

Derivatives Can Be Hazardous to Your Health: The Case of Metallgesellschaft

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In late 1993 and early 1994, MG Refining and Marketing, Inc. (MGRM), the American affiliate of Germany's fourteenth largest industrial firm, Metallgesellschaft AG (MG), reported staggering losses of about \$1.3 billion on positions in energy futures and swaps (see Protzman [1994] and Eckhardt and Knipp [1994]). Subsequent to these losses, MG spent another \$1 billion buying its way out of contracts it had made with Castle Energy.¹

Only a massive \$1.9 billion rescue operation by 150 German and international banks kept MG from going into bankruptcy, an event that would undoubtedly have had far-reaching consequences for MG's creditors, suppliers, and some 58,000 of its employees (see Miller [1994]). Had MG defaulted on its enormous derivatives positions and other debt obligations, major international banks and perhaps even the clearing association of a major futures exchange could have sustained substantial losses, the ramifications of which we will never know.

What went wrong at MG, and what can we learn from the MG experience about the pitfalls of using derivatives? How could a large, sophisticated, worldwide energy conglomerate like MG have been so inept as to incur derivatives-related losses that all but destroyed the firm? Clearly, derivatives can be hazardous to a firm's health.

WAS MGRM HEDGING OR SPECULATING?

Initial press reports of MGRM's losses suggested that MGRM incurred these losses as a

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result of massive speculative positions in energy futures and over-the-counter (OTC) energy swaps. During the latter half of 1993, MGRM purportedly established long energy futures and swap positions equivalent to nearly 160 million barrels of oil, positions that would benefit handsomely if energy prices rose. Instead, energy prices (crude oil, heating oil, and gasoline) fell sharply during the latter part of 1993, causing MGRM to incur huge unrealized losses and margin calls on its derivatives positions.

Subsequent press reports, however, suggest that MGRM was not speculating but was in fact using derivatives to *reduce* the exposure it had to rising energy prices. In particular, MGRM was said to be engaged in a complex hedging operation using both futures and swap contracts as a hedge against a large volume of fixed-price, forward supply contracts for gasoline and heating oil that it had written for customers.²

MGRM's forward supply contracts committed it to supplying at fixed prices some 160 million barrels of energy products over the next ten years to end-users of gasoline and heating oil. The fixed supply prices were agreed to when the contracts were entered into, and were typically \$3 to \$5 a barrel higher than the prevailing spot prices at the time the contracts were negotiated (this was MGRM's profit margin or markup). Most of these contracts were negotiated during the summer of 1993, when energy prices were falling and end-users saw an attractive opportunity to lock in low energy prices for the future.

MGRM's counterparties in these forward contracts consisted of retail gasoline suppliers, large manufacturing firms, and even government entities. Although many of the end-users were small firms, some were substantial: Chrysler Corporation, Browning-Ferris Industries Corporation, and Comcar Industries, which has annual diesel fuel use of some 60 million gallons a year (see "New Shadows..." [1994]).

These forward supply contracts exposed MGRM to rising energy prices. If energy prices were to rise in the future, MGRM could find itself in the unprofitable position of having to supply energy products to its customers at prices below prevailing spot prices. If prices rose high enough, MGRM's profit margin could be eroded, and it could even have ended up with substantial losses for years to come.

Thus, MGRM reportedly sought to hedge this price risk with long futures and OTC swaps. Not to have hedged this risk would have put MGRM (and therefore MG) in the position of

making a substantial bet that energy prices either would fall or at least not rise in the future, a bet too large for MG to have prudently made.

MGRM'S HEDGING STRATEGY

MGRM sought to hedge the risk of rising energy prices by acquiring long energy futures positions on the New York Mercantile Exchange (NYMEX) and by entering into OTC energy swap agreements to receive floating and pay fixed energy prices (see Taylor and Bacon [1994]). MGRM's swap counterparties were large OTC swap dealers such as major banks. During the latter part of 1993, MGRM held long futures positions on the NYMEX equivalent of 55 million barrels of gasoline and heating oil (55,000 futures contracts), and had swap positions amounting to some 100 to 110 million barrels, substantial positions by any measure (see Taylor and Sullivan [1994]). Thus, MGRM was hedging its forward supply contracts on a one-to-one basis with energy derivatives.

An important aspect of MGRM's hedging strategy is that its derivatives positions were concentrated (or "stacked") in short-dated futures and swaps that had to be rolled forward continuously to maintain the hedge.³ In general, MGRM's futures and swap positions were in contracts with maturities of at most a few months from the current date, so that it had to roll these contracts forward periodically (perhaps even monthly) to maintain its hedge against the forward supply contracts.

This short-dated stack hedging strategy clearly exposed MGRM to the basis risk associated with its having to roll its futures and swap positions forward through time. MGRM apparently believed this risk to be acceptable.

Indeed, MGRM believed that a short-dated stack hedging strategy was the most attractive hedging strategy for two reasons (see *Benson v. MG* [1994]). First, because its forward delivery contracts included an "early liquidation" option for end-users if energy prices were to rise, MGRM believed that the actual duration of its forward supply contracts would likely be far shorter than the periods stated in the contracts (see Falloon [1994]). If end-users were to exercise their options, presumably because the options had value to them, MGRM would have to make substantial up-front, lump sum payments to them at the time of exercise. These lump sum payments would be based on changes in spot (or near-month) energy prices.

Specifically, they would be based on the difference between the prevailing near-month futures price at the time of exercise and the contractually fixed supply price times the quantity to be supplied over the term of the contract. MGRM believed that a stack hedge, which would increase in value substantially as spot and near-term energy prices rose, could be relied on to provide the needed funds for MGRM to meet these potential early-payment obligations.

Second, MGRM saw the necessity of having to roll its positions forward constantly as a benefit and not as a risk. MGRM believed it could earn a positive return by rolling its positions forward. More specifically, its rolling-forward strategy was designed to take advantage of a common characteristic of energy futures markets: backwardation.

In backwardation markets, oil for immediate delivery (nearby-oil) gets a higher price than does deferred-delivery oil, such as three-month oil. Thus, a strategy of purchasing deferred-delivery contracts and continually rolling these positions forward yields profits (or "roll gains").

MGRM strategy, therefore, sought to exploit the backwardation that is common in energy futures markets. Its implicit assumption was that energy futures markets would continue being in backwardation much of the time, and that the roll gains it made when markets were in backwardation would more than offset any roll losses that it incurred when markets were in contango.⁴

While it is clear that under certain conditions a short-dated stack hedging strategy such as MGRM used can be an effective way to hedge long-dated forward commitments, there are still risks associated with it.⁵ First, as with any hedging strategy, there is "operational" risk. Hedge positions must be correctly implemented and managed (and in particular the "hedge ratio" must be correct) for the hedge to reduce price exposure effectively.

Second, there is "basis risk" associated with all hedging strategies. MGRM's hedging strategy exposed it to "intertemporal basis risk" because it required MGRM to roll its derivatives positions constantly forward through time.⁶ Under certain conditions, rolling positions forward can result in substantial losses.

Third, MGRM was potentially subject to a "funding risk" because its derivatives positions were subject to mark-to-market valuation and to variation margin payments, while its forward supply contracts were not. Under some circumstances, this

marking-to-market asymmetry could result in MGRM needing sizable amounts of funding to meet margin calls.

Fourth, MGRM's forward supply contracts exposed it to "credit risk." MGRM's ability to profit on its forward supply contracts depended on its customers honoring their contractual obligations to purchase oil for many years into the future.

Finally, MGRM was subject to "reporting risks." As we shall see, the application of inappropriate accounting and disclosure conventions to MGRM's hedging activities resulted in misleading financial statements that threatened to undermine public confidence in the firm.⁷

WHAT WENT WRONG?

MGRM's problems surfaced in late 1993 when energy spot prices tumbled (instead of rising, as MGRM had both expected and feared). As a result, MGRM experienced large unrealized losses on its stacked long futures and swap positions and incurred huge margin calls.⁸ Adhering to German accounting and disclosure principles, MG disclosed these unrealized losses publicly, sending shock waves through the financial community.

In addition, because of an unusual forward pricing curve in energy futures markets during 1993, MGRM sustained substantial "rolling losses" when it rolled its large stacked futures positions forward through time. In 1993, energy futures markets were in contango for almost the entire year, causing MGRM to incur losses each time it rolled its derivatives positions forward.

If, instead, energy prices had risen rather than fallen, there would have been no problem. MGRM would have had unrealized gains on its derivatives positions and positive margin flows (or cash inflows). In addition, when prices are rising, energy markets are often in backwardation, rather than contango, so that MGRM may not have had rollover losses. The fact that MGRM also would have had unrealized losses on its forward delivery obligations would not have mattered. No one would have cared.

But energy prices did fall, from around \$19 a barrel of crude oil in June of 1993 to less than \$15 a barrel in December 1993, forcing MGRM to come up with enormous amounts of money to fund margin calls and rollover losses so that its hedge positions could be maintained. In response to these reversals, MG's supervisory board brought in new management, which quickly made the decision to

liquidate the bulk of MGRM's derivatives positions and forward supply contracts.

While complete information about all aspects of MGRM's energy and hedging strategies is not yet available, some key implications can already be drawn from the MG experience. First, conflicting and inappropriate accounting and disclosure conventions can undermine a firm's hedging strategy by causing confusion among its creditors and investors about what the firm is doing and about its financial position. Confusion of just this kind undermined public confidence in MG, likely weakening its ability to cope with MGRM's problems.

Second, short-term funding requirements such as MG experienced, if not anticipated and properly managed, can undermine an otherwise sound hedging strategy. Finally, lack of understanding at board level about how a firm is using derivatives can ultimately undermine a firm's hedging strategy.

CONFLICTING AND MISLEADING ACCOUNTING CONVENTIONS

MGRM's problems were compounded by widespread confusion about its financial position caused by conflicting and inappropriate accounting conventions. Under German accounting principles, unrealized losses on open forward positions have to be recognized at the end of the financial year, but unrealized gains on open forward positions are not allowed to be recognized.⁹

For MGRM, this meant that, when energy prices fell in late 1993, MG had to recognize MGRM's unrealized losses on its derivatives positions (futures and swaps), but was unable to recognize any unrealized gains that MGRM may have had on its forward supply contracts. Thus, MG reported huge derivatives-related losses, leaving the impression that these losses were incurred by inappropriate and possibly speculative trading in derivatives by MGRM, and that MG's financial solvency was itself in jeopardy.

Not recognizing the gains on MGRM's forward supply contracts resulting from the fall in energy prices distorted the true picture of MGRM's financial position. Falling energy prices made MGRM's forward supply contracts more valuable, because these contracts gave MGRM the right to sell oil at higher fixed prices. It is hypothetically possible that MGRM's unrealized derivatives losses could have been almost entirely offset by unrealized gains on its forward supply contracts.¹⁰

(Even if "perfectly" hedged, MGRM would still have experienced losses because of its rolling costs during 1993. However, these losses would have been much lower than the losses on the derivatives positions that occurred because of falling energy prices during 1993.)

In any case, MGRM would certainly have had some amount of unrealized gains on its forward supply contracts, which would have offset some of its derivatives losses. Thus, had MGRM's unrealized gains on its forward supply contracts been recognized as well as the unrealized losses on its derivatives positions, MGRM (and therefore MG) would have been able to report smaller losses than it did.

Unlike German accounting conventions, U.S. hedge accounting principles recognize this reporting asymmetry, and impose different disclosure requirements on hedgers. U.S. "hedge-deferral" accounting principles do not require that either unrealized gains or unrealized losses on hedged positions be recognized.

Thus, had MGRM been subject to U.S. accounting principles, it would not have had to report its unrealized derivatives losses at all. It would not have had to report these losses until realized, which would presumably have occurred at the time that it also recognized the gains on its forward supply contracts.

Alternatively, U.S. accounting conventions allow a firm with a hedged position to mark both sides (or positions) to market. In particular, MGRM could have marked to market both its forward supply contracts and its derivatives positions, permitting the immediate recognition of the respective gains and losses on both positions.

The application of both German and U.S. accounting principles to MGRM clearly created confusion among MG's creditors and investors. In particular, MG's U.S. and German auditors at different times issued conflicting reports on MG's condition.

On November 19, 1993, just before its supervisory board meeting at which MG's then-Chairman's contract was extended for another five years, MG's U.S. auditor, Arthur Andersen, disclosed that MGRM had a \$61 million profit before taxes for the fiscal year ending September 30, 1993. Further, it reported that MGRM's U.S. parent, MG Corporation, had a profit of \$30 million for the fiscal year (see Eckhardt and Knipp [1994]).

Just a short time later, however, MG's German auditor, KPMG, apparently applying German accounting principles, reported a loss of hundreds of millions of dollars for MG's U.S. opera-

tions for the same fiscal year ending September 30, 1993 (see "Benson's Billion Dollar Lawsuit" [1994]).

Which set of figures gave the most accurate picture of MG's financial health? One indicates that MG was profitable and doing nicely, the other that MG's losses were so large that they threatened the solvency of the firm. Thus, conflicting and inappropriate accounting conventions contributed to confusion about MG's true financial state, undoubtedly weakening the firm's ability to deal with its problems.

FUNDING PROBLEMS

Because of falling energy prices, MG was forced to fund sizable margin calls on MGRM's derivatives positions. According to press reports, MG's creditors balked at providing the necessary funds for MGRM to meet these margin calls (see Parkes and Waller [1993]). It is not clear, however, why MG's creditors refused to make this credit available. If, for example, MGRM had unrealized gains on its forward supply contracts (due to falling energy prices) that were equal and offsetting to the unrealized losses on its derivatives positions, it is not clear why MG's creditors would have refused to make loans against the collateral of these forward supply contracts. The market value of the firm, after all, would not change.

MG's creditors may have been reluctant to lend against the collateral of MGRM's forward supply contracts for two reasons. First, these contracts may have lacked sufficient transparency. In particular, although falling energy prices, everything else equal, should have increased the net present value of MGRM's forward supply contracts, MG's creditors may have been concerned about the continued creditworthiness of MGRM's contractual counterparties over the long time period covered by these contracts (as much as ten years). For MGRM to realize its full profits on these contracts, its counterparties would have to make good on their future obligations to purchase oil from MGRM at the fixed contractual prices, which might have been considerably higher than prevailing spot prices at the time of the required purchases.

Thus, if MG's creditors believed that they did not have sufficient information to make an independent evaluation of MGRM's credit risk, they may have responded by heavily discounting the potential increase in MGRM's cash flows on its forward supply contracts. This would have made it difficult for MG

either to sell (or liquidate) its forward supply contracts or to borrow against them to meet margin calls.

Notwithstanding this possible non-transparency, it has been reported that on December 7, 1993, Chemical Bank (and possibly other banks) offered financing to MGRM on the basis of MGRM securitizing its forward supply contracts (see Eckhardt and Knipp [1994]). Of course, we do not know the terms that the banks were offering, or how big the "haircut" would have been. In addition, it is noteworthy that MG had available a DM 1.5 billion Eurocredit line with forty-eight banks that it seemingly could have used to fund margin calls.

The second reason that MG's creditors may have refused to make the necessary funds available is that MGRM may have been "overhedged." MGRM has reported using a one-to-one hedge ratio, which may have resulted in its derivatives position being greater than required to match (or to offset) changes in the net present value of its forward supply contracts due to price changes. If this were the case, when energy prices fell, MGRM would have incurred greater losses on its long derivatives positions than it would have had gains on its forward supply contracts.

Thus, the value of MGRM's forward supply contracts would not have been sufficient to collateralize the loans it needed, forcing MG to borrow by increasing its general debt obligations. The prospect of such a large increase in MG's debt may have alarmed its creditors, especially when MG's conflicting financial disclosures about MGRM's activities created an atmosphere of uncertainty and confusion about the continued viability of the firm.

MG's funding needs also were aggravated by actions taken by the New York Mercantile Exchange (NYMEX) at the end of December 1993. Just when MGRM's funding needs were the greatest, NYMEX demanded "supermargin" — margin in excess of twice normal levels — from MGRM, placing an even greater strain on MG's resources. NYMEX also revoked MGRM's "hedger exemption" from its speculative position limits, forcing MGRM to liquidate part of its futures positions and to realize some of its unrealized losses (see Culp and Hanke [1994]).

It is not clear why the NYMEX took these drastic "regulatory" actions, but it appears to have acted only after the December 17 firing of the entire management board of MG by MG's supervisory board. Also, the new management's decision to force MG's commercial counterparties to draw down on the standby letters of credit issued to MG by various

banks may have convinced the NYMEX that MG was caught in a liquidity squeeze.

Thus, in retrospect, it is clear that MGRM's hedging strategy did expose it to "funding" risk associated with having to meet margin calls on its short-dated derivatives positions, and that MGRM was not adequately prepared to meet these funding needs. Further, MGRM's funding problems appear to have been exacerbated by conflicting and misleading accounting and disclosure conventions and by a lack of understanding on the part of its creditors and the financial community about exactly what it was doing.

LACK OF UNDERSTANDING AT THE SUPERVISORY BOARD LEVEL

On November 19, 1993, the supervisory board of Metallgesellschaft extended the contract of its management board chairman, Heinz Schimmelbusch, for another five years. Exactly four weeks later, the same supervisory board fired Schimmelbusch. MG's new management quickly decided to liquidate the bulk of both MGRM's derivatives positions and its forward supply contracts, a strategy that proved immensely costly for MG.

Between December 20 and December 31, 1993, when prices for crude oil, heating oil, and gasoline were at their lowest in many years, MGRM liquidated most of MGRM's futures and swap positions, resulting in substantial realized losses on its derivatives positions.¹¹ Judging from daily closing prices for that period, MGRM probably liquidated these positions at an average price of about \$14 a barrel.¹² Assuming that MGRM had acquired these derivatives positions at an average price of \$18 a barrel, an average liquidation price of \$14 a barrel would have meant a loss of \$640 million on its 160 million barrel derivatives position.¹³ In addition, in order to eliminate its exposure on its forward supply contracts if prices rose, MGRM liquidated these contracts as well, apparently waiving cancellation penalties on the contracts, thereby giving up unrealized gains that could have offset at least some of MGRM's derivatives losses.

Had MG's new management not ordered the liquidation of MGRM's position, the situation would be far different today. From December 17, 1993, when the new management took control, to August 8, 1994, crude oil prices increased from \$13.91 to \$19.42 a barrel; heating oil prices increased from \$18.51 to \$20.94 a barrel; and gasoline prices increased from \$16.88 to \$24.54 a barrel.¹⁴ Given these price increases, MGRM would have had

substantial unrealized gains in its derivatives positions and a huge inflow of margin funds.

What inferences can be drawn from MG's supervisory board's decision to liquidate MGRM's forward supply contracts and its derivatives positions? We know that during the summer of 1993, when energy prices decreased sharply, MGRM substantially expanded its strategy of providing its customers with fixed-price, long-term, forward supply contracts, and then hedging its price risk with derivatives. Thus, prior to its extending Schimmelbusch's contract on November 19, MG's supervisory board must have known (or, if it did not, it should have known) about MG's forward-contracting strategy and its use of derivatives.

The supervisory board's liquidation decision in December, therefore, suggests three interpretations. One is that the board was informed about MG's forward-contracting strategy but did not fully understand the potential risks and funding requirements that the strategy entailed. Another is that the board understood the risks that were involved, but later changed its collective mind about the magnitude of these risks in the face of the huge margin calls that occurred. Still another possibility is that the strategy that the board approved was sound, but the board panicked in the face of huge margin calls when it ordered the liquidation of MGRM's positions.

Under all three scenarios, one thing seems clear: At some point MG's supervisory board either failed to understand fully MGRM's forward-contracting and associated hedging strategies or seriously misjudged the risks that MGRM's strategy entailed.¹⁵

WHAT ARE THE LESSONS FROM METALLGESELLSCHAFT?

Metallgesellschaft's near-collapse and experience with derivatives suggests some lessons for firms using derivatives and for policymakers. My inferences can be drawn from the MG experience independent of what one might conclude about whether MG's strategy exposed it to unreasonable risk.

ACCOUNTING AND DISCLOSURE CONVENTIONS MUST BE APPROPRIATE

Conflicting and inappropriate accounting and disclosure conventions can create uncertainty about a firm's hedging program and make it difficult for a firm to raise money when it needs to. Accounting and disclosure requirements for firms using derivatives to

hedge can be informative if they are appropriate, and provide meaningful information. Otherwise, they can result in misleading financial statements that can wreak havoc on firms and markets. Particularly in rapidly developing markets like OTC derivatives, accounting and disclosure conventions developed to meet past needs may be inappropriate for reporting new activities.

The MG case clearly demonstrates the dangers of treating derivatives positions differently from the assets or liabilities that the derivatives are being used to hedge. There should not be accounting recognition of gains and losses on derivatives positions used for hedging unless the gains and losses on the positions that are being hedged also are recognized.

MG's disclosures recognized losses on its derivatives positions but did not recognize any gains on the forward energy contracts it was hedging. Thus, accounting and disclosure conventions that treat derivatives positions asymmetrically are misleading and can result in unwarranted market responses to firms' disclosures.

Two accounting alternatives seem preferable to the one used by MG. One is to mark both sides to market — the derivatives positions and the positions being hedged. The other is to adopt "hedge-deferral" principles.¹⁶ The first, marking both positions to market, requires an ability to determine reasonably accurate and unambiguous values for all positions. In some cases, this may be difficult, and may give the firm wide latitude in determining values.

MG may be a case in point. MGRM's forward supply energy contracts were for durations as long as ten years. To determine the net present value of these contracts, therefore, it would be necessary to select a forward pricing curve for the various energy products on which the forward contracts were written. No choice is clearly correct, and any choice could subject MG to criticism, since MG would be able to exercise considerable discretion in making its choice.

For instance, MG could have chosen to value the contracts on the assumption that current spot energy prices would exist for the next ten years. Alternatively, it could have used the forward pricing curve that existed at the time of its report — but reliable forward prices for energy products are available for only a short period of time into the future. MG would have had to select a methodology for extrapolating existing forward prices out to ten years. Thus, whatever method MG used to estimate the present value of its forward supply contracts could subject it to criticism.

The valuation of MGRM's forward supply contracts was made even more difficult by the presence of two additional factors: The contracts included "early liquidation" customer options, and there was considerable uncertainty about MGRM's counterparty credit risk.

With respect to its customer options, if energy prices were to rise such that MGRM's forward supply contracts went "into the money" for its customers, MGRM's customers had an option to "cash out" of these contracts, requiring MGRM to make substantial up-front payments. Further, the exercise of these options would substantially shorten the duration of the forward supply contracts.

Thus, to value the forward supply contracts, it would have been necessary to estimate the likelihood of the embedded options being exercised (which was dependent on the likelihood of an increase in energy prices and on changes in the forward pricing curve), and the likely costs to MGRM if the options were exercised. Considerable discretion exists in the procedures that MGRM could have used to value these options.

Finally, the options were asymmetrical. MG's customers had no option in the event of falling energy prices (which is what actually occurred).

The value of MGRM's forward supply contracts was also dependent on how the credit risk associated with these contracts was evaluated. Although these contracts would become more valuable to MGRM if energy prices fell, MGRM's ability to reap the full value of these contracts was dependent on the willingness and ability of its customers to meet their contractual obligations over a period of time as long as ten years. To value the forward supply contracts, therefore, it would be necessary to estimate probable default rates over many years and to place a concrete number on the likely distribution of MGRM's default losses.¹⁷ Once again, MGRM would have had considerable discretion in how it determined its likely default losses.¹⁸

The second alternative accounting convention is the "hedge-deferral" principle, under which neither gains nor losses on derivatives positions used for hedging are recognized until the gains and losses on the positions being hedged are realized. While this procedure has the virtue of treating both sides symmetrically, it may not provide adequate disclosure of the risks that firms are taking.

In particular, application of hedge-deferral accounting principles to MGRM's hedging strategy would not have made clear the risks that this strategy

entails. It would not, for example, have made clear the implications of MGRM not having a hedge position that balanced changes in the net present value of its forward supply contracts, or the implications of its using short-dated derivatives to hedge long-term commitments.

At minimum, therefore, adoption of hedge-deferral accounting conventions should be accompanied by footnotes explaining the nature and purpose of the firm's derivatives positions and the potential risks to which the firm is exposed.¹⁹ There remains, of course, the issue of how complete a firm's disclosures can be before they become unacceptable because they require revealing proprietary information.

BOARDS AND MANAGERS MUST UNDERSTAND DERIVATIVES STRATEGIES AND IMPLICATIONS

It is critical that both senior managers and the board of directors of a firm understand how a firm is using derivatives, and, if the firm is using derivatives as part of a hedging strategy, that they understand and approve of the potential ramifications and risks associated with this strategy. In general, the board should formally ratify this strategy before it is implemented.²⁰ In addition, senior managers should understand the firm's exposure to changes in prices and to basis changes, and should be informed about potential funding needs.

The facts of the MG case suggest that MG's supervisory board either did not fully understand the risks associated with MGRM's forward-contracting and associated hedging strategy or did not correctly evaluate these risks when it approved this strategy.

BOARDS AND MANAGERS MUST ACKNOWLEDGE FINANCIAL AND REGULATORY CONSTRAINTS

It is important for hedgers to anticipate and to manage funding needs.²¹ A critical need is to have the backing of financial institutions that understand and approve of the firm's use of derivatives, and are willing to advance credit to fund margin outflows on derivatives positions. MG apparently did not have such an understanding with its creditor banks.

Managers of firms using complex derivative strategies must be cognizant of the possibility of unanticipated "regulatory" actions (by either government regulators or exchange officials), and of the potential consequences of these actions for the

firm's position. The actions taken by NYMEX in raising MGRM's margins and revoking its hedger exemption clearly exacerbated MG's problems.

DERIVATIVE MARKET LIQUIDITY

The MG case suggests that both organized futures markets and OTC derivatives markets may be more liquid than commonly believed (see, for example "Financial Derivatives..." [1994]). The forced liquidation of MGRM's massive derivatives positions was accomplished quickly, with very little market impact. Almost all of this liquidation was done, either directly or indirectly, on the NYMEX. MGRM sold its long futures positions directly, and, in liquidating its swap positions, it undoubtedly forced its swap counterparties (or dealers) to liquidate the long futures positions on NYMEX that they were almost surely using to hedge their swap positions with MGRM. During MGRM's massive liquidation late in December 1993, energy prices were largely unchanged, and even rose a bit. Apparently, there were ample buyers readily available to absorb MGRM's forced sales.

INTERNATIONAL CONSIDERATIONS

The MG debacle raises an obvious question about the efficacy of the German system of corporate governance. This system relies on large stakeholders in a company acting as directors and managers of the company. As I have argued elsewhere, in theory directors with a large stake in a company's performance will be better informed about the company's activities and can be expected to be more vigilant *monitors of the company's management*. (See Edwards [1993] and Roe [1993].)

MG is a classic example of a German firm: Seven institutional investors held just over 65% of the company's stock. The Emir of Kuwait held 20%; Dresdner Bank, Germany's second-largest commercial bank, held 12.6%; a holding company jointly owned by Deutsche Bank (Germany's largest commercial bank) and Allianz (a major insurance company) held 13.2%; Daimler-Benz, the giant automaker, held 10%; the Australian Mutual Provident Society held 6%; and M.I.M. Holdings Ltd. of Australia held 3.5% (see Protzman [1994] and "Metallgesellschaft Woes..." [1994]). In addition, German banks typically control large amounts of stock through proxies given to them by their clients. The chairman of MG's supervisory board is Ronaldo

Schmitz, who also is a prominent member of the management board of Deutsche Bank. Despite this high-powered board, a lack of understanding at the supervisory board level appears to have contributed substantially to the MG debacle.

The MG experience, therefore, clearly brings into question the effectiveness of the German system of corporate governance and, in particular, of large banks as corporate monitors.

Recent press articles have indicated that leading politicians in all parties in Germany have introduced legislation to limit the stakes that banks can hold in industrial companies. (See Friedman [1994].)

ENDNOTES

An earlier version of this article was presented at the Conference on "The Implications of Derivatives for Regulation," London School of Economics, December 2, 1994. The author thanks conference participants for their helpful comments.

¹See "How a Former Banker..." [1994]. MG's total losses appear to be almost as much as its entire total capital, which was DM3.672 on September 30, 1994.

²See Affidavit of W. Arthur Benson, *W. Arthur Benson v. Metallgesellschaft Corp. et al.*

³A "stack" hedge refers to a futures position being "stacked" or concentrated in a particular delivery month or months rather than being spread over many delivery months. In MGRM's case, it placed the entire 160 million barrel hedge in short-dated delivery months, rather than spreading this amount over many, longer-dated, delivery months.

Common reasons for using short-dated stack hedges are that liquidity is much better in near-month contracts (or longer-dated derivatives are simply not available), and hedgers may hold certain expectations about how the term structure of energy futures prices will change in the future. Culp and Miller [1994] refer to MGRM's short-dated, stack hedging strategy as a "textbook" strategy.

⁴Markets in which nearby prices are below deferred-month prices are commonly referred to as "contango" markets. In contango markets, MGRM's rolling forward strategy would produce losses.

⁵For a discussion of the pros and cons of stack hedging strategies, see Edwards and Ma [1992, pp. 305-307]. For a discussion of using a short-dated stack hedging strategy to hedge long-dated forward obligations, see Culp and Miller [1994].

⁶MGRM may also have been exposed to significant basis risk if it "cross-hedged" — hedged, say, heating oil with crude oil futures. The full details about MGRM's hedging positions have not been made public — which futures, what amounts, on which dates, and so forth.

⁷Edwards and Canter [1995] analyze these risks in greater detail.

⁸Futures contracts are marked to market daily by exchanges, and traders are required to post with the exchange any losses they incur. In addition, while swap contracts usually are not formally marked to market, it is not uncommon for counterparties in swap agreements to call for additional collateral from losing counterparties as losses mount. Such collateral can often be posted in the form of bank letters of credit.

⁹One reason for these account principles may be that in Germany financial statements are used for tax purposes as well. Thus, if the objective is to maximize "tax losses," recognizing only unrealized losses accomplishes this.

¹⁰This would have been true, for example, if MGRM had

successfully used a "minimum-variance" hedge ratio.

¹¹MRC Oil Division Retainer Fax [1993].

¹²MGRM had long futures positions in crude oil, heating oil, and gasoline.

¹³MG did not finish liquidating its positions until sometime early in 1994.

¹⁴I assume liquidation began when the new management took control on December 17, 1993. See MRC Oil Division Retainer Fax [1993]; "CEO Schimmelbusch to Leave MG" [1993]; and "MG Fires Top Management After Loss" [1993].

¹⁵The fact that MG's supervisory board in December rejected alternative actions that could have protected MG against further margin outflows is evidence that it did not believe that MGRM's forward-contracting strategy was fundamentally sound. For example, MG could have protected itself against further margin outflows due to price declines by purchasing put options on energy products, which were available in December 1993. This strategy would have neutralized further margin outflows on MGRM's long futures and swap positions, and may have been able to lock in the net gains MGRM had.

¹⁶See "Recommendation 19: Accounting Practices," of the Group of Thirty Study [1993], which states:

— End-users should account for derivatives used to manage risks so as to achieve a consistency of income recognition treatment between those instruments and the risks being managed. Thus, if the risk being managed is accounted for at cost (or, in the case of an anticipatory hedge, not yet recognized), changes in the value of a qualifying risk management instrument should be deferred until a gain or loss is recognized on the risk being managed. Or, if the risk being managed is marked to market with changes in value taken to income, a qualifying risk management instrument should be treated in a comparable fashion.

— End-users should account for derivatives not qualifying for risk management treatment on a mark-to-market basis.

¹⁷There is evidence that "cumulative" default rates rise sharply with time. See Fons [1994].

¹⁸See "Recommendation 10: Measuring Credit Exposure," in the Group of Thirty Study [1993], which proposes that end-users and dealers measure credit exposure in two ways:

— Current exposure, which is the replacement cost of derivatives transactions, that is, their market value.

— Potential exposure, which is an estimate of the future replacement cost of derivatives transactions. It should be calculated using probability analysis based upon broad confidence intervals (e.g., two standard deviations) over the remaining terms of the transactions.

¹⁹See "Recommendation 20: Disclosures," of the Group of Thirty Study [1993], which recommends disclosure of:

— Information about management's attitude to financial risks, how instruments are used, and how risks are monitored and controlled;

— Accounting policies;

— Analysis of positions at the balance sheet date;

— Analysis of the credit risk inherent in those positions;

— For dealers only, additional information about the extent of their activities in financial instruments.

See also "Public Disclosure of Risks Related to Market Activity" [1994].

²⁰See "Recommendation 1: The Role of Senior Management," of the Group of Thirty Study [1993], which states:

— Dealers and end-users should use derivatives in a manner consistent with the overall risk management and capital policies approved by their boards of directors. These policies should be reviewed as business and market circumstances change. Policies governing derivatives use should be clearly defined, including the purposes for which these transactions are to be undertaken. Senior management should approve procedures and controls to implement these policies, and management at all levels should enforce them.

²¹See "Recommendation 9: Practices of End-Users," of the Group of Thirty Study [1993], which states:

— As appropriate to the nature, size, and complexity of their derivatives activities, end-users should adopt the same valuation and market risk management practices that are recommended for dealers. Specifically, they should consider regularly marking-to-market their derivatives transactions for risk management purposes; periodically forecasting the cash investing and funding requirements arising from their derivatives transactions; and establishing a clearly independent and authoritative function to design and assure adherence to prudent risk limits.

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