Was Metallgesellschaft’s use of petroleum futures part of a rational corporate strategy?

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Abstract

Financial losses incurred in trading petroleum futures by Metallgesellschaft have been viewed as a mistake that occurred because the firm’s Supervisory Board overreacted. However, these conclusions have been based on an incomplete analysis of the firm’s business and petroleum markets. Metallgesellschaft’s futures market position was excessively large, poorly distributed, and in the wrong products when the firm’s long-term, fixed-price supply arrangements are balanced against its obligations to customers. Furthermore, Metallgesellschaft was unprotected financially against its long-term purchase obligations if its customers triggered the so-called “blowout” option. Finally, Metallgesellschaft’s trading practices exposed the firm to the risk that the specifications of the commodities it had agreed to deliver would change and to the risk of manipulation by other firms. At least one large company has reported publicly that it profited at Metallgesellschaft’s expense. © 1999 Elsevier Science Inc. All rights reserved.

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1. Introduction

Six years ago, the name “Metallgesellschaft” was unknown to most practitioners in the field of finance. Five years ago, any student, professor, or expert in the field knew the name, knew how to spell it (no small feat), and had an opinion regarding the decision by the company’s Supervisory Board, the German equivalent of a board of directors, to install new management, a decision that led to the termination of positions in the futures market and a loss of $1.5 to $2 billion. Most academics have concluded that the board overreacted to a transitory problem because it did not understand the concept of a hedge. Many practitioners and industry observers think

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otherwise, accepting the conclusion that the managers of the U.S. affiliate incurring the loss had created a massive bet on the price of oil.

The controversy began in December 1993 when the U.S. affiliate of Metallgesellschaft (MG), Metallgesellschaft Refining and Marketing (MGR&M), liquidated a very large position in petroleum futures on the New York Mercantile Exchange (NYMEX). Experts on financial economics such as Culp and Miller (1995a) strongly criticized the action. They believed (incorrectly as it turns out) that in closing this position, MG eliminated a hedge against long-term delivery obligations. Executives of the firm responded that the liquidations were required by NYMEX officials, who had become alarmed at the size of MG’s position (“MG’s Trial by Essay,” 1994). This statement did not and has not placated MG’s critics, who answered back that the NYMEX took action when MG indicated it would not provide unlimited financial backing for losses incurred by MGR&M. The critics suggested that no action would have been taken if MG had continued to provide funds to cover margin requirements needed to maintain the hedge. They also concluded that the funds ultimately would have been returned when MGR&M ended the transactions it was hedging. Recently, Bollen and Whaley (1998) calculated that the transaction would have realized a profit of more than $1 billion had the hedge not been terminated prematurely.

Several important facts have been overlooked in this academic debate. The most critical of these was the nature of MGR&M's business as an oil company, a business the German executives elected to restructure. As part of its business, MGR&M had made long-term product sales contracts at fixed prices with customers, many of whom were small and could perform only if markets moved in the right direction. MGR&M's futures transactions were purportedly entered to hedge against these delivery obligations. However, in addition to hedging the price risk of its delivery obligations, MGR&M had also entered long-term, fixed-price delivery agreements with two refiners, effectively doubling its hedge. These purchase contracts were made at prices well above market. At the time the hedge was eliminated in 1993, the contracts were projected to cost the firm between $200 and $300 million per year. These obligations were also terminated as part of the restructuring.

A second fact ignored by MG’s critics is the changing character of petroleum products. Academics analyzing the affair have treated MGR&M’s contracts to deliver gasoline (43% of the company’s delivery obligation) as if the product were homogeneous over time, like copper, silver, and gold. This assumption is incorrect. The character of gasoline changed in 1994 with the introduction of reformulated gasoline. The makeup of this gasoline, the costs of its manufacture, and the availability of futures contracts for it were unknown. Yet MGR&M entered contracts requiring it to supply this undefined product from 1994 to 2003 at a fixed price.

A third fact ignored in the debate was the effect of a large position in the market on prices and competitor behavior. MG’s critics have asserted that the firm’s losses occurred because prices declined sharply between September and December 1993. Specifically, the nature of MGR&M’s trades could have provided an incentive for other firms to increase the supply of petroleum products, causing prices to decline. At least one company, Tosco, reported that it boosted production and futures sales
during 1993 at the very time MG was building its large futures position. This conjecture is reinforced by the recent 32% decline in the exchange rate of the dollar against the yen in a much larger financial market, a decline attributed to liquidation of positions by hedge funds.

A fourth fact ignored in the discussion has been the lack of credit-worthy counterparties for MGR&M. MG’s critics assume that MGR&M’s customers could perform on their obligations. However, there was ample evidence that many firms could not perform. Indeed, many of MGR&M’s customers had difficulty performing in the fall of 1993, when prices fell. To assist its customers, MGR&M modified these contracts, lowering prices for 6 months. The change in these contracts altered MGR&M’s exposure to future price shifts, yet there was apparently no change in its hedge positions.

When examined in light of these other factors, the new management’s decision to change MG’s hedge positions is far more understandable. Indeed, most readers will agree after analyzing the situation that the firm really had no choice.

The plan of this article is as follows. The structure of MGR&M’s petroleum business is explained in section 2. Section 3 describes the nature of MGR&M’s trading position before the decision to restructure the business. The criticisms of this choice are then reviewed in section 4. Section 5 outlines the facts drawn from outside the theory of finance, which are thought to more than adequately justify MG’s closing the position. Section 6 concludes.

2. Metallgesellschaft refining and marketing

MGR&M’s business plan called for it to become a substantial supplier of petroleum products in the United States. The firm’s success in this regard was trumpeted in a prospectus filed with the SEC by Castle Energy (a firm MG had many dealings with) on November 23, 1993, less than a month before the collapse. In that prospectus, MGR&M’s activities were described as follows:

Through its large and diverse customer base and innovative risk management programs, MG has built a strong U.S. presence in the marketing of petroleum products. MG delivers approximately 300,000 B/D of refined products to its customers and utilizes an extensive terminal network with 165 locations in 42 states to store, process, and distribute its petroleum products. MG markets petroleum products throughout the U.S. to various commercial end users, industrial companies, federal and state governments, municipalities, and large retail marketers. Many of the customers are end users of energy products that are not in a position to optimally manage their individual energy risks. MG provides its customers a supply of refined products through long-term agreements. MG also offers various risk management programs, which are designed to reduce risk while maintaining upside potential for its customers (Castle Energy Corporation, 1993, p. 21).

However, MGR&M was not a traditional oil company. As noted in the Castle prospectus, MGR&M’s business was supplying petroleum products to customers. These customers included operators of retail service stations, manufacturing companies
such as Chrysler, large users of products such as trucking companies, and state and local government agencies. MGR&M supplied (or claimed to supply) over 300,000 barrels per day (kbd) of products from an “extensive terminal network with 165 locations in 42 states” (Castle Energy Corporation, 1993, p. 21). To put this figure in context, Castle’s claim regarding MGR&M would make that firm’s activity equal to Marathon Petroleum or Ashland Petroleum, the 12th and 18th largest oil companies in the United States, according to the Oil and Gas Journal’s list of the largest US companies at the time (Financial, Operating Results, 1993, p. 47).

Metallgesellschaft’s approach to the business differed from that of competitors such as Sun or Marathon. MGR&M owned no refineries and no terminals. Indeed, MGR&M appears not to have had physical title to any assets in the petroleum business in the sense that its employees could control the day-to-day operation of those assets. Instead, MGR&M relied on lease agreements and contracts with suppliers to conduct its business. For example, MGR&M would sign “throughput agreements” to use terminal facilities owned by other companies. These agreements provided temporary access to storage and a supply of products. However, the long-run viability of these arrangements was uncertain.

MGR&M also signed long-term supply agreements with Castle Oil, a former operator of drilling funds that acquired two closed refineries with financial support from MG. The Castle prospectus reported that Castle owned the Indian Refinery in Lawrenceville, Illinois, and the Powerine Refinery in Santa Fe Springs, California (Castle Energy Corporation, 1993, p. 3). These refineries had the combined capacity to produce 126 kbd of petroleum products. The Castle prospectus reported that 51% of the output of the Lawrenceville Refinery was gasoline and 30% was distillate, while 48% of the Powerine Refinery production was gasoline and 43% was distillate (pp. 23–25). Thus, MGR&M’s contract with Castle guaranteed it approximately 110 kbd of product supply.

MGR&M’s agreement with Castle obligated it to pay Castle $5 per barrel over the near-month price for WTI crude for all the output from the Lawrenceville Refinery and $10.20 per barrel over the near-month price of Alaskan North Slope crude as quoted in Platt’s for the entire output of the Powerine Refinery (Castle Energy Corporation, 1993, p. 3). These obligations extended through June 2000 for the Lawrenceville Refinery and January 1, 1998, for the Powerine Refinery. However, the margins paid to Castle for output from the Lawrenceville Refinery could be reduced to half a cent over the prevailing “rack” or local wholesale price after January 1, 1998 if certain Castle loan obligations to third parties had been met (pp. 21 and 24). MGR&M entered these obligations at a time when margins between products and crude were much lower, effectively increasing the firm’s loss by between $200 and $400 million through 2000 (see Treuarbeit & Wollert-Elmendorff, 1995, p. 78, or Verleger, 1994, p. 12).

W. Arthur Benson, the former president of MGR&M who was dismissed in December 1993, described MGR&M as a “petroleum merchant” whose business was to provide its customers (referred to as “long-term partners”) with petroleum products. In a telling commentary ignored by many of Metallgesellschaft’s critics, Benson differentiated MGR&M’s business from that of other oil companies as follows:

Many pure-profit driven companies have sold totally inappropriate products with unreasonable mark-ups to their clients for the sake of doing a trade, or conducted
activities along the lines of those self-serving motives. In doing so, they have also created all the reasons for their customers to default. Worst of all, those companies would never be able to maintain a loyal customer base.3

MGR&M’s clients were generally distributors or jobbers who marketed products independently of the major oil companies. One of the customers was Pilot Petroleum. Pilot is an independent marketer that has developed a niche market supplying trucking companies. Pilot owns very large service plazas located at the strategic intersections of major interstate highways across the country. It supplies approximately 10% of the diesel fuel consumed by the trucking industry. Pilot is independently owned and not associated with any major supplier.4

Much of MGR&M’s business consisted of supplying local government agencies with petroleum products. These arrangements were bid competitively and are well known in the industry to offer very low profit margins to even the most efficient companies. In December 1993, MGR&M’s obligations to these customers amounted to 13.5 kbd.

A second and growing business consisted of long-term, fixed-price contracts with a variety of customers. These contracts led to the 1993 crisis, and the trading practices of Metallgesellschaft associated with the firm’s sales of petroleum products at fixed prices contributed to the controversy. MGR&M entered three types of contracts:

- “Firm Fixed” contracts that required the buyer to take delivery of a specified volume of product each month at a fixed price for periods ranging from 5 to 10 years. These contracts obligated MGR&M to perform to 2003 (Treuarbeit & Wollert-Elmendorff, 1995, pp. 32–34).
- “Firm Flexible” contracts that obligated the buyer to take delivery of a certain volume of product at some point during a 10-year period but imposed no obligation to accept a specific volume at any time during the contract. Customers, however, could take delivery of up to 20% of the contract volume in any year before the end of the contract. These agreements also obligated MGR&M to perform up to 2003 (Treuarbeit & Wollert-Elmendorff, 1995, pp. 34–35).
- “Guaranteed Margin” contracts that guaranteed retailers (service stations) a fixed profit margin on gasoline marketed at stations after the deduction of taxes and costs (Treuarbeit & Wollert-Elmendorff, 1995, pp. 30–34). These contracts expired in January 1994 but could be extended at the option of MGR&M. Treuarbeit and Wollert-Elmendorff reported that “MGR&M had the option to extend the contract for a certain period. MGR&M would only exercise the option if a profit resulted from the hedging transaction” (p. 35). It is unclear whether MGR&M was required to exercise the option. In any event, it did not do so. Treuarbeit and Wollert-Elmendorff note that the contracts exposed MGR&M to the risk of retail price wars. If competitors “started a price war and the margins of the customer were reduced, MGR&M had to pay the difference up to the guaranteed margin, but in turn participated in higher margins”(p. 35). The contracts also permitted MGR&M to hedge the transitions at such times as MGR&M deemed appropriate. Profits from such hedges were to be shared with the customer on a fifty-fifty basis (Paragraph 6 of the Guaranteed Margin Contract).
Each contract contained many of the clauses typical of contracts used in the petroleum business. Locations where the customer was to take delivery of the product were specified. MGR&M obligated itself to deliver products meeting the prevailing specifications established by government regulators for products distributed in the delivery area. Taxes imposed on the product by government agencies were to be paid by the customer and collected by MGR&M at the time of delivery. Specific procedures for payment were set out. In these respects, the contracts were no different than those used by other firms in the industry. Indeed, the contract language was quite similar to other types of petroleum product agreements.

However, the Fixed Firm and Firm Flexible contracts had three characteristics that differentiated them from other contracts:

- First, both contracts imposed a 5- to 10-year delivery obligation on Metallgesellschaft. Most contracts in the petroleum business carry obligations that last for only a few months or a year at most.
- Second, the contracts obligated MGR&M to deliver products meeting the specifications set in the delivery market by government authorities for 5 or 10 years, no matter what specifications were imposed. The contracts offered MGR&M no relief if government officials imposed standards that increased the costs of production and materials.
- Third, MGR&M granted the customer the option to terminate the contract at the customer's discretion. Both contracts contained unique clauses that allowed the customer to “cash out” if certain market conditions occurred. (This feature was referred to as the “blowout” option by MGR&M. I use this term in this article.) Specifically, customers could elect to cancel the contract and receive a cash payment if prices on the NYMEX exceeded a specific threshold level. Customers with ratable contracts generally would receive a payment calculated by multiplying the volume remaining under their contract by an amount equal to half the difference between the NYMEX price that prevailed on the day the election was made and the threshold price. Customers with Firm Flexible contracts were generally entitled to receive a sum that was determined by multiplying the remaining volume by the difference between the price that prevailed on the day the election to cancel was made and the threshold price.

These cancellation features gave the contracts an “option-like” characteristic. In entering the contracts, MG had written calls to its customers with strike prices equal to the threshold price. In the case of the Fixed Firm contract, MGR&M had written its customers a sequence of American-type calls with maturities varying from 1 to 120 months. In the case of the Firm Flexible contracts, MGR&M had written a single American-style call with a 5- to 10-year maturity.

The delivery price specified under the contracts was determined generally by NYMEX market conditions at the time the contract was entered—between 57 and 64 cents per gallon for gasoline and distillate—despite the fact that the delivery obligations assumed by MGR&M were nationwide and despite the fact that the chemical characteristics of the products delivered could differ. For example, MGR&M charged the same price
Table 1
MGR&M Product Balance, December 1993a (Thousand Barrels per Day)

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<tbody>
<tr>
<td>Supply from Castleb</td>
<td>31.0</td>
<td>31.0</td>
<td>31.0</td>
<td>31.0</td>
<td>18.2</td>
<td>27.3</td>
<td>169.5</td>
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<td>Delivery Obligationsc</td>
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<td></td>
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<tr>
<td>Bid Business Guaranteed Margin</td>
<td>10.8</td>
<td>10.8</td>
<td>10.8</td>
<td>10.8</td>
<td>10.8</td>
<td>0.0</td>
<td>54.0</td>
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<tr>
<td>Fixed Firm</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>9.9</td>
<td>49.5</td>
<td>99.0</td>
</tr>
<tr>
<td>Firm Flexible</td>
<td>5.1</td>
<td>5.1</td>
<td>5.1</td>
<td>5.1</td>
<td>5.1</td>
<td>26.5</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>76.0</td>
<td>204.0</td>
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<tr>
<td>Balance: Supply less Demand</td>
<td>5.2</td>
<td>5.2</td>
<td>5.2</td>
<td>5.2</td>
<td>−7.6</td>
<td>−48.7</td>
<td>−34.5</td>
</tr>
</tbody>
</table>

a Supply obligations and delivery obligations by year.
b Source: Castle prospectus, pp. 23 and 25. Data reported are for gasoline and distillate production. Note that the data were adjusted because the Powerine Refinery had been shut down for 101 days. Castle’s published figures show production for 254 days. During this period, Powerine production of gasoline and distillate were reported to be 11.4 million barrels. This figure was adjusted assuming the refinery would normally operate for 360 days.
c Source: Treuarbeit and Wollert-Elmendorff, p. 32. Note, however, that Cyndy Ma asserts that the volume of Guaranteed Margin contracts was 44 million barrels (see Ma, 1995, p. 22).

to customers in California, Salt Lake City, and Louisville entering contracts on the same day despite the fact that the costs of acquiring products to meet these contracts could differ by as much as 20% on the day the contract was signed.

3. Metallgesellschaft’s trading position

A firm’s hedging requirement will obviously be determined by the differences between its obligations to deliver at prices other than market prices at the time delivery occurs and its obligations to take delivery at prices other than market prices at the time of delivery. A firm need not engage in hedging transactions if it holds no inventories, buys at market prices, and sells simultaneously at market prices. On the other hand, a company will have large hedging requirements if it (a) holds inventories, buys at market prices, and sells at fixed prices, or (b) buys at fixed prices and sells at market prices. The contractual obligations entered into by MGR&M required it to engage in some hedging activities. However, the firm’s situation was quite complex.

MG’s contracts with Castle and its various sales programs created a relatively balanced and naturally hedged position for part of the firm’s business. This position may be observed from Table 1. The first row of the table shows the product supplies MGR&M agreed to take from Castle. The next four data rows show MGR&M’s various delivery obligations. In calculating delivery obligations, I have assumed that customers for the Firm Flexible contracts accept delivery ratably over the duration of the contract, although there was no indication that customers would have accepted delivery in that way. I have also assumed that MGR&M exercised its options to cancel
the Guaranteed Margin contracts. (In fact, MGR&M’s new management exercised its options to cancel the contracts in January 1994.)

The level of deliveries of 25.8 kbd shown in Table 1 contain a critical assumption that MG would deliver ratably 5.1 kbd against its Firm Flexible obligations. This assumption is arguably incorrect because no oil was ever delivered against these contracts. Instead, there is substantial evidence that the parties to these contracts (MGR&M’s old management) and its customers never contemplated delivery (see Treuarbeit & Wollert-Elmendorff, p. 34). If these contracts were ignored, the balance of MGR&M’s position would be a negative 10.2 kbd. In other words, MGR&M needed to be short, not long, 3,600 product contracts per year.

Examining Table 1 reveals that MGR&M had an excess supply of gasoline and distillate for the years from 1994 to 1997 because it was obligated to take 31 kbd of product but only had firm delivery obligations of at most 25.8 kbd. As is often the case in the petroleum business, supply and demand were not matched by geographical location, and thus various types of trades would be required to get the product to the right places. Historically, firms in the industry (including MGR&M) have entered long-term exchanges or swaps that permit the parties to dispose of unneeded product at the point of production, while obtaining required products in other geographic locations.

A cursory review of Table 1 suggests that, through its contracts with Castle and its fixed-price contracts with its customers, MGR&M had established a natural hedge and thus did not need to engage in trading on the futures market. Such a conclusion is incorrect. MGR&M’s supply contracts with Castle established a margin but did not set an outright price. MGR&M was thus exposed to crude oil price risk on its delivery obligations, risk that might have been addressed by purchasing crude oil futures or crude oil derivative contracts. Since the Castle contract obligated MGR&M to purchase roughly 62 million barrels of products, MGR&M might theoretically have needed to purchase 62,000 WTI contracts with delivery spread over several years.

MGR&M was also exposed to “blowout risk.” This risk was associated with the Fixed Firm and Firm Flexible contracts. This financial exposure was created by the structure of the two contracts, which permitted the buyer to cancel the contract unilaterally and receive payment on a portion (or all in the case of the Fixed Firm contracts) of the remaining volume multiplied by the difference between the spot futures price and the contract price.

The blowout exposure required that MGR&M hold long positions in product futures contracts. For MGR&M to achieve a perfect or near perfect hedge, these contracts had to be held in the spot contract. This minimized MGR&M’s potential financial exposure in case of a sudden price change. Since spot contracts expire approximately every 30 days, this also required MGR&M to roll its futures contracts every 30 days.

The calculation of blowout risk is shown in Table 2. This table is divided into three parts. For the Firm Flexible contracts, the blowout exposure equals the total number of contracts outstanding—51 million barrels. Calculating blowout exposure under the Firm Fixed contracts, in contrast, is divided into two parts because some customers had signed letters capping MGR&M’s exposure at 62 cents per gallon.
Table 2
MGR&M Blowout Exposure (Million Dollars or Barrels)

<table>
<thead>
<tr>
<th>Contract</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Firm (dollars)</td>
<td>40.0</td>
</tr>
<tr>
<td>Fixed Firm (barrels)</td>
<td>18.5</td>
</tr>
<tr>
<td>Firm Flexible (barrels)</td>
<td>51.0</td>
</tr>
<tr>
<td>Total Exposure (barrels)</td>
<td>69.5</td>
</tr>
</tbody>
</table>


obligation to these customers was no more than $40 million. MGR&M’s maximum delivery obligation to the remaining customers having 38.9 million barrels in delivery obligations was 18.5 million barrels because, on cancellation of the contract, MGR&M was obligated to pay the customer only half the difference between the market price and the contract price. Thus, to hedge against its blowout exposure, MGR&M needed to hold long positions for delivery of approximately 70 million barrels of products in the prompt delivery month.

MGR&M’s blowout risk created a second exposure that has been ignored up until now. This risk was created by MGR&M’s fixed-price purchase obligations from Castle. The purchase requirements theoretically obligated MGR&M to hold contingent short positions in products for delivery in future months and years. MGR&M needed to do this because cancellation of a delivery contract through a customer exercising a blowout option would leave MGR&M with obligations to purchase products from Castle at a fixed margin to WTI, for which MGR&M had no offsetting sales.

Thus, to be hedged completely under its contractual obligations with Castle and its offsetting long-term delivery contracts, MGR&M had to do the following:

- Hold long positions on approximately 170 million barrels of crude distributed across 5 to 10 years.¹⁰
- Hold long positions in approximately 70 million barrels of products for delivery in the spot month.
- Hold contingent short positions in 70 million barrels of products and crude for delivery across 5 to 10 years to balance the delivery obligations under Fixed Firm and Firm Flexible contracts should the blowout options under these contracts be exercised.¹¹

MGR&M’s position in futures markets at the end of December 1993 was very different from the position described above. According to the firm’s auditors, Treuarbeit and Wollert-Elmendorff, MGR&M was long approximately 170 million barrels of product, with most delivery occurring in the first or second month.¹² This position represented a failure to match the firm’s financial exposure with its contractual obligations. Specifically:

- The concentration in the first few delivery months of 170 million barrels was approximately 2.5 times in excess of the firm’s blowout exposure.
There was no protection against the effect of crude oil price increases on the firm’s longer-term purchase obligations from Castle.\textsuperscript{13} The firm had no contingency contracts to hedge its exposure on its fixed-price obligations to purchase product from Castle.

After reviewing the firm’s obligations to purchase product from Castle at fixed margins, its long-term delivery contracts to customers (many of whom had not been able to perform in the short term because of price declines), and the complex and insecure nature of MGR&M’s throughput and terminal obligations, MGAG’s Supervisory Board decided to restructure Metallgesellschaft’s oil business. Futures positions were closed. Negotiations were held with customers of Fixed Firm contracts to terminate these. Firm Flexible contracts were either concluded by negotiation or later closed after they were ruled illegal by the Community Futures Trading Commission (CFTC). Contracts with Castle Energy were terminated upon cancellation of Castle’s debt to MGR&M, cancellation of stock in Castle owned by MG, and assumption by MG of debt owed to Societe Generale of $120 million. The cost to MG was put at roughly $500 million. Castle reported that it realized a gain of $391 million in its 10K statement filed with the SEC.\textsuperscript{14}

4. The critics’ view

In the aftermath of the closing of the futures position, MG and MGR&M were criticized intensely by MGR&M’s former managers and by academics. The initial “criticism” was a complaint filed in U.S. Federal Court in Baltimore, Maryland, by MGR&M’s former president, W. Arthur Benson. Benson (1994) claimed that in altering the position in the futures market, MG’s Supervisory Board converted a hedge into a certain financial loss. Benson explained that the futures position that had been closed (at a $1.5 billion loss) was one half of a well-designed trading position. The other half consisted of long-term, fixed-price sales of petroleum products to a variety of customers. Benson also asserted that these positions ultimately would have produced very large financial gains for the company. In his complaint in Federal Court, Benson asserted that half of these gains were owed him under his employment contract with Metallgesellschaft \textit{(Benson v. Metallgesellschaft Corp., 1994)}.

Benson’s complaint was noted by two academics, Christopher Culp and Merton Miller (1994\textsuperscript{a}). These authors concluded that the strategy outlined by Benson was sound and echoed his criticism of the Supervisory Board. In an article entitled “Derivative Dingbats,” Culp and Henke (1994) also jumped on Benson’s bandwagon.\textsuperscript{15}

The thrust of the analysis of Culp and Miller, Culp and Henke, and others was that the trading strategy Benson described was mathematically sound. For example, Culp and Miller demonstrate algebraically that a perfect hedge will ultimately be costless to a firm if the time value of money on cash flows paid to maintain the hedge is ignored.

According to these studies, the losses were created by the premature termination of the futures position taken to hedge the physical business. In the view of Culp, Miller,
Henke, and others, MGR&M’s strategy would have protected Metallgesellschaft from losses in the long run had it been left undisturbed. Ultimately, the monies paid to cover short positions on futures markets would have been recovered when the oil was delivered under the contracts. These analysts also opined that, in terminating the position prematurely, the Supervisory Board converted a transitory, temporary loss into a real loss. In other words, in their view, the board panicked.

Edwards (1994) and Edwards and Cantor (1995) also criticized the management of Metallgesellschaft, but in a more balanced manner, noting that not all of the circumstances related to the events of December 1993 and January 1994 were known. They declared themselves neutral regarding the decisions made, noting that MGR&M’s “rollover and credit exposure at that time [the time when action was taken] were such that a reasonable case could have been made for the unwinding of its positions” (Edwards & Cantor, 1995, p. 255). Edwards and Cantor suggested that a stacked hedge (where long positions are concentrated in the nearby futures contracts) was likely to be profitable because oil markets were generally in backwardation.

Recently, Bollen and Whaley (1998) presented results of statistical simulations of MGR&M’s futures position and concluded that MGR&M would have earned $1.1 billion had the firm stayed the course. However, the authors also noted that MGR&M might have been required to suffer a negative cash flow of as much as $1 billion to sustain the position.

Unfortunately, none of these critiques allows for MG’s supply contracts with Castle. MG’s obligation to take 170 million barrels of product at fixed margins is ignored. MG’s unhedged financial exposure to Castle in the event that the blowout options were exercised is disregarded. Indeed, with the exception of Edwards and Cantor, MGR&M’s entire physical operation is ignored.

Of the academics, only Mello and Parsons (1995) began to understand the nature of MGR&M’s exposure. These authors noted that the trading strategy pursued by Benson for MGR&M was a money loser on a long-term basis. Mello and Parsons came closer than any other academics in their attempts to link MGR&M’s futures positions to its other long-term contractual obligations.

We claim, moreover, that a careful examination of MGR&M’s actual business plan as well as the history of its trading activities and most especially the exaggerated size of its stack all lead one to the conclusion that the MGR&M management was speculating (Mello & Parsons, 1995, p. 120).

On balance, most of MGR&M’s academic critics compared the firm’s obligations to deliver products with its futures positions and concluded that the company had a well-designed hedging strategy. However, these conclusions ignored the supply obligations the firm had taken on, obligations that should have affected the firm’s positions on futures markets and obviated the need to hold such a large long position in nearby contracts. These analyses also ignore MGR&M’s contingent financial exposure to Castle, which was almost equal in magnitude to the obligation to customers. The failure to account for these obligations invalidates their conclusions regarding the actions of the Supervisory Board.
5. Other considerations that should have influenced MG’s decision to restructure the oil business

Metallgesellschaft’s decision to restructure its activities in the oil business, or at least the portion that had been established by MGR&M, should have been influenced by at least three other factors: (1) specification risk related to the characteristics of petroleum products, (2) the impact of the size of MGR&M’s large position on the market, and (3) the lack of creditworthiness of many MGR&M’s clients. Each of these factors increased the financial risk associated with MGR&M’s strategy and reduced the probability of long-term success.

5.1. Specification risk

Most analysts appear to have assumed that MGR&M’s long-term contracts involved the delivery of products meeting constant, unchanging specifications. This assumption is incorrect. Petroleum products are subject to changes in specification over the season and over time. The specifications and cost of manufacture of the two key products (gasoline and distillate) to be delivered by MGR&M beginning in 1994 were unknown in 1993. Furthermore, the ability of MGR&M’s supplier, Castle, to supply products meeting these new and uncertain specifications was also unknown.

The confusion on the part of academics who evaluated MGR&M’s situation can be seen in the work of Edwards and Cantor (1995). The authors asserted that one strategy that might have been employed by the managers of MGR&M was stockpiling a volume of oil equal to the firm’s delivery obligations:

An alternative hedging strategy to MGR&M was physical storage. To understand MGR&M’s rationale for choosing to hedge with short-dated derivatives, it is instructive to examine why it did not hedge by physical storage. MGR&M clearly could have hedged the price risk on its forward delivery contracts by purchasing and storing the amount of physical oil (or other energy products) to meet its forward-supply commitments, thereby locking in today’s energy price. This strategy, however, while assuring that MGR&M would have the oil it needed, in the future, would have locked in a loss rather than a profit (p. 217).

In putting this proposal forward, Edwards and Cantor appear to assume that petroleum products are similar to metals such as copper, silver, or gold. If this assumption were correct, a commitment made today to sell gasoline or diesel fuel for delivery in 5 or 10 years would impose an obligation on the seller to provide a product in 5 or 10 years meeting the specifications that prevailed today. Such an assumption is incorrect.

The theoretical option proposed by Edwards and Cantor is impossible first with regard to oil industry operations because specifications for petroleum products change over seasons, unlike the specifications for other physical commodities, such as gold, copper, and other metals. Second, spoilage rates of petroleum products are very high—as much as 100% of products can “go off spec” within a 6-month period. Third, the specification of products is the result of a continuing negotiation between governments and industry. It is this last factor that is critical.
The Environmental Protection Agency has the authority to alter specifications of products and has been exercising this authority. Consequently, the types of products (and the cost of manufacturing them) has been changing during the last decade and will continue to change over the next decade. This means that the chemical composition of petroleum products, the cost of manufacturing them, and the industry’s capacity to manufacture them 2 years hence is unknown (and was unknown in 1993). Furthermore, the changing chemical structure of products has created situations where the New York Mercantile Exchange has been unable to assure traders that it would be able to continue offering a futures contract for trading the product.

This last factor creates “specification basis risk.” Specification basis risk occurs when the deliverable product under the futures contract is not identical to the specification of the commodity that a hedger has agreed to deliver. Traditionally, traders adjust for this risk through statistical studies that compare prices of the product they propose to deliver with the prices of the associated futures contract. MGR&M could not make such an analysis because the costs (and prices) of the products to be delivered were not known. Indeed, the costs could not be known because the costs and specifications of gasoline for delivery in 1995 were not known at the time the contracts were entered. Nor could MGR&M know whether the NYMEX would continue to trade futures contracts for delivery in the new gasoline. In effect, MGR&M faced an unknown basis risk. The examples of diesel fuel and gasoline provide clear examples of this unquantifiable risk.

In 1991, the EPA issued rules requiring that the sulfur content of diesel fuel be reduced below 0.5%. At the same time, the State of California required that diesel fuel sold in that state meet even stricter standards. These specifications are subject to further modification.

MGR&M’s exposure occurred because it entered into contracts to supply diesel in 1992, at a time when the cost of manufacturing this new diesel fuel was uncertain and when there was no market for the fuel. Furthermore, at that time, it was known that the NYMEX would not offer a contract for the new diesel fuel. Instead, the NYMEX continued to offer contracts for distillate fuel oil that could be used for heating but not in trucks. Traders that needed to hedge diesel fuel purchases were required to enter basis trades in the over-the-counter (OTC) market. Such trading did not develop until 1994, when the costs of manufacturing diesel fuel were understood.

As the date for compliance with these regulations approached, the price for compliant diesel fuel rose relative to the price of ordinary distillate fuel oil, the product deliverable under the NYMEX contract. A firm that had entered a long-term contract to supply diesel fuel oil (as MGR&M had) would have found that its hedge against price increases was highly imperfect because the basis between the price of distillate fuel oil and diesel increased (see Fig. 1).

The situation in California presented an even greater problem because the California Air Resources Board adopted regulations that mandated the introduction of a very special, low-emissions diesel referred to as CARB diesel. In the first weeks of its introduction, this product sold at a premium of 30 cents per gallon to conventional diesel fuel (Petroleum Argus, p. 8). This created the possibility that MGR&M might
Fig. 1. Spread between diesel fuel oil and New York Harbor distillate fuel oil—U.S. Gulf Coast and California locations.

have lost as much as 20 cents on every gallon it was obligated to deliver in California. (There is no indication that MGR&M had many such obligations.)

The uncertainty with respect to gasoline was more severe. The Clean Air Act Amendments of 1990 required gasoline specifications to be altered. The petroleum industry was ordered to introduce new types of gasoline (reformulated gasoline or RFG). Refiners and petroleum merchants such as MGR&M were required to distribute this gasoline in those regions found to be in noncompliance with clean air laws. Other regions were allowed to “opt in,” effectively adopting the cleaner gasoline as part of their “Implementation Plans.” The law also granted California, the state that accounted for one sixth of the nation’s gasoline consumption, the right to impose specifications on the chemical composition more stringent than those used in the rest of the country.

Three different changes in specifications were identified: in November 1994, in January 1998, and in January 2000. The National Petroleum Council (1993) concluded that the price of gasoline would have to increase by as much as 12 cents per gallon to meet these standards (p. 15). (The National Petroleum Council [NPC] is an organization of industry officials appointed by the Secretary of Energy to guide and advise the government.)

The introduction of RFG created a serious problem for the NYMEX because it was not initially clear whether reformulated gasoline would be a fungible product. Draft regulations removed almost all the flexibility the industry had previously enjoyed to shift product between companies or even between tanks. Ultimately, the EPA removed some of the rules, which made it easier to trade the product. However,
articles in the industry press reveal enormous concerns held by individuals in the oil industry as to whether the government deadlines could be met and whether adequate supplies of reformulated gasoline could be obtained. The details are described in Appendix 1.

The difficulties experienced in the industry made it impossible for the NYMEX to list futures contracts for gasoline delivery in months after following November 1994 until April 1994. Then, when trading began, liquidity was very limited. Open interest in the gasoline contract declined by 50% from the previous year. Open interest has yet to recover to the levels observed before RFG’s introduction. In the post-RFG era, open interest has always been less than 70% of the peak level of open interest before the shift in specification.

Specification risk created two enormous uncertainties for Metallgesellschaft in December 1993. First, the firm could not know whether the financial instruments used to maintain the company’s long-term hedging program would be available after the product specifications changed. Furthermore, the company could not know the costs that would be incurred in rolling contracts at the time specifications changed. This risk was particularly acute regarding gasoline because the NYMEX had indicated that its contract would require delivery of reformulated gasoline when the new specifications became effective in November 1994.21

The second uncertainty for Metallgesellschaft was associated with the ability of the refineries owned by Castle Energy to supply the products meeting the new specifications. MGR&M’s contract with Castle, in theory, would provide a means of hedging these exposures. However, the Castle prospectus (Castle Energy Corporation, 1993) reveals that neither of the Castle refineries had the capacity to produce either the low-sulfur diesel fuel required by EPA or reformulated gasoline. The prospectus states that the Lawrenceville Refinery was considering investments that would allow it to produce low-sulfur diesel fuel (Castle Energy Corporation, p. 46), while the Powerine Refinery in Santa Fe Springs was producing diesel fuel under a 1-year exemption (p. 31). The prospectus also states that the Santa Fe Springs refinery had not decided whether it would make the investments required to produce reformulated gasoline (p. 31).

Moreover, MGR&M’s contract with Castle provided no economic incentive for Castle to make the investments. MGR&M was contractually obligated to take delivery of all the output from the refineries whether or not the products met specifications for sale.22

Thus, MGR&M was confronted with a situation where it had entered long-term, fixed-price supply contracts that required it to deliver products where the specifications and costs were unknown, and where it could not be certain that instruments to hedge its financial exposure would be available. In this context, the following statement made by one of MGR&M’s supporters must be considered preposterous:

Reduced to simplest terms, MG’s U.S. subsidiary MGR&M sold forward delivery contracts for up to 10 years at fixed prices for heating oil and gasoline in the central United States. MGR&M’s gross profit margin at the time the contracts were first entered was equivalent to about $3 a barrel of crude. MGR&M, as virtually the sole such contractor in the market, could get deals that [were]
profitable because its customers were willing to pay a substantial premium for guaranteed price and delivery. But while the expected return on the contracts was substantial, MGR&M was exposed to the risk that prices might take off sometime during the life of the contracts. During the Gulf War, for example, prices rose to nearly $40 a barrel (Miller, 1997, p. 128).

The facts were quite different. One, as noted in the Castle prospectus (Castle Energy Corporation, 1993, p. 21) and in the Treuarbeit/Wollert-Elmendorff report (1995, p. 32), MGR&M’s business was nationwide. MGR&M was the only company that would offer such long-term contracts at fixed prices because no other company would propose to supply products of unknown specifications at a fixed price where the cost of production was unknown.23

5.2. Impact of the size of MG’s position

A second factor facing MG’s Supervisory Board was the size of MGR&M’s position. Barcot et al. (1998) implicitly raised this issue in a short note, where they stated the following: “However, the lessons learned from the failure of MG’s hedging program should serve as a reminder that it is virtually impossible to hedge the risks for organizations with positions large enough to impact the market as a whole” (Barcot et al., 1998, p. 19).

This view is not unanimous. Edwards and Cantor (1995) concluded that the position was not that large:

MGR&M’s positions, however, were not large relative to total open interest. Its total futures position constituted only about 6.7% of total open interest, and its combined futures and swaps positions constituted only about 20% of total open interest (pp. 228–229).

In a footnote, Edwards and Cantor noted that MGR&M’s total position in gasoline, heating oil, and distillate futures accounted for only 6.7% of the maximum open interest in futures. They also noted that if swap positions were included (because swap counterparties would have hedged their positions with futures), the total position would have constituted only 20% (or 160,000 contracts) of total open interest of 810,000 contracts (Edwards & Cantor, 1995, p. 229).24 They concluded with this observation:

In addition, it seems unlikely that traders would have had monopoly power vis-à-vis MGR&M. There are no significant barriers to entry into trading futures on an exchange, and in the OTC swap market there are a large number of potential counterparties. MGR&M would have to move positions from one energy market to another, from exchange to off-exchange positions, and could have rolled positions forward on many different dates (p. 229).

This view is correct in the abstract. However, MGR&M’s futures positions were concentrated not in the entire futures market of 810,000 contracts but in two products, gasoline and distillate fuel oil. Open interest in these products was only 370,000 contracts. Furthermore, as noted by Bollen and Whaley (1998), MGR&M’s positions were concentrated in the nearby contracts. On this basis, MGR&M’s position on
December 16, 1993, apparently consisted of long futures and swaps amounting to 69 million barrels of gasoline and 90.5 million barrels of distillate fuel oil. At the peak, MGR&M’s position appears to have accounted for 90% of the long positions in the prompt gasoline contract and a similar share of the long position of distillate fuel oil in the prompt contract. As noted by Benson (1994) and others, the December position was not unusual. MGR&M’s trading policies had involved large long positions in nearby or prompt futures contracts throughout 1993.

This large position created the potential for companies to trade against MGR&M. The firm’s very large market share in prompt contracts combined with its intention not to take delivery created the opportunity for competitors to trade against it. One firm that clearly took advantage of this chance was Tosco Corporation.

In December 1992, Tosco Corporation agreed to purchase the Bayway, New Jersey refining assets of Exxon (“Exxon Sells Bayway,” 1992), taking possession of the refinery in April 1993 (Tosco Corporation, 1994, p. 6). This refinery had the capacity to manufacture between 100 and 200 kbd of gasoline. This acquisition had the potential to exert an important influence on market dynamics because the former owner, Exxon, never used the futures market, while the acquirer, Tosco, was widely and correctly viewed as one of the largest participants in the futures market.25

The acquisition of the Bayway refinery gave Tosco an entry into the New York market that was unique for two reasons. First, the refinery was large and relatively new. DOE statistics reveal that the refinery accounted for 80% of refining capacity in the NYMEX delivery area, which includes only the New York/New Jersey area, and 13% of refining capacity in the northeastern states. Second, the refinery provided a sophisticated user of petroleum commodity markets with an ideal platform to profit from the use of futures markets. Industry publications commented at the time that the refinery’s location was perfect because it was a delivery location for NYMEX gasoline and distillate contracts. Thus, Tosco could increase output and sell the products forward on the NYMEX when profitable opportunities arose, while reducing production and purchasing futures when opportunities were not present. Furthermore, to the extent that Tosco wanted to build its presence quickly in New York, the link to the NYMEX as a delivery point provided a perfect platform. Tosco’s acquisition of the refinery changed the market dynamics because the refinery’s previous owner had not taken advantage of this location opportunity.

The statements in Tosco’s 1993 and 1994 annual reports confirm that the firm used its locational advantage precisely to this purpose. Production and hedging were increased in 1993, when MGR&M was a significant factor in the prompt market. Production and hedging were reduced in 1994 after MGR&M was no longer a factor. The Tosco 1993 Annual Report summarizes the firm’s successful takeover of Bayway as follows:

The Bayway refinery, purchased from Exxon Corporation on April 3, 1993, has achieved an average throughput of almost 260,000 barrels per day, an increase of 50% over the levels at which the facility ran before our purchase. Bayway employees accomplished this while maintaining one of their best safety records ever. Higher throughput, efficiencies at the crude unit and fluid catalytic cracking unit (the cat cracker), and several minor improvement projects have reduced
operating costs to around $2.21 per barrel from over $4.00 per barrel before our purchase. Bayway’s gross refining margin in 1993 was close to $3.50 per barrel. To capture available margins, Bayway employs hedging techniques on the New York Mercantile Exchange, locking in crude oil and product prices in advance of production whenever market conditions warrant (p. 6).

A possible interpretation of Tosco’s comment is that they boosted the production of gasoline and heating oil by 85 kbd. This incremental product was then sold into the NYMEX with the expectation that Tosco would deliver the product to traders holding long positions. MGR&M, having created the demand for futures through its purchases in the spot contract and its dominant market share, would have been one of the logical firms to take delivery. Of course, MGR&M did not want to take delivery. Instead, it was forced to find a price at which Tosco would close its position through the bilateral process that occurs on the futures market.

The Tosco 1994 Annual Report states that refining margins at Bayway had declined to $3.02 per barrel. Lower margins were attributed to higher competition, market uncertainty related to the introduction of reformulated gasoline, and reduced output (p. 19). MGR&M’s situation in the market may have been particularly threatened by the Tosco purchase because MGR&M was not very active in the physical market in the Northeast. As several authors have noted, most of MGR&M’s business was not in the New York or Northeastern market. Thus, MGR&M intended to use futures and derivatives as a hedge against physical obligations in other markets. Tosco and other companies, on the other hand, were active in the Northeast market and were perfectly willing to make delivery. Tosco may have been particularly willing to make delivery after it reorganized the operations of the former Bayway refinery during the summer of 1993.

5.3. Lack of creditworthiness of MGR&M counterparties

A third exposure of MGR&M was the potential poor credit ratings of some of its customers. Edwards and Cantor (1995) alluded to this problem, noting that many of MGR&M’s customers were small (p. 213). Edwards and Cantor also noted that the risk of default on long-term contracts is high for firms with low credit ratings. For example, they reported that the probability of default on bonds of a B-rated issuer rises to 39.96% by the 10th year (p. 244). Since many of MGR&M’s customers had low credit ratings, the risk of default was quite high.

The vulnerability of MGR&M’s smaller customers is indicated by the following illustration. If, for example, spot gasoline prices rose from 55 cents per gallon to 99 cents per gallon overnight because of the sudden closure of several refineries, MG would have been obligated to pay the difference between 99 cents and 59 cents to any of these small customers demanding to have its contract paid off. However, this exposure did not remain in effect for long because approximately half of MGR&M’s customers found that the fixed-price contracts imposed unacceptable financial burdens on them. For these customers, MG agreed to reduce the fixed purchase price by 9 cents per gallon for 6 months (180 days) in exchange for capping the blowout option at 62 cents per gallon (Treuarbeit & Wollert-Elmendorff, 1995, p. 34).
This adjustment was introduced because many of MG’s customers with Firm Fixed contracts found that the free options proved to be expensive when prices fell. In litigation between Metallgesellschaft and Thorton Oil, the president of a customer who had faced this problem and accepted the option, Mr. Paul Perconti, explained the justification for taking it.

...I didn’t have any problems with that [taking the option] because at that point in time it saved us 10 cents a gallon when gasoline was all the way down to 40 cents. So short-term—we’re not, a huge company like MGAG or Shell or Texaco. Short-term we protected ourselves. It was almost like a reverse hedge (Thorton Oil Company v. MG Refining and Marketing, Inc., 1995, p. 20).

Customers such as Thorton accepting these options effectively wrote an American call to Metallgesellschaft that, by the contract, MG was required to exercise if, as, and when the option was in the money. In most cases, the difference between the strike price of the calls written to the customers by MGR&M and the call written back to MGR&M was 3 cents per gallon. By December 1993, customers accounting for 63% of the volume of Firm Fixed contracts had exercised this option, suggesting that the fixed-price contracts were imposing difficulties on MGR&M’s customers.26 Since these difficulties had been encountered generally within the first year of the contract, one could wonder whether performance would continue to create a problem in the future.

Despite the struggles of customers such as Thorton and despite this empirical evidence, MGR&M made no adjustments to correct for this fact. No funds were collected to finance the 5- and 10-year options offered under the Firm Fixed and the Firm Flexible contracts. Furthermore, no attempt was made to collect performance guarantees from customers as prices declined. Instead, MGR&M offered free calls to firms with very low credit ratings.

The Supervisory Board’s decision to restructure MGR&M’s futures position was undoubtedly influenced by the increasing inability of some customers to perform on their Firm Fixed contracts. MGR&M’s position in the futures market and the cash costs of maintaining it would appear to be very tenuous if it became apparent that the customers of the long-term contracts were financially unable to perform.

6. Conclusions

The Supervisory Board of Metallgesellschaft has been widely criticized for restructuring the futures position of its American petroleum operation, MGR&M. Some critics have gone as far as to accuse management of being “derivative dingbats” who had no knowledge of futures, futures markets, or derivative instruments. In fact, it is the critics who have been “dingbats.” The management of Metallgesellschaft terminated an extraordinarily confused and poorly structured entry into the petroleum business, not a carefully designed hedging program. MGR&M entered long-term commitments to purchase potentially unsalable petroleum products at above market prices, while
agreeing to supply salable products meeting unknown specifications at fixed prices over an even longer term. These later contracts also provided customers with financial options that offered the buyer large potential benefits at no cost, even though many of the customers were unable to perform except in the most favorable conditions.

Under these circumstances, the Supervisory Board deserves criticism not for changing the position but rather for allowing it to be created in the first place. This raises the broader issue of corporate governance in general and particularly the practices followed by German corporations. Such a study is, obviously, the topic of another paper. Such a study, also obviously, is better undertaken by those familiar with business structure rather than students of finance.

Appendix 1: Specification risk associated with long-term sales of petroleum products

MGR&M entered 5- and 10-year contracts to supply distillate fuel oil and gasoline for 5 to 10 years at fixed prices. These contracts obligated MG to deliver products that met “commercial specifications.” Much of the distillate fuel oil was to be sold as diesel fuel by MGR&M customers. All contracts also specified that the product would be delivered to the customer at specific geographic locations.

At the time these contracts were entered into, there was widespread knowledge that the specifications for petroleum products were changing. The nature of some of these changes was known, but the nature of some specification changes remained to be determined. In addition, it was not clear which geographic areas would require the new fuels. Furthermore, the increased costs associated with the new fuel and the general availability of the product were unknown. Thus, MGR&M had essentially entered contracts to supply its customers at a fixed price with products whose characteristics, availability, and price to MGR&M were not known. Futures contracts and swaps for these new products were also not offered until specifications had been determined.

Diesel fuel

Changes in the specification of diesel fuel were announced in August 1990. At that time, the Environmental Protection Agency ordered that the sulfur content of U.S. diesel fuel be reduced by 80% beginning on October 1, 1993. At the time of the announcement, the EPA indicated that it expected the rule would add 1.8 to 2.3 cents per gallon to the diesel cost (“EPA Proposes Cut,” 1990). The NPC, a consultative body to the Secretary of Energy, separately estimated that the increased costs to manufacture the low-sulfur diesel fuel would be 8.4 cents per gallon (NPC, 1993, p. 58).

Separately, the State of California imposed more stringent regulations, which required that the aromatic content of diesel fuel be reduced to lower levels than required by EPA (“New Diesel Rule Litmus Test,” 1993). This fuel would also be required to be marketed on October 1, 1993. The NPC estimated that the higher cost of manufacturing California Air Resources Board diesel (CARB diesel) would add 19.1 cents per gallon to the cost of diesel (NPC, 1993, p. 58).
These regulations were implemented as scheduled on October 1, 1993. In the period from October 1, 1993, to September 30, 1998, the spot price of CARB diesel was 6.4 cents per gallon higher than the spot price of conventional distillate fuel oil in Los Angeles and 9.65 cents per gallon higher than the spot price of conventional distillate fuel oil delivered in New York (the fuel MGR&M used as a hedge). During the same period, the spot price of low-sulfur EPA diesel fuel deliverable in other areas of the country was approximately 2 cents higher than the spot price of conventional distillate fuel oil.

The effect the introduction would have had on MG is not clear. Some disruptions were experienced with the introduction of CARB diesel. In the first months after the introduction of the fuel, the spot price of CARB diesel was as much as 30 cents higher than the price of conventional diesel. The high prices created enormous political pressure for changes in the regulations ("US Diesel Shortages Send Prices Soaring," 1993).

In response, independent refiners such as Powerine were granted temporary exemptions to market conventional diesel fuel (Castle Energy Corporation, 1993, p. 31). Through its offtake agreement with Powerine, MGR&M could have profited by marketing conventional diesel as CARB diesel. However, this exception was not granted until late 1993, well after MGR&M had entered its long-term contracts, including the long-term contracts to supply CARB diesel to some customers.

**Gasoline**

The Clean Air Act of 1990 required that the formulations for gasoline be changed. Three separate dates were established for the program. Beginning in 1995, refiners were required to market a "simple model reformulated gasoline" in some regions. Beginning in 1998, refiners were required to market a "complex model reformulated gasoline." Finally, in 2001, refiners were required to market a third, more environmentally friendly gasoline ("Reformulating Gasoline," 1993, p. 221).

Separately, the State of California adopted rules that mandated a different gasoline be marketed throughout California. Beginning in March 1996, refiners were required to sell CARB gasoline, a product that contained lower olefins and was more expensive to manufacture (Oil and Gas Journal 91, No. 35, p. 21).

The exact composition of the fuels was left to the EPA to determine. From 1991 to 1993, representatives from the public, the auto industry, and the petroleum industry met in a joint government/industry task force to determine the composition of the fuel. Final rules relating to fuels were issued by the EPA in February 1994 ("Regulation of Fuels and Fuel Additives," 1994).

Uncertainty concerning the regulations continued for some time after they were issued because the EPA initially required that a certain portion of reformulated gasoline contain ethanol, an alcohol manufactured from agricultural products. This rule, adopted by the EPA to placate senators from certain agricultural states, was eventually overruled by the courts ("EPA's Reformulated Gasoline Plan Draws Fire," 1993).

There was also widespread uncertainty concerning the total requirements for RFG because many regions had the option to require the use of RFG. For example, some cities such as Louisville, Kentucky, chose to "opt in" to the program as part of
“Implementation Plans” mandated by the Clean Air Act of 1990, while other cities and states chose not to require the distribution of RFG. States and localities had this ability to “opt in” or “opt out” from 1990 through 1995 when the program went into effect. Some regions chose to opt out at the very last minute.28

The capacity to opt in or opt out clearly affected MGR&M because it was required to deliver product to customers in specific geographic locations. If the region in which a customer operated opted in, MGR&M was on the hook to deliver the more expensive product. If the region opted out, MGR&M could deliver the conventional product, which had a lower cost. Louisville provides a clear example of the problem. That city opted in, and as noted above, MGR&M had a contract to deliver product to Thorton, a Kentucky dealer. On the other hand, the State of Ohio, just across the river from Louisville, opted out of the RFG program. Thus, MGR&M was not obligated to deliver RFG to customers in Ohio.29

The NPC’s 1993 report estimated that the regulations pertaining to reformulated gasoline would raise the cost of making gasoline by 12.4 cents per gallon and the costs of manufacturing gasoline to State of California specifications would raise prices by 23.7 cents per gallon (NPC, 1993, p. 58). Castle estimated that it would be required to make investments of between $70 and $75 million to meet the standards (Castle Energy Corporation, 1993, p. 31). Castle had made no announcement as to whether it intended to make such investments before the termination of the contract between Castle and MGR&M.

Since the rules went into effect, reformulated gasoline has sold at a premium to conventional gasoline. On spot markets, the spot price of reformulated gasoline has been 3 cents per gallon greater than conventional gasoline on the Gulf Coast. Since its introduction in 1996, CARB gasoline has sold for 4 cents per gallon more than conventional gasoline.

Notes

1. B/D is barrels per day. There are 42 U.S. gallons in a barrel.
2. The lease agreements granting access to storage facilities were particularly vulnerable. Firms in the petroleum industry have frequently granted and then canceled the access of third parties to storage facilities, particularly if the tenant became too aggressive in its pursuit of business in the lessor’s market. A number of tenants with businesses like that of MGR&M complained to the Federal Trade Commission when Shell and Texaco proposed to create a joint venture because they asserted that the joint venture proposed to close or deny them access to many terminals. Their objections were based on prior experiences when mergers had denied them admittance to terminals. Independent suppliers also objected when the merger of Ashland and Marathon threatened to deprive them of access to most of the terminals on the Ohio River (see The Oil Express, November 25, 1996, p. 7). Other companies have curtailed or eliminated sales to independents (non-branded buyers). Coastal dropped its sales to unbranded firms in most states in 1996 (The Oil Express, October 7, 1996, p. 7). In December 1997,
Citgo terminated unbranded sales at fifty separate terminals (The Oil Express, December 8, 1997, p. 1). More recently, BP and Marathon have stopped supplying unbranded customers (such as Metallgesellschaft) from several terminals in Ohio. These actions point out one of the vulnerabilities faced by MGR&M because it relied on short-term leases to obtain access to storage or supply. Commercial decisions taken by other companies threatened to raise the cost of providing products to customers under 10-year supply contracts.

3. Benson v. Metallegesellschaft (1994), Exhibit “E,” p. 4. Many readers may wonder why the Supervisory Board of Metallgesellschaft entrusted management of MGR&M to an individual who did not believe his firm should be “profit driven.” It is a question that has never been addressed.


5. This statement assumes that the products received from Castle were salable. There is evidence that the products could not be sold without further processing at MG’s expense. However, MG was obligated to take delivery. The dismissed management of MGR&M had signed contracts with Castle requiring the products to be taken whether they met specifications or not (see Castle Energy Corporation, 1993, p. 63). These actions by the dismissed managers are viewed as gross negligence by the author, who knows of no other trading company that had agreed to pay a seller for delivery of unsalable products.

6. Indeed, the CFTC ruled that these contracts were illegal futures contracts because many customers never contemplated taking delivery (CFTC, 1995).

7. All petroleum firms engage in location “exchanges” as well as outright purchases and sales to achieve a geographical match between customers and supplies. MGR&M engaged in many such transactions.

8. This would not have presented a very difficult problem because open interest in crude oil was approximately 300,000 contracts at the time. Thus, MGR&M’s purchases of crude futures would have had a relatively modest impact on the market, particularly if the contracts were spread over 2 years.

9. During the fall of 1993, many customers had trouble meeting their obligations to purchase at fixed prices of around 60 cents per gallon because of a price decline to 40 cents per gallon. MGR&M agreed to revise these customers’ contracts to allow them to purchase at a lower price of 51 cents per gallon for 6 months. In return, these customers agreed to cap MG’s obligations at 62 cents per gallon. Approximately two thirds of the Fixed Firm customers signed these amendments. See Treuarbeit and Wollert-Elmendorff (1995) and Bollen and Whaley (1998).

10. Given the flatness of the forward WTI curve, these obligations could be hedged in futures expiring after 10 to 12 months.

11. It is unclear whether long-term, American-type puts on products were available in 1993. The premium would have been quite large.

12. Treuarbeit and Wollert-Elmendorff (1995, p. 41). Note that this position has variously been reported as ranging from 150 to 210 million barrels.

13. The excess product contracts provided some protection against this exposure.
in theory. However, product prices are not perfectly correlated with crude prices. Furthermore, prices of deferred products and crude do not move dollar for dollar with the spot price. As Benson v. Metallgesellschaft (1994) notes, the price volatility of prompt contracts is much greater than the volatility of deferred contracts. Thus, a prudent hedging strategy that relied exclusively on prompt contracts, as MGR&M’s did, would use a hedge ratio of less than one to one to be hedged perfectly against crude price risk, assuming that the correlation of product contracts with crude contracts was sufficiently high.


15. One may wonder why a Nobel laureate such as Merton Miller would take such a strong interest in this matter. The answer appears to be that many politicians seized on MGR&M’s losses as potential justification to impose new regulation over the operation of futures markets. Platt’s Oilgram Price Report of February 24, 1994, reported that the CFTC was considering introducing new regulation on swaps. The CFTC Director of Trading and Markets was quoted as stating that the MG episode might have been avoided had a proposed regulation requiring more detailed reporting been in effect. Several U.S. Senators and Representatives also called for new regulation. Miller was and is a strong opponent of further regulation. His interest in the MG matter may have resulted because he wanted to show that the collapse was the result of bad management, not the absence of regulation. See the collected essays and speeches of Merton Miller (1997). In this volume, Professor Miller makes a strong and persuasive case against regulation. Miller’s interest in the Metallgesellschaft matter appears to be based on a fear that the derivative losses incurred by the firm would be used as an excuse to tighten the regulation of derivatives.

16. Edwards and Cantor describe physical storage in a footnote as “purchasing and storing oil, and not physical storage in conjunction with reverse cash-and-carry arbitrage to take advantage of backwardation,” as the latter “would involve continually making and taking delivery of oil” (Edwards and Cantor, 1995, p. 217).

17. See “US Diesel Shortages Send Prices Soaring,” Petroleum Argus, October 18, 1993, p. 9. The article explains that the introduction of low-sulfur diesel fuel oil in all states but California was accomplished without market disruptions. However, California experienced substantial price increases, with spot prices rising from 56 cents per gallon to 81 cents per gallon, because the state air resources board had imposed more-stringent standards.

18. The NYMEX contract requires delivery of distillate fuel oil with a sulfur content that meets local environmental requirements for heating oil. After imposition of the EPA diesel standards, this fuel could no longer be sold for use as diesel fuel in cars or trucks driven on highways. Agricultural interests did, however, obtain a waiver that permitted farmers to use the higher-sulfur distillate fuel oil on farms.

19. A 1993 study by the NPC prepared at the request of the Secretary of Energy
concluded that the costs of manufacturing low-sulfur diesel would be 8.4 cents per gallon greater than the cost of distillate fuel oil (see NPC, 1993, p. 15).

20. In this case, MGR&M’s exposure to a “blowout” was not affected because its contracts with its buyers referenced the NYMEX price of number two fuel oil. However, the cost of honoring MGR&M’s fixed-price contracts increased because the price of the product the firm was obligated to deliver increased.

21. One could imagine, for example, that the last conventional contract for conventional product could expire at 55 cents per gallon (cpg), while the first contract for delivery of the new product was trading at 90 cpg. MGR&M would then have incurred a cost of 35 cpg. The risks that such roll costs could affect the profitability of MGR&M’s hedge were not contemplated in either the firm’s plan nor by the academics who have examined MGR&M’s hedging program.

22. The prospectus states “MGR&M is contractually and unconditionally under the Indian Offtake Agreement to purchase 100% of the refined product output at the Indian Refinery through June 2000” (emphasis added, Castle Energy Corporation, 1993, p. 63). The prospectus also states, “Pursuant to the terms of the Powerine Offtake Agreement, Powerine will sell substantially all of the refined products it produces to MGR&M through January 1, 1998” (p. 66). In both cases, there is no indication that the products needed to meet market specifications. The special audit of Metallgesellschaft reports that MGR&M was required to take delivery of the products regardless of whether the product met quality standards (Treuarbeit & Wollert-Elmendorf, 1995, pp. 66–67). Often the products received failed to meet market specifications.

23. As a member of the board of Valero Energy Corporation in 1994, I discussed the feasibility of offering such contracts and was told that, given the tendency of the EPA to impose arbitrary standards, there was no way any firm could offer such contracts for a period of 10 years. Representatives of other companies concurred with this statement. Some companies did, however, offer 1-year fixed-price contracts on the basis that the specifications were known.

24. The figure of 160,000 contracts is incorrect. Kendall (1998) reports that the position was “over 200 million barrels.” As a former employee of Metallgesellschaft brought in to resolve the problems after 1993, he was aware of the firm’s actual position (see Kendall, p. 13).

25. It is difficult to document these statements. Exxon by its own admission almost never trades in futures markets. A review of the risk disclosure statements in the firm’s annual reports and 10K statements reveals that Exxon is very inactive in futures markets. Traders and Exxon personnel willingly confirm this statement. Tosco, on the other hand, is known to be a frequent user. Tosco’s CEO, Thomas O’Malley, was president of Phibro before taking over Tosco and has been one of the most successful traders in the market.

26. The volume is calculated from data reported by Bollen and Whaley (1998).

27. MGR&M Fixed Firm, Firm Flexible, and Guaranteed Margin Contracts all contain this language.

28. The state of Pennsylvania opted out of the program in December 1993, just
weeks before the program went into effect. The state’s action left many distributors in Pennsylvania with RFG that had to be marketed as lower-priced conventional fuel. See “U.S. Refining Industry Enters RFG Era,” (1994).

29. If Thorton had outlets in both Ohio and Louisville, it could theoretically have asked MGR&M to deliver conventional product to Ohio locations. However, since MGR&M agreed to supply only a fraction of any customer products, Thorton should logically have demanded that MGR&M supply it only RFG at the fixed price, while it obtained conventional products from other suppliers because such a strategy would have reduced Thorton’s total cost.

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