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Credit Risk Via EWRM**Credit Risk Management for Energy and Commodity Firms in a EWRM framework**

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The domino effect of defaults after the electricity price spikes in the Summer of 1998 as well as restructurings after the year 2000 have highlighted the industry's need to have a better understanding of credit risk. A chain of bankruptcies, including high-profile cases like Enron, Mirant, NRG, PG&E and Southern California Edison, have stimulated the evolution of best-practice policies and methodologies to manage credit risk inherent in energy trading and business activities. In this article, we provide an overview of some of the key issues in counterparty

risk measurement and management for energy and commodity firms.

1. Introduction

A credit risk manager regularly makes complex judgments on the credit worthiness of an energy company's counterparties. This analysis, based on both quantitative and qualitative factors, requires the manager to integrate many different pieces of information to assess the credit quality of the counterparty.

The first factor affecting the portfolio is credit standing. A trading firm, for example, usually strives to trade with prime, investment-grade counterparties that have a very low probability of default. Alternatively, in order to conduct certain transactions, energy firms often choose to trade with more risky, speculative-grade counterparties. A typical disclosure in an

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annual reports and 10-Ks regarding the quality of the counterparties of an energy firm is shown in Table 1.

The second factor is the degree of “concentration risk.” Concentration risk is the extent to which counterparties are diversified across geographical markets and industries. For ex-

Table 1: Counterparty credit quality and exposure for Sempra Energy Trading at Dec. 31, 2003 and 2002, expressed in terms of net replacement value.

(Dollars in millions)	December 31,	
	2003	2002
Counterparty credit quality*		
SET:		
Commodity exchanges	\$ 134	\$ 49
AAA	5	69
AA	310	194
A	463	316
BBB	345	559
Below investment grade	357	504
Total	<u>\$1,614</u>	<u>\$1,691</u>

Source. *Sempra Energy. 2003 Annual Report*

ample, the credit quality of Calpine, PG&E and Southern California Edison was clearly codependent because they shared the same geographical markets. Due to the California energy crisis, they simultaneously experienced credit problems.

This leads to the third important factor that affects portfolio risk: the state of the energy markets in which firms conduct their business. For most industries, the frequency of defaults falls sharply during periods of economic growth and rises during periods of recession. Periods of high default rates, such as 2001-2002, are typically characterized by low recoveries that in turn lead to high loss rates. Historically, energy-trading firms have had a relatively low level of bankruptcies and restructurings since the Great Depression. But recently there has been a clustering of negative credit events. Energy companies that have had to file for Chapter 11 or restructure during the period from 1998 to 2000 include El Paso Electric Company, Public Service Company of New Hampshire, Columbia Gas System, Columbia Gas Transmission and Tucson Electric Company. After 2000, other companies that suffered credit events included the PG&E’s National Energy Group, Enron, NRG, Mirant, Northwestern, Southern California Edison and Covanta. Most of the companies in that last cycle of defaults were merchant energy ventures.

The credit quality of the portfolio is also affected by the maturities of the various contracts. Usually, everything else being the same, longer maturities are considered riskier than short-term maturities. Time diversification can reduce the risk of the portfolio since maturities can be spread over seasons and economic cycles. One of the lessons learned from the last few years is that energy market participants should be particularly prudent about extending large lines of credit, particularly for deals with longer maturities. Creditors should understand the nature of the energy business as well as the complexity of the risks. Creditors should also recognize when they are being asked to extend credit beyond the core business activities of an energy firm.

Another important aspect is the collateral used as a buffer against potential credit events. Well-structured collateral clauses that protect against potential negative credit events can greatly diminish the potential of a domino effect.

2. Obtaining Information

A key problem faced by credit analysts of energy and

commodity firms is obtaining information about their counterparties. The data about companies are often of unproven quality (e.g. Enron) and are therefore less reliable. It can be a challenge to extract the minimum-required information in order to improve the allocation of credit.

The energy credit analyst needs to consider many diverse attributes of

the counterparty. These attributes are financial as well as managerial, quantitative as well as qualitative. Energy firms can experience credit problems due to poor managerial decisions. For example: Enron’s decision to move into emerging markets – telecommunications bandwidth, data storage and water – was a factor in its decline.

The energy analyst must ascertain information on the financial health of the firm. This includes determining if earnings and cash flows are sufficient to cover potential obligations, obtaining information on the quality of the assets as well as the liquidity position of the firm and accounting for features of the firm’s industry and geographical area, as well as its status within its industry. The analyst must also consider the effects of macro events such as weather, price increases in global commodities (such as oil) and the country risk of the firm and its industry. Combined industry and country factors are typically assessed to calculate the correlation between assets for the purpose of calculating portfolio effects. Now we will describe an internal risk-rating system that can be constructed based on this information.

It is also important to assess the credit risk derived from contagion effects. Contagion effects can arise through “sleeving,” a practice in which a counterparty with a strong credit profile makes a transaction between two counterparties with weak credit profiles possible by assuming the role of an intermediary. The intermediary enters into a long-term position with Counterparty A and automatically enters into a similar, short-term position with Counterparty B, thereby offsetting the market risk of the operation. The intermediary absorbs the credit risk from counterparties A and B in exchange for a fee charged through the bid-ask spread.

For example, in the Summer of 1998, the arrangements between generators and final buyers to transfer the credit risk to highly rated counterparties broke down due to dramatic market swings. This caused a domino effect that affected several firms that had to cover short positions in the spot market.

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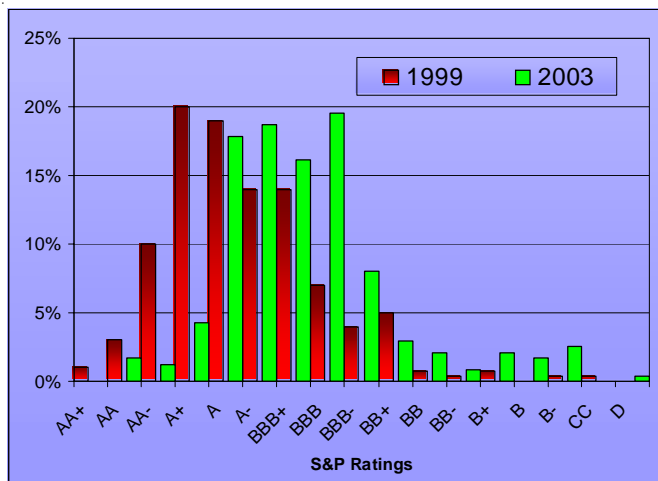
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Federal Energy Sales, of Rocky River, OH, had sold call options to various utilities and marketers, but it did not have the capital to pay if those options were exercised. Once prices “spiked” to record levels, Federal Energy defaulted on its obligations. The default also caused the City of Springfield, IL, to default on options it had written to four large utilities under the assumption that they were fully backed by contracts with Federal Energy. When Federal Energy defaulted, they were left in a “naked” position that forced the city into Chapter 11. According to FERC, city officials acknowledged that they didn’t adequately study the risks involved in energy derivatives markets, and they argued that credit checks were impossible because many companies were not rated by credit rating agencies. Power Company of America also defaulted as a result of contracts not honored by Federal Energy Sales.

3. Using Information from Issuer and Issue Evaluations

There are several established rating systems that an energy analyst can use to assess the overall risk of trading with a particular counterparty. “Issuer credit ratings” are based on an opinion of the obligor’s overall capacity to meet its financial obligations. The opinion is neither specific to any particular liability of a counterparty, nor does it consider the merits of having guarantors for some of the obligations. In the issuer credit rating category are counterparty ratings, “corporate credit ratings” and “sovereign credit ratings.” Figure 1 shows the S&P ratings distribution for utilities in the year 1999 and the year 2003. The whole distribution clearly shifted to the right, as the industry experienced financial difficulties that resulted in widespread credit downgrades.

Figure 1: Standard & Poors Utility Ratings Distribution as of year-end 2003 versus year-end 1999



Another class of rating is “issue-specific or facility credit ratings.” A facility is typically the instrument itself. The rating process includes quantitative, qualitative and legal analyses. The quantitative analysis is based on complex mathematical models and financial analysis based on the firm’s financial reports. The qualitative analysis concerns the quality of management. It includes a thorough review of the firm’s competitiveness within its industry, the expected growth of the industry and its vulnerabil-

ity to technological changes. The legal analysis relates to regulatory changes and labor relations. When rating a company in the energy space, key considerations include the liquidity position of the firm and ready access to capital markets, the ability to generate cash flows in a solid and predictable fashion and a clearly articulated and defined strategy.

The assessment of the firm’s management, although subjective in nature, entails investigating its likelihood of operational success and its risk tolerance. The nature of a firm’s competition within its industry is a very important consideration. This analysis concentrates on issues such as market position in specific markets locally and internationally, including barriers to entry, revenue generation (including pricing, utilization of capacity, service reputation, and productivity), cost control (for labor, fuel, commissions), and the quality of the operations.

The rating process includes meetings with the management of the issuer to review operating and financial plans, policies and strategies. All the information is reviewed and discussed by a rating committee comprised of members who have appropriate expertise in the relevant industry. The rating committee then votes on the recommendation. Usually the ratings are reviewed at least once a year based on new financial reports, new business information and review meetings with management.

4. Probability of Default Based on an Internal Risk Rating Approach

A credit analyst for a trading firm often expresses credit views using a risk rating system (RRS) that assigns both an obligor rating to each counterparty (or group of counterparties) and a facility rating to each available facility or transaction. A risk rating (RR) is designed to depict the *risk of loss* in a credit facility or transaction. A robust RRS should offer a carefully designed, structured and documented series of steps for the assessment of each rating. The goal of the credit analyst is to generate accurate and consistent risk ratings, while allowing professional judgment to significantly influence a rating when appropriate. A typical risk rating methodology (RRM) initially assigns a counterparty rating that identifies the expected *probability of default (PD)* by that borrower (or group) in repaying its obligations in the normal course of business

5. Probability of Default Based on Mathematical Models

The credit analyst typically uses a number of approaches for credit modeling in order to calculate a PD for each counterparty. Modeling credit risk and pricing risky credits is a complicated task, and in many cases an analyst must rely on multiple methodologies. The factors that affect credit risk are both exogenous and endogenous (such as capital structure). The approaches can be grouped in the following categories:

Credit migration approaches: These approaches are based on the analysis of credit migration, i.e., the probability of moving from one credit quality to another, including default, within a given time horizon (often arbitrarily taken to be one year). CreditMetrics is the best-known methodology using this approach, and was originally developed by JP Morgan. CreditMetrics models the full forward distribution of the values of any bond or loan portfolio, say one-year forward, where the changes in values are related to credit

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migration only. Interest rates are assumed to evolve in a deterministic fashion. The credit VaR of a portfolio is then derived in a similar fashion as for market risk. It is simply the distance from the mean of the percentile of the forward distribution at the desired confidence level. (This definition applies to all credit risk models, and is independent of the underlying theoretical framework.)

Merton-based structural form approaches: These approaches are based on the asset value model originally proposed by Merton in 1974. KMV's methodology is the best known in this category and it used to assess default probabilities and the loss distribution related to both default and migration risks. KMV's methodology differs from CreditMetrics in that it relies on the "expected default frequency (EDF)" for each issuer or counterparty, rather than on the average historical transition frequencies produced by the rating agencies for each credit class.

Actuarial approaches: These approaches focus on default rather than credit migration. The most common approach in this class is CreditRisk+ developed by Credit Suisse Financial Products (CSFP). CreditRisk+ assumes that the dynamics of default for individual bonds or loans follows a Poisson process.

"Reduced form" approaches: These are currently the foundation of credit derivatives pricing models. These models allow one to derive the term structure of default probabilities from credit spreads.

For a detailed comparison of the main credit risk modeling methodologies, we recommend Crouhy, Galai and Mark (2002).

6. Internal Risk Rating Systems

A risk rating system (RRS) identifies the *risk of loss* by assigning a risk rating (RR) to each individual credit facility granted to a counterparty. RRs quantify the quality of individual facilities, credits and portfolios. If the RR is accurately and consistently applied, it provides a common understanding of risk levels and allows for active portfolio management. An RRS also provides the initial basis for capital charges used in various pricing models. It can also assist in establishing reserves.

The obligor rating represents the probability of default by a counterparty or group in repaying its obligation in the normal course of business. Counterparty ratings represent the expected loss with any counterparty, and combine the likelihood of default by a counterparty and the conditional severity of loss from the exposures with a given counterparty, should default occur.

The process should ensure that all counterparties are objectively rated using a consistent set of criteria to arrive at accurate ratings. For example, the RRS process could have nine steps. The first five steps arrive at an obligor rating such as a:

1. Financial assessment of the counterparty (initial counterparty rating) that sets a floor on the counterparty rating (CR).

A series of further steps arrive at a final counterparty rating, which may be lower than the initial rating attributed in Step 1.

2. Analysis of the managerial capability of the counterparty;
3. Examining the counterparty's absolute and relative position within the industry;
4. Review of the quality of the financial information;
5. Examining the country risk.

Additional steps (four, in our example) are associated with arriving at a final facility rating, which may be above or below the final counterparty rating.

6. Examination of third-party support;
7. Factoring in the maturity of the transaction;
8. Review of how strongly a facility is structured;
9. Examination of collateral.

Panel 1: Parent Company Guarantees

To analyze the counterparty risk of the energy-trading arm of an energy firm, it is important to understand the business and financial linkages between units within the same group and also to investigate potential contagion effects. Parent companies usually have a higher credit rating and more transparent financial information than their unregulated subsidiaries. However, the degree of support from a parent company to a trading subsidiary cannot be taken for granted, even if a parent company is hinting that it would support its subsidiaries. For example, after Xcel bought NRG, Xcel hinted that it would support NRG. But, Xcel ended up negotiating a settlement to pay \$752 million to its creditors in exchange for having them drop future claims against it. Another example is TXU, when it decided to put TXU Europe into administration after it became obvious that it was not worth it to support its European subsidiary. On the reverse side, Portland General, the regulated utility of Enron, suffered contagion effects from the Enron debacle that prevented the firm from accessing capital markets and caused a downgrade in its credit ratings, despite the fact it had strong financial ratios. The correlation between defaults of parent and subsidiaries is usually quite high, so parental guarantees should be viewed cautiously.

7. Dynamic Market-Based Counterparty Credit Limits

A market risk analysis at the counterparty level can provide valuable insights into the counterparty risk profile. An energy trading book may show very low diversified VaR numbers, but breaking it down by counterparty can show us the level of losses that we could experience if one or more of those counterparties were to default. We can also determine the resulting increase or decrease in the diversified portfolio risk by computing marginal VaR by counterparty.

In Figure 2, we can see a dynamic counterparty-level market risk report. Counterparty limits are sometimes measured against current MtM exposures (taking into account net A/R and collateral payments) with any given counterparty. The larger the exposure, the larger the current loss if the counterparty were to default today. One problem with this analysis is that it does not provide any indications about the possible future P&L changes in the positions against counterparties. For example, we could have a MtM loss today that could turn into a large "paper" profit tomorrow if a large market swing were to take place. A simple and robust way to bring a dynamic component to MtM limits is to add an estimate of how much could be gained versus a given

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counterparty over a particular horizon. This is exactly what VaR measures indicate, but it refers to the other tail of the distribution. We can refer to this measure as VaR+. If we add our current VaR+ (or expected tail gain) to our existing MtM exposures, we can obtain a potential MtM exposure for a given confidence level and horizon.

If we estimate the marginal VaR coming from any of the subportfolios grouped by counterparty, we get an indication

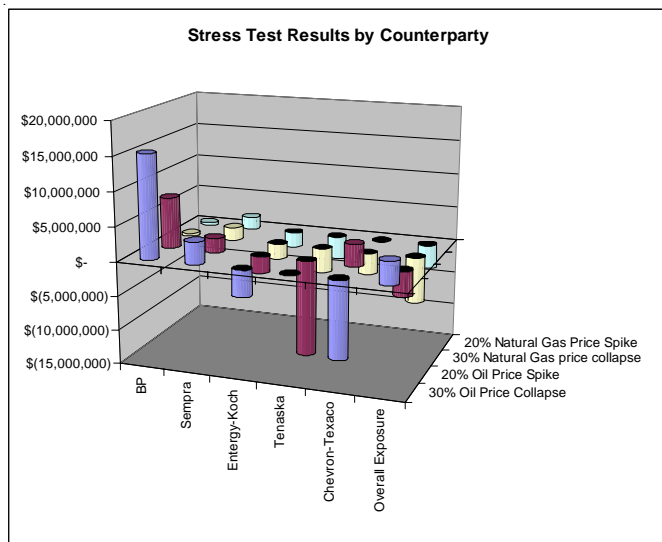
Figure 2: VaR-enhanced Counterparty Market Risk Report

Counterparty	Current MtM Exposure	MtM Limit	Under /Over	Current VaR+	Potential Exposure (MtM + VaR+)	Under/Over MtM limit	Marginal VaR
BP	8,448	12,000	3,552	4,500	12,948	(948)	22,697
Sempra	5,111	10,000	4,889	1,700	6,811	3,189	9,215
Dominion	(2,481)	8,000	10,481	2,400	(81)	8,081	(10,828)
Tenaska	(13,898)	6,000	19,898	3,900	(9,998)	15,998	(13,742)
Chevron-Texaco	3,173	5,000	1,827	1,900	5,073	(73)	(11,408)

of the impact on our risk profile if a counterparty were to default (see last column in Figure 2). The positions with negative marginal VaR numbers act as a natural portfolio hedge. If any of the counterparties with negative marginal VaR numbers were to default, we would need to cover certain positions in order to bring down the risk of the portfolio to the predefault levels.

It is also important to stress-test positions against each counterparty in order to determine potential large exposures, particularly if the counterparty has similar positions with other firms. Stress tests are particularly relevant for nonlinear positions such as options. Figure 3 illustrates the results of various stress tests by counterparty. We can see how a 30 percent oil price

Figure 3: Stress Tests at the counterparty level



collapse would mean a counterparty exposure with BP of \$15 million.

PG&E and Southern California Edison, for example, experienced negative credit events due to very high spot power prices and larger-than-expected demand. Flaws in the regulatory system prevented them from entering into forward contracts for hedging purposes, and left those firms exposed to a set of risks that absorbed more capital than they had in their reserves.

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