰ Others have objected to this view.⁷¹ In either event the interrelationships deserve further consideration. The fact that it was once easy to lease coal for a pittance, goes a long way toward explaining why so much undeveloped coal is under lease. Today, leasing coal is not easy, and diligence rules require near-term development,⁷² but the FMV controversy lives on.⁷³ Better understanding of the interconnections among coal lease policy elements would be quite helpful, but at this juncture the interconnections have been surprisingly under-researched.

⁷⁰ Council on Economic Priorities, *LEASED AND LOST* (1974), and for the history of complaints NELSON, *supra* note 11 and S. HAYS, *CONSERVATION AND THE GOSPEL OF EFFICIENCY* (1959).

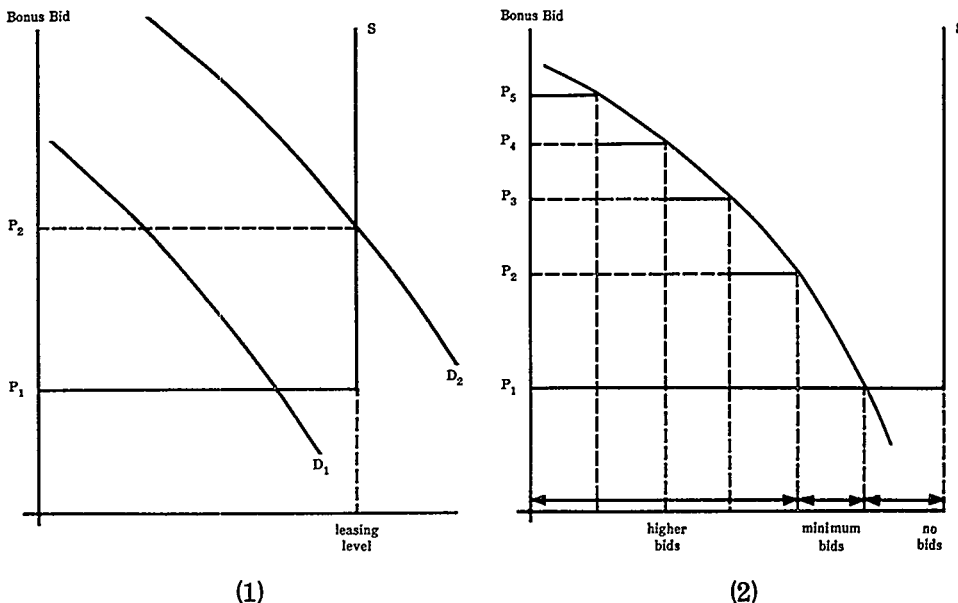
⁷¹ See S. McDONALD, *THE LEASING OF LANDS FOR FOSSIL FUEL DEVELOPMENT* (1979) and R. GORDON, *FEDERAL COAL LEASING POLICY: COMPETITION IN THE ENERGY INDUSTRIES* (1981).

⁷² 30 U.S.C. § 207(b) (1976).

⁷³ Interview respondents frequently viewed the leasing program as long, drawn-out, complex, and not responsive enough to changing conditions. GULLEY & MEI, *supra* note 10.

For example, the relationship between average tract price and leasing level is unclear. This much would seem to be clear from the laws of supply and demand, there being no compelling *a priori* reason to believe that the laws are suspended in this market. Presumably average price would fall due to larger leasing levels if either (i) the incremental acreage involved more marginal tracts (a likely outcome given present tract delineation processes);⁷⁴ or (ii) bidding competition were to fall. However, it is difficult to fit observed behavior into a single supply demand framework (Figure 3), and in any even the requisite data are unknown. Studies of the cost impact of under-leasing provide a roundabout measure of potential revenue increases from greater leasing, but this approach would be conjectural and of course the cost estimates themselves are not very reliable.⁷⁵ If the government FMV policy was to capture total economic rents (which of course is but one interpretation of FMV), and if this policy was successfully implemented, then tract prices would be constant and total revenues would increase with leasing level.⁷⁶ Many people would argue this situation is neither feasible nor desirable.

FIGURE 3 RELATIONSHIP BETWEEN LEASING LEVELS AND TRACT PRICES



⁷⁴ GULLEY & MEI, *supra* note 10.

⁷⁵ Two cost estimates are contrasted in GULLEY & MEI, *supra* note 10, and differ considerably despite similarities in methodology. The validity of current forecasting and impact assessment methodologies is discussed at length in the report.

⁷⁶ This assumes that increasing leasing levels does not increase production.

In these diagrams, the quantity of reserves placed on the market is portrayed on the horizontal axis with the added assumption that the reserves are in order of declining profitability. This gives rise to a downward-sloping demand curve, assumed to measure the opportunity cost (marginal product to a new entrant) which is likely to set price (See Figure 2). Panel 1 portrays the simplest reserve market, where the government will supply parcels at a constant cost up to a predetermined, price-insensitive limit; this defines the supply curve, S. As this diagram indicates, in such a context either the minimum price (D^1) or the leasing level (D^2) sets a single, uniform price, but the two could not both be simultaneously effective. However, this single price is unlikely to hold since by assumption the tracts are heterogeneous and the market can differentiate among the tract's projected profitability. This would lead to price stratification, as shown in panel 2. In this case, a change in acreage would affect individual tract prices only if it reduced the likelihood of a rival bidding on a given tract. However, a change in acreage could affect *average* tract prices if the changes in acreage modified the average tract characteristics (i.e., tracts added or deleted are higher or lower than average in profitability). Panel 2 suggests that a simple supply-demand relationship is unlikely to exist, and that the price effects of a change in leasing level are not immediately obvious.

The relationship of bonus bids and diligence requirements is another fruitful avenue for more analysis. Section 3 of the Federal Coal Lease Amendments Act⁷⁷ creates major uncertainties for the coal reserves market. However, once the old lease issue is resolved (by complying with or changing the law), more orderly market conditions will result, and effects of diligence on FMV will prove easier to evaluate and far more modest in magnitude. At a first approximation, the ten-year development requirement increases the firm's marketing risk, and this tends to lower the firm's expected earnings and the maximum bid. However, under certain circumstances, the diligence requirement could raise *average* tract prices by eliminating marginal tracts. Where the blanket minimum bonus is a successful bid, diligence stipulations would have a small overall effect. Comprehensive analysis of this issue would be useful.

What the foregoing shows most clearly is that diligence and leasing level can affect fair market value, but the extent to which they do depends upon the FMV policy in force. If the per-acre minimum payment is or becomes the de facto FMV for a federal lease, then the effect is minimal. If total rent-taking were to become the policy, then leasing level would not much affect FMV, but diligence rules might. A high minimum could at some point affect leasing levels, becoming an effective means of regulating total leasing acreage. Further work on this general subject is warranted, and the reader is

⁷⁷ 30 U.S.C. §§ 201(a)(2),(3) (1976).

therefore cautioned that the foregoing sketch of some of the dimensions is not a substitute for further analysis.

VI. CONCLUSIONS

The technical sounding terminology "fair market value" obscures the essential fact: the price of energy reserves is at issue. Price is not a technical detail. In a market society, price is a crucial variable. When the government sets a price for its coal reserves, it sets in motion a chain of reactions that help shape the extent to which this public resource is used. Other goals, such as leasing level, reclamation, and diligence, can be frustrated or facilitated by pricing policy, and vice versa.

No systematic microeconomic interpretation of FMV has been offered by the Department of the Interior. Actual FMV practices include instances of splitting profitability estimates in half,⁷⁸ and other ad hoc adjustments. By offering a consistent economic interpretation of FMV, the Department could determine and better defend a consistent FMV policy. The framework for such an analysis was provided in Section 3 of this article. When viewed from such a framework, *some* past approaches appear plausible. For example, sometimes a FMV team would project a tract's present worth using assumptions plausible for a new coal field entrant operating a single mine. In effect, the team was estimating the coal's value in its alternate use, i.e., to a firm other than the adjacent operator. This amounted to simulating an efficient reserves market, for the government's minimum price in this case would substitute for a plausible rival bidder, who usually does not come forward. Setting a plausible reservation price this way, and then offering the tract in an open competition, (thus offering assurances that the government is not freezing anyone out of the market), would seem to combine elements of negotiation and auctions in a practical if theoretically impure system. This system is not foolproof, since the reservation price is so crucial. But rather than abandon the reservation price-setting process, it would be better to incorporate expert opinion and perhaps offer the public the assurances of greater visibility. And the place to begin is with a truly operational definition of fair market value, using an analytically precise concept.

Mining companies can address the FMV issue at several points. The two most obvious points are at the preparation of a sealed bid and the application for royalty reduction. Firms also have opportunities to address FMV at regional coal team meetings (particularly those meetings which address tract selection) and immediately following the publication of minimum bids. Firms are understandably reluctant to say much about a tract's economics, but if

⁷⁸ As mentioned earlier, this may have been an attempt to split total rents. One newspaper interpretation of this situation is *Interior Dept. Sells Coal tract to Amax for half its worth*, Rocky Mountain News, June 6, 1983, p. 3.

they do not avail themselves of the opportunity to say *something* about current market conditions, comparability with other tracts sold, and such, then the firms are missing an opportunity to make themselves heard.

The government is more than just a landlord, and its interests as a merchant are not necessarily compatible with the goal of fostering overall welfare. Maximum taxes do not generally maximize the citizen's pursuit of happiness, and higher coal revenues can come into conflict with other dimensions of public policy. The broader issues have not been given the airing here that they deserve, due to a desire to focus as tightly as possible on FMV determination, i.e., the government's landlord role. Nevertheless, an appreciation of the broader policy issues is a valuable complement to this discussion.

