APPENDIX VIII

CREDIT RISK IN POWER MARKETS

INDEX

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1. BACKGROUND

A critical aspect of trading in any power market is credit risk. As participants in a power market purchase and sell volumes of power, as well as use forwards, swaps and options to hedge their market risk in electricity, the natural by-product of these activities is credit risk.

Fundamentally, credit risk is the risk a Party takes when the consummation of a transaction it enters into is dependent on a third-party to pay monies or provide value (in all forms) at some predefined future date. Since in all derivatives markets, market risk is effectively transferred from one party to another, interdependence between participants is created to pay and/or to perform under the terms of a contract.

1.1. BASIC MEASURES OF CREDIT RISK

We identify two basic forms of Credit Risk:

1) *Delivery Risk* (Accounts Receivable) – amount owed to a Party in exchange for physical delivery of electricity. In the U.S. power market, buyers of electricity are generally required to pay for volumes received on the 20th day following the end of the month in which the electricity was received.

2) *Performance Risk* (Mark-to-Market) – value that arises from the different between the market price and the contract price due a Party from any forward contract. This source of credit risk is more difficult to manage than delivery risk, and is a significant and compelling aspect of credit risk in spite of a firm's accounting method.

Another aspect of credit risk is a forward-looking combination of the above basic credit risks known as *Potential Risk*. Potential Risk is measured and managed as a way of proactively responding to anticipated Delivery Risk and Performance Risk occurring in the future from a Party's portfolio of transactions with another Party.

1.2. THE EFFECT OF VOLATILITY

Easily the most significant factor in managing credit risk in any power market is volatility. Since electricity cannot be stored, prices can swing violently in either direction. With no ability to mitigate price swings by buying electricity in one delivery period, storing the product, and then selling it in the next period, electricity prices are entirely a function of available generation capacity, transmission capability and demand (which is predominantly driven by weather patterns).

Volatility makes credit risk management so difficult to successfully implement in power markets when compared to managing credit risk in other, less volatile commodity markets. Extreme volatility, as witnessed in U.S. power markets in the Summer of 1998 and the Winter of 2001, is capable of undermining all forms of credit risk mitigation. For example, during these volatile periods in the U.S. power market, the use of credit limits became entirely ineffective as even the smallest trades of electricity yielded millions of dollars of credit exposure, far beyond stated credit limits. Additionally, during these same periods, the practice of margining was overwhelmed, as most participants in the market were not capable of posting hundreds of millions of dollars of collateral. The result of this volatility and consequential credit problems was illiquidity in the market, and a further exasperation of an already strained power market. Some cases resulted in blackouts.

2. CREDIT RISK MITIGANTS

2.1. *CREDIT LIMITS*

2.1.1. ACTUAL EXPOSURE LIMITS

These credit limits are used mainly to provide an upper limit to delivery exposure (accounts receivable). Once these limits are reached or exceeded with a counterparty, trading is halted with the counterparty until exposure is reduced through margining or other means.

2.1.2. POTENTIAL EXPOSURE LIMITS

Unlike the actual exposure limits, the potential exposure limit represents how high exposure could get over a given time horizon. Although this exposure may never be realized, it has the potential to occur. These limits are used primarily to avoid entering into trading positions with a counterparty that could result in substantial performance risk (mark-to-market).

2.1.3. GUARANTEES

Often trading organizations lack the necessary capital to adequately support the financial resources required by counterparties in the granting of credit. Therefore, it is common for a trading company to engage its parent company to provide guarantees to its counterparties in an effort to gain credit. Most companies require that the guarantee that they grant contain a cap or upper limit.

2.1.4. MARGINING

Margining is used in trading agreements to provide a pre-negotiated upper limit to credit exposure. Through margining, a Party can demand the posting of collateral (usually in the form of cash or Letters of Credit) by its Counterparty to secure itself from default. Margining is used widely through the International Swaps and Derivatives Association agreement ("ISDA").

2.1.5. CREDIT RISK PRICING / CHARGING FOR CREDIT RISK

If done appropriately, credit risk charges can lead to more efficient and higher average returns for the same level of credit risk. Credit charges provide signals to traders about the credit risk associated with a given transaction.

3. TOOLS TO MANAGE CREDIT RISK

3.1. QUALITATIVE TOOLS

3.1.1. CREDIT SCORING MODELS

Many credit scoring models use financial and qualitative assessments of a company to determine a credit score and thus a default probability. One example of a credit scoring model is the Altman Z-score model. Many commercially available models are widely marketed to provide qualitative support to credit risk managers.

3.1.2. CREDIT RATINGS

Credit ratings have been utilized for over 100 years by fixed-income investors. Standard & Poor's and Moody's Investor Services are two agencies that provide credit ratings to the market. The ratings are provided on a scale of AAA (Best) to D (Default). Companies

having a rating of BBB or higher are deemed "Investment Grade" and those lacking these ratings are deemed "Junk". Although widely used by many investors and trading companies in the granting of credit, the use of ratings has come under fire in the last several years due to the agencies' slow response to changes in company's financial conditions.

3.2. QUANTITATIVE TOOLS

3.2.1. EXPOSURE MANAGEMENT SYSTEMS

Often through the use of internal trading systems, a credit risk manager can obtain critical information regarding the current and potential credit exposure within a portfolio. These systems are the backbone of a credit risk management function and provide the needed platform to administer credit limits effectively, store collateral information and bestow effective reporting.

3.2.2. POTENTIAL EXPOSURE MODEL

By using this model, one can determine when the maximum exposure will occur over the life of a contract. This information can be used to negotiate credit terms of the contract such as the margining threshold and size of parent guarantee. This model can also be used to evaluate new transactions, help negotiate credit terms and monitor current potential exposure by counterparty.

Example of Delivery Risk

Buyer:**Party B**

Seller: **Party A**

Term: **Jan. 2003**

Volume: **50MW (5x16) On-peak**

Contract Price: **$45.00 / MWH**

Figure 1

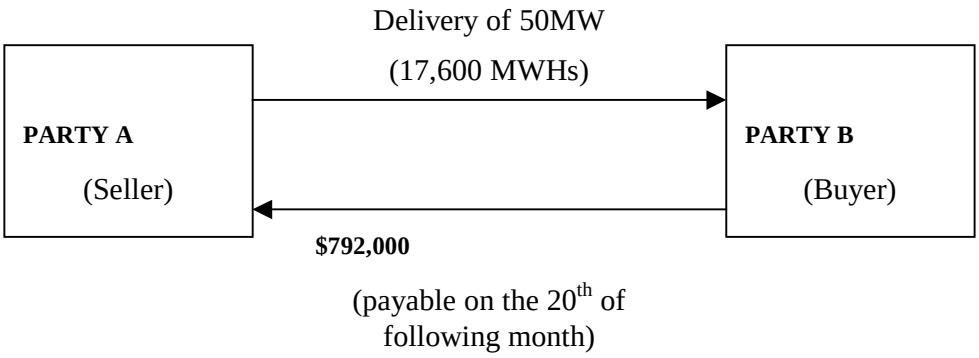
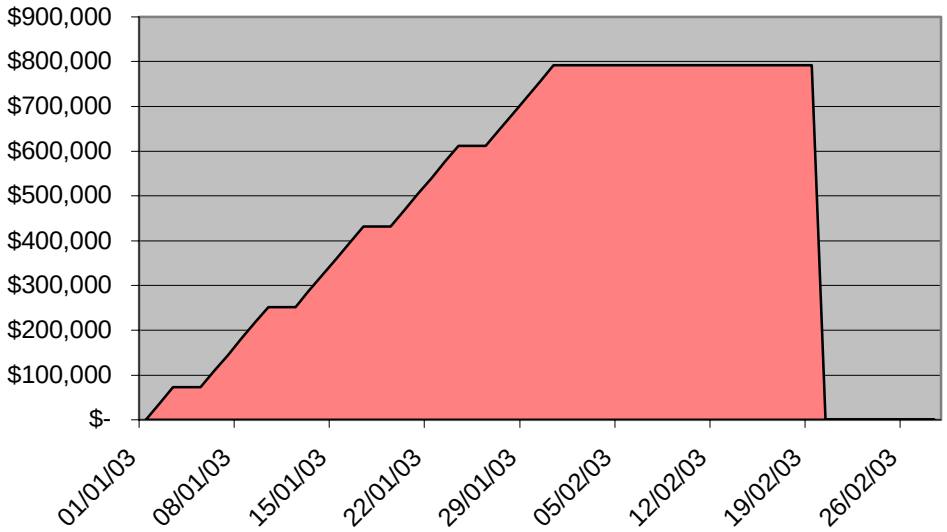


Figure 2



Credit risk is borne by Party A in the form of Delivery Risk (Account Receivable) since Party A is delivering electricity to Party B during the month of January (Figure1). As Party A delivers power, a receivable grows from $0 to $792,000 over the course of the month. Party A will receive $792,000 on February 20 if and only if Party B does not default on its obligation (Graph 1).

Example of Performance Risk

Buyer: **Party B**

Seller: **Party A**

Term: **Jan. 2003**

Volume: **50MW (5x16) On-peak**

Contract Price: **$45.00 per MWH**

Market Price: $75 per MWH

Figure 3

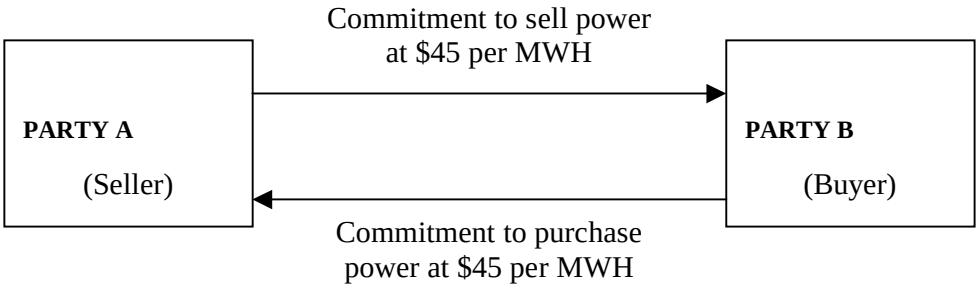
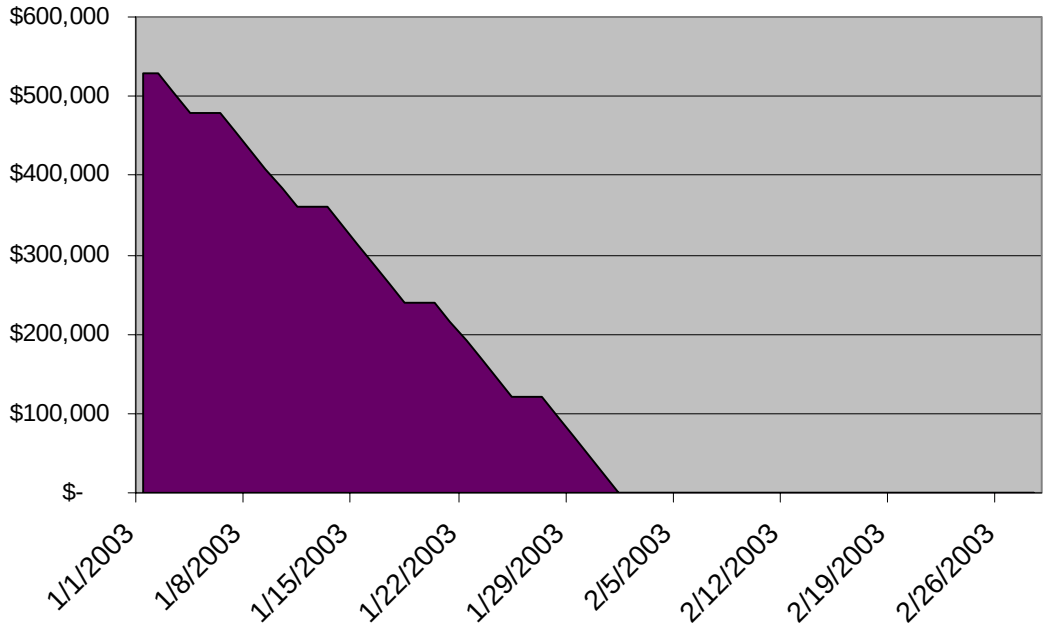


Figure 4



Credit risk is borne by Party B in the form of Performance Risk (Mark-to-Market) since Party A is delivering electricity to Party B during the month of January (Figure 2) at a fixed price of $45 per MWH. Because the market price for the transacted power has risen to $75 per MWH, Party B bears a risk that Party A will default and fail to deliver electricity at the original contract price of $45 per MWH. However, as Party A delivers power, the performance risk borne by Party B diminishes over the course of the month (Graph 2).